

DETERMINANTS OF MOTHERS' SOLID FOOD FEEDING PRACTICES  
DURING THE TRANSITION PERIOD (4 – 9 MONTHS OF AGE):  
IMPLICATIONS FOR IRON NUTRITION

By

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**ABSTRACT**

Solid food feeding is complex and involves interaction at many levels. Solid food feeding practices are determined, in part, by the mother's perceptions of infant food needs, the infant's feeding responses, and the mother's knowledge and skills. It is known that by 9 months of age infants who are not bottle-fed with iron-fortified formula are at high risk for iron deficiency anemia and low iron stores. Dietary iron from complementary solid foods is essential to prevent iron deficiency anemia and iron depletion in these infants by 9 – 12 months of age. However, the content and bioavailability of iron from solid foods offered during the transition period is low. Because of this, it is critical that infant feeding practices are appropriate to meet the infant's evolving nutritional requirements, especially iron needs, during the transition period (4 to 9 months). The success of infant feeding requires that mothers learn both what and how to feed solid foods.

The present research used a grounded theory approach and in-depth interviews with 12 mothers to explore how mothers feed their infants and what influences the way they feed solid foods during the transition period (4 – 9 months). This research identified 5 themes that are central to infant solid food feeding – *the feeding process, perceiving infant food needs, ways of feeding, gaining expertise and tailoring the transition process*. The central theme that had the most influence on the solid food feeding process was how mothers were 'tailoring' the transition process. A 3-dimensional conceptual model of infant solid food feeding was developed to illustrate the interaction between the themes. A causal-consequence model was used to build a second conceptual model to link dietary iron adequacy to the plausible relationships that were identified from the 5 themes.

Findings from this study provide information needed for future development of effective multi-level education strategies that are aimed at facilitating health professionals' practices and mothers' learning about the feeding process and conditions within the proximate environment that determine infant feeding choices and impact on the dietary intake of young infants.

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## Chapter I

The transition period in infant feeding is defined as the time when semi-solid foods are introduced to infants, usually at about 4 – 6 months of age. With acceptance in increasing quantities, solid foods slowly replace the exclusive milk diet and the diet progresses to a 'modified' table diet. The transition to a 'modified' table diet is usually complete by 1 – 2 years of age. Infant feeding during the early transition period occurring from 4 – 9 months is complex because of several key issues – intense growth and thus high nutrient requirements, the developmental stage and thus physical readiness of the infant to accept foods, and interactions between the mother – the infant – and the environment. Infancy is a time of great nutritional vulnerability because it is a period of intense growth and limited dietary variety. For instance, an 8-month-old infant requires more than three times as much iron per kilogram body weight than the average adult male, and over two-thirds of this iron is needed for growth (Dallman, 1992). Gradually expanding the exclusive milk diet (breast milk or formula) to include solid foods enables young infants to meet their changing nutritional needs.

Weaning recommendations are based on three major factors: nutritional need, physiological maturation<sup>1</sup> and developmental<sup>2</sup> feeding issues (Hendricks and Badruddin, 1992). Based on these factors, it is usually recommended that the introduction of solid foods begins between 4 and 6 months of age. The recommendations are considered 'ideal' because as the milk diet becomes nutritionally insufficient (Whithead, 1985a,b; WHO, 1985; Underwood 1985; Forman, 1984) the addition of complementary foods compensates for the nutrients that become limited, thus providing a nutritionally adequate diet. The major nutrients of concern during infancy in industrialized countries include energy, iron, and vitamin D. Iron deficiency, in particular, is a nutritional problem among infants and young children in Canada. Thus, prevention of iron deficiency anemia is a primary focus of nutrition expert groups (CPS, 1991; CPS, 1998; Health and Welfare Canada, 1986; The Vancouver Health Department, 1993) in Canada.

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<sup>1</sup> Physiological maturation includes renal function capacity (increased concentrating and excretory capacity) and gastrointestinal function (increased gastric capacity, bile acid pool, pancreatic amylase, pepsin and matured microvillus membrane structure).

<sup>2</sup> Developmental feeding issues include the extrusion reflex, the head, trunk, gross and fine motor control and exploratory behavior.

The age of onset of weaning is important because it is known that introducing solid foods 'too early' or 'too late' can have negative health consequences (Hendricks and Badruddin, 1992). By 4 – 6 months of age the intestine and kidney (Grand, 1976; Scammon, 1990; Akre, 1989) are better developed to digest and absorb complex foods, and the infant is reaching important physical and neurological milestones (Ingram, 1962; Gesell, 1937; Pridham, 1990) needed for successful solid food intake. An infant fed solids 'too early' is at increased risk for diarrhea and allergic disease due to intestinal immaturity, which may cause malnutrition. In addition, early solid food introduction may lead to decreased breast-milk production because solid foods can displace milk intake. Infants fed solids 'too late', on the other hand, may display negative outcomes, including iron deficiency anemia because human milk alone cannot meet iron needs in the second six months of life. Complementary solid foods that are age and nutrient appropriate are, therefore, essential for normal infant growth and development.

Iron deficiency anemia<sup>3</sup> (IDA) is the most common nutritional deficiency in the world, affecting about a quarter of all infants worldwide (Lozoff, 1996). IDA is most prevalent between 6 and 24 months of age because the iron stores accumulated during gestation are depleted by this time and the requirements to meet growth needs are high. Further, the iron content and absorption of different solid foods commonly fed to infants during the transition period varies. The composition of various food combinations can also positively or negatively influence iron bioavailability (e.g., enhance or inhibit iron absorption). For some infants, early feeding of non-fortified cows' milk that is low in iron further increases the risk of iron deficiency<sup>4</sup> (CPS, 1991). Although the national prevalence of iron deficiency in infancy in Canada is unknown some populations of infants are at high risk for poor iron status. A recent study in Vancouver found about 15% of breast-fed 9-month-old infants had iron deficiency anemia, and a further 30% were iron deficient (Innis et al., 1997).

Although the types of solid foods and how foods are fed to infants during the transition period can influence dietary iron adequacy, data are lacking on the solid food feeding process. Health care professionals, (Nutritionists, Public Health Nurses and Doctors) and mothers themselves interpret and use the current infant feeding recommendations.

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<sup>3</sup> Iron deficiency anemia is defined as the final stage of iron deficiency where there is decreased hemoglobin synthesis and clinical abnormalities (erythrocytes are microcytic and hypochromic). Anemia occurs when iron deficiency is severe.

<sup>4</sup> Iron deficiency is a process of gradual depletion of iron content in the body. The first stages of iron deficiency coincide with the depletion of iron stores, the second stage with inadequate iron transport to the bone marrow.

However, data are lacking on how mothers feed iron containing solid foods, how mothers interpret the guidelines (CPS, 1998) or whether or not mothers can follow the recommendations put forth by the guidelines, in a natural setting. The following research was undertaken to contribute to the gaps in the literature on determinants of mothers' solid food feeding practices during the transition period.

### **1.1. Study purpose**

The purpose of the present research was exploratory, to learn about how mothers feed solid foods to their infants, what influences their feeding practices in a natural setting and how these feeding practices impact on iron nutrition. Very little information has been published on complementary solid food feeding practices during the transition period. A clear understanding of how mothers feed infants solid foods is required in order to understand how to modify the infant's diet to prevent iron deficiency anemia. A qualitative research approach was used to describe the solid food feeding process and identify factors that determine mothers' solid food feeding practices. Qualitative research methods were chosen because these methods are best suited for exploratory research where basic knowledge building is a primary focus.

### **1.2. Study objectives**

**The objectives of this study were:**

1. To identify mothers' solid food feeding practices, focusing specifically on iron-fortified infant cereals, (e.g., what cereals are fed, the preparation methods and the patterns of cereal intake over time) during the transition period when infants are between 4 to 9 months of age.
2. To identify why mothers feed their infants solid foods in the way that they do, focusing on what influences cereal feeding practices and decisions.
3. To explore the link between the mothers' solid food feeding practices and current solid food feeding recommendations forth by expert groups for the transition to solid foods and the prevention of iron deficiency anemia (Canadian Pediatric Society, Dietitians of Canada and Health Canada in Nutrition for Healthy Term Infants, 1998).

## Chapter II

Infancy is an important period for physical and cognitive development because at this time nutritional problems can have long-term effects both on attainment of physical growth and on cognitive functions. The nutritional adequacy of the infant diet and factors that influence food intake are critical for health and achievement. The diet plays an important role in infant iron status because up to 30% of the infant's body requirement for iron must be derived from dietary sources (Smith, 1974; Fomon, 1974). Iron deficiency anemia (IDA) is most prevalent between 6 – 24 months of age. This is further emphasized by the fact that IDA is the most common single nutrient deficiency in the world, affecting approximately 20-25% of infants worldwide (Lozoff 1996). Research is lacking on the national prevalence of iron deficiency among infants in Canada. However, the studies that have been completed have found that iron deficiency anemia is a considerable problem, affecting 7 to over 50% of young infants (Chan Yip and Gray-MacDonald, 1987; Gupta, et al., 1999; Innis et al., 1997; Lehmann et al., 1992; Sawchuck et al., 1996; Walen et al., 1997; Willows et al., 2000).

During the transition period between 4 and 9 months of age, milk is gradually replaced with semi-solid food. The high risk of iron deficiency in the second six months of life coincides with the transition period. Both factors – the high demand for iron due to intense growth and the low iron content and bioavailability of solid foods in the transition diet (Fairweather-Tait et al., 1989; Lynch, 1997) increase the risk of iron deficiency. Research on iron and solid food feeding has focused primarily on the age at which complementary (solid) foods are introduced to infants with little investigation on understanding the more complex behavioral factors that determine solid food feeding over time, and thus potentially influence infant iron nutrition. Clearly, the way a mother<sup>5</sup> feeds her infant iron containing solid foods has the potential to impact on the infant's acceptance of the foods, and thus food consumption patterns and dietary iron adequacy.

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<sup>5</sup> The primary person usually feeding an infant is the mother. However, other people besides the mother also feed infants. For the purpose of this study that involves interviewing mothers, the word "mother" refers to the primary feeder/caregiver.

Information on what motivates mothers to feed their infants solid foods the way that they do is also lacking. Much of the research on factors influencing infant feeding choices has focused on the determinants of breast-feeding initiation and duration. Although this is interrelated with the introduction of solid foods, determinants of breast-feeding choices cannot be extrapolated to understanding the solid food feeding process during the transition period. The effectiveness of infant feeding recommendations designed to decrease the risk of iron deficiency anemia should be based, fundamentally, on their efficacy, comprehensiveness and practical utility within the natural setting, as well as the dietary iron content.

This review provides an overview of current research in key areas relevant to infant iron nutrition between the age of 4 and 9 months when most healthy infants are undergoing the gradual transition from an exclusive milk diet to a diet with milk and semi-solid complementary foods. The main areas this review will focus on are iron status, iron requirements and nutritional balance, diet composition and food iron absorption, dietary consumption patterns, food acceptance, breast-feeding and weaning practices, and the infant feeding guidelines. Breast-feeding practices are discussed because they are closely interrelated to the solid food diet and the risk of iron deficiency anemia. Current infant feeding guidelines are also described to provide an understanding of the information that is available for health professionals and the public about the transition to solid foods and prevention of iron deficiency anemia during infancy.

## **2.1. Iron status – iron deficiency and anemia**

The importance of ensuring adequate dietary iron intakes in infants and children as a basis for prevention of iron deficiency is a public health priority because iron-deficiency may be associated with detrimental effects on the infant's behavioral, cognitive and motor development (Fomon and Zlotkin, 1992). There is also evidence that the treatment of iron deficiency anemia may not completely correct the adverse effects on cognitive development (Idjradinata et al., 1993; Lozoff et al., 1991; Lozoff et al., 1996; Pollitt et al., 1993; Walter et al., 1989). In addition, animal studies have shown that iron deficiency alters neurological function and that the effects are

related to an insufficient supply of iron to different tissues for the synthesis of various iron compounds, such as enzymes (Bynes, 1994; Beard et al., 1993).

Current data on the prevalence of iron deficiency and iron deficiency anemia (IDA) in Canadian infants are limited. The prevalence of IDA among 6 – 14 month old infants living in a low socio-economic environment was reported to be 25 – 27% (Lehman et al., 1992; Chan-Yip and Gray-Donald, 1987). High prevalence rates of IDA have been reported in First Nation infants in Canada (Moffatt, 1995; Sawchuck et al., 1996; Willows et al., 2000; Walen et al., 1997). A recent study in Bella Bella, British Columbia found that 52% of infants between the ages of 6 and 24 months had anemia (Hgb <100g/L) (Sawchuk et al., 1996). In northwestern Ontario, 71 – 79% of 6 to 12 month old infants had IDA (Hgb <110g/L) (Walen et al., 1997). In northern Quebec, 31% of the infants had IDA (Hgb <110g/L) at 9 months of age (Willows et al., 2000). Infants from 8 to 18 months of age in higher socio-economic environments and urban centers appear to have much lower prevalence rates, ranging from 3.5 % to 7% (Greene-Finestone et al., 1989; Innis et al., 1997; Zlotkin et al., 1996).

Although breast-feeding offers some protection against the development of IDA (CPS 1998; McMillian et al., 1976; Pizzaro et al., 1991), other studies have found that a longer duration of breast-feeding is associated with increased risk (Calvo et al., 1992; Chan-Yip and Gray-Donald, 1987; Hertrampf et al., 1986; Innis et al., 1997; Kim et al., 1996; Siimes et al., 1984; Willows et al., 2000). Five recent studies have indicated major differences in IDA between breast and formula-fed infants at about 9 months of age. Although a recent study in Vancouver found the overall prevalence of IDA was 6.7%, infants who were breast-fed for longer than 8 months had a prevalence of 15.5% (Innis et al., 1997). Willows et al., (2000) found that IDA is highly prevalent among First Nation infants. These authors reported strong associations between hemoglobin concentration and the type of milk feeding at 9 months of age. They reported 43% of breast-fed and 16% of formula-fed infants had IDA (Hgb <110g/L) at 9 months of age. Severe anemia (Hgb <100g/L) was found among 1.3% of the infants fed formula and 17% of the infants who were breast-fed (Willows et al., 2000). Pizarro et al., (1991) combined the results of three studies involving a total of 854 9 month old infants completed between 1975 and 1985, in Santiago,

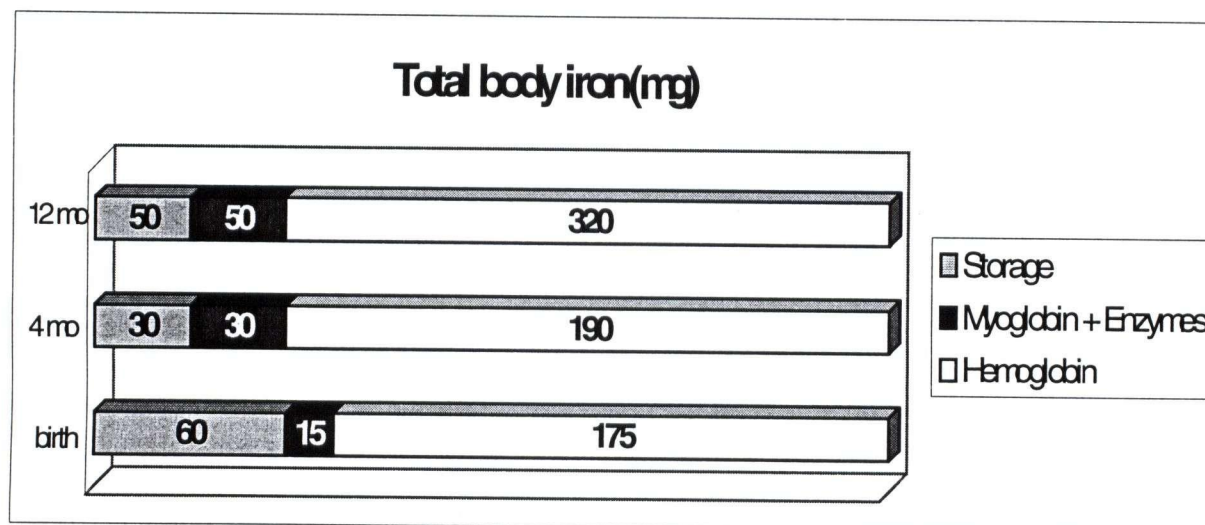
Chile and reported a prevalence of IDA of 14.7% (Hgb <110 g/L) among infants fed human milk, 20.2% among infants fed cows' milk, and 0.6% among infants fed iron-fortified formula. Walter et al., (1993) found that feeding iron-fortified cereal to breast-fed infants decreased the percentage of infants with a low hemoglobin (<105g/L) by more than half to 12% from 27% by 15 months of age. This trend was evident by 8 months of age in that about 10% of the infants fed fortified cereal and about 15% of infants not fed fortified cereal had low hemoglobin levels (<105g/L). Of note, the prevalence of IDA in this study for breast-fed infants in Chile who were not fed iron-fortified cereal is very similar to that reported for breast-fed infants in Vancouver by Innis et al., (1997). Calvo et al., (1992) found that 27.8% of 9 month old breast-fed infants in Argentina had IDA (Hgb <100g/L) compared with 7.1% of infants fed formula. In summary, breast-feeding does not appear to completely protect the infant from iron deficiency in the second six months of life, and feeding with iron-fortified infant cereal decreases the risk of IDA at 8 – 9 months of age.

## **2.2. Factors that influence infant iron status.**

### **2.2.1. Iron requirements and nutritional balance.**

The requirement for dietary iron per kilogram body weight is greater during infancy and childhood than at any other period in life (Dallman, 1980; Oski, 1989). There is very little change in the total body iron content of the healthy term infant between birth and 4 months of age (Oski, 1989). Abundant iron stores are laid down in the developing fetus in the last months of pregnancy and in the infant shortly after birth from the breakdown of fetal haemoglobin (Hallberg, 1992). Through these processes the iron stores of the healthy term infant provides a phase of iron self-sufficiency that makes it unlikely that the infant will become iron-deficient before about 6 months of age (Dallman, 1992; LRSO, 1998; Simmes 1984; Stekel, 1984). From 4 – 12 months of age, the total body iron content almost doubles (Dallman, 1986). The rapid growth during the second six months of life, and the accompanying rapid expansion of blood volume quickly depletes the infant's iron reserves. After 6 months of age the risk of iron deficiency is high and the adequacy of the dietary iron supply becomes critical. For example, in the 1-year old infant approximately 30% of the body's iron needs for growth and blood volume expansion must be

provided by the diet (Smith, 1974; Fomon, 1974). The iron of human milk, unfortified infant formula and cows' milk is inadequate to meet the infant's iron requirements, thus other dietary sources are needed from 4 – 6 months of age when the infant's iron stores are no longer able to prevent iron deficiency (Dallman, 1980). Figure 1 illustrates the changes in body iron during the first year of life.



**Figure 1.** Changes in body iron content during infancy. The requirement for dietary iron is minimal until about 4 months of age because storage iron is used of to support the needs for hemoglobin and iron-containing enzymes. In contrast, a large quantity of iron must be assimilated during the remainder of infancy, and are needed from the diet to support the rapid increase total body iron (adapted from Dallman, P.R., 1986)

Iron requirements during the second 6 months of life are based on estimated obligatory iron losses, which include intestinal, skin and urine losses averaging 0.37 mg per day (0.04 mg/kg). Iron accretion for growth and iron stores is estimated at 0.34 mg/day. Thus, the total iron requirement is set at 0.7 mg/day and the dietary iron intake recommended to meet this requirement, assuming an absorption of 10%, is 7.0 mg/ day from 5 – 12 months of age (Health and Welfare Canada, 1990).

Iron balance is a physiological state in which the quantity of iron absorbed from the diet is sufficient to offset daily iron losses, to allow iron utilization for physiological functions, and to

maintain adequate iron stores. Iron deficiency progresses in three stages or degrees of severity. The first stage coincides with the depletion of iron stores. The second stage coincides with the inadequacy of iron transport to the bone marrow. The third and most severe stage, anemia, coincides with a defect in haemoglobin production (Hercberg and Galan, 1992). The impairment in the production of essential iron compounds is referred to as iron deficiency. When essential iron compounds such as haemoglobin, mitochondrial iron proteins (cytochromes) and iron sulfur proteins, that function in oxidative production of cellular energy in the form of adenosine triphosphate are limited then impaired physiological function is likely (Filer, 1989). Low iron stores per se indicate that the infant is vulnerable to iron deficiency; the lower the stores the more vulnerable the infant becomes (Dallman, 1989). The term iron deficiency does not provide a specific description of the degree of iron depletion. Iron deficiency anemia (IDA), on the other hand, is a hematologic state that results from iron deficiency. In IDA, the body iron stores (ferritin and hemosiderin) have been exhausted and the infant is in the last stage of iron deficiency in which there is insufficient iron for the synthesis of hemoglobin. Thus, IDA is the end result of a cumulative process of iron depletion that occurs over a period of months. The measurement of both serum ferritin and haemoglobin reflect the iron status of almost 90% of body iron (Bothwell, 1979). The 4 key factors that influence infant iron status and risk of iron deficiency are the abundance of neonatal iron stores, body iron losses (basal, pathologic, gastro-intestinal bleeding), the high demands for iron during rapid growth and the iron content of the diet. The iron content of the diet depends on the quantity consumed, the form of iron (heme or non-heme iron), and the overall diet composition (Bothwell et al, 1989; Charlton and Bothwell, 1983; Cook and Bothwell, 1984; Hallberg, 1981; McMillian et al., 1976; Saarinen et al., 1977). Of these 4 factors, the infant's diet is the most highly modifiable. Therefore, the basis of prevention of IDA during infancy is dietary modification. A clear understanding of how mothers feed infants solid foods is required in order to understand how to modify the infant's diet to prevent iron deficiency.

### 2.2.2. Diet composition and food iron absorption

The diet can influence infant iron status and the risk of IDA in 3 ways: the iron content (quantity), the form of iron ingested (heme or non-heme iron) and the composition of the diet (Bothwell et al., 1989; Charlton and Bothwell, 1983; Cook and Bothwell, 1984; Hallberg, 1981; McMillan et al., 1976; Saarinen et al., 1977). The major sources of dietary iron in later infancy are breast milk, iron-fortified infant formulas, iron-fortified infant cereals and meats.

Human milk provides about 0.26 mg of iron per day, based on a typical daily consumption of 750 mL milk/day with an iron content of 0.35 mg/L milk (Saarinen, Siimes et al., 1977; Health and Welfare Canada, 1990). However, the range of iron in human milk varies between 0.2 to 0.8 mg/L (LRSO, 1998). Further, the absorption of iron from human milk ranges from 12 to 50% (Abrams et al., 1997; Davidsson et al., 1994b; Hallberg et al., 1992; McMillan et al., 1977; Saarinen et al., 1977; Schulz-Lell et al., 1987). At an average iron content of 0.26 mg, and assuming 50% absorption, the infant would absorb about 0.12 mg/day of iron from human milk. Alternately, assuming the maximum iron in human milk of 0.8 mg/L, a maximum absorption of 50%, and a high consumption level of 1000 mL of milk per day, the infant would absorb a theoretical maximum of about 0.40 mg iron/day. However, with maximum absorption and the minimum iron content in human milk (0.2 mg/L), the infant would absorb only about 0.10 mg iron per day. Similarly, since iron absorption decreases with the increasing amount of iron provided from the food, assuming a more likely absorption rate of 12% with 0.8 mg/L iron, the infant would also only absorb about 0.10 mg iron/day from 1000 mL of milk. This 4-fold difference in potential iron absorption among the breast-fed infants creates challenges to estimating the amount of iron obtained from breast milk alone, and thus from complementary foods.

Infant cereal contains approximately 3 mg of iron (2.7 – 3.5 mg) per 3 tablespoons of dry infant cereal (Health and Welfare Canada, 1986). Rios et al., (1975) found that the mean absorption of electrolytic iron from mixed cereal was 4.0%. With an absorption of 4.0%, 4 tablespoons of dry infant cereal would provide about 0.13 mg of iron. The combined total iron content of human milk (0.3mg/L) plus 8 tablespoons of infant cereal per day could theoretically provide about 0.6 mg, close to the estimated requirement of 0.7 mg/day. Clearly, the solid food

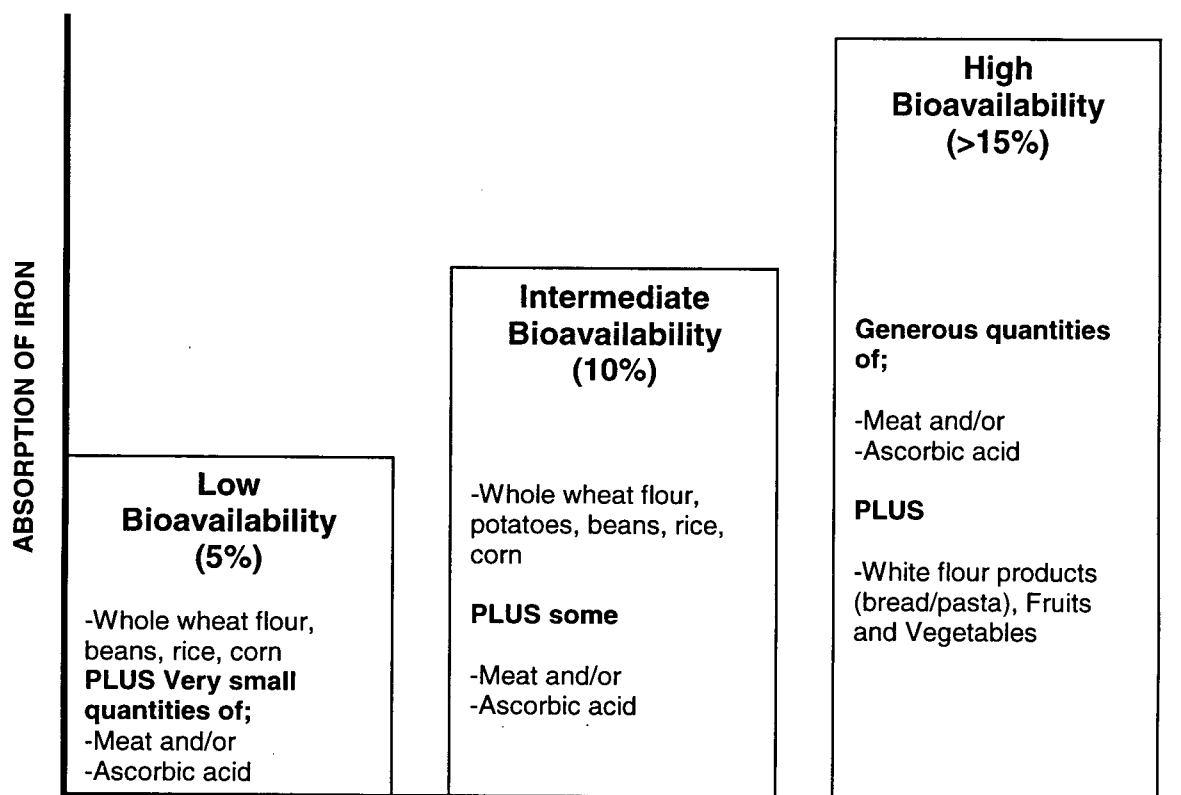
feeding practices of the mother will affect the solid food intake, and thus iron status of the infant. Thus, an understanding of factors that influence infant solid food consumption patterns is important to identifying practices that promote or decrease the consumption of iron-fortified first foods.

In addition to the quantity of iron in food, both the form of the iron and the composition of the diet also influence iron bioavailability. In fact, the form of the iron in food and the effect of food combinations on iron bioavailability can have a greater impact on iron nutrition than the total amount of iron in the diet (Charlton et al., 1983; Cook et al., 1984; Hallberg, 1981; McMillan et al., 1976; Oski et al., 1980; Saarinen et al., 1977). The interplay between promoters and inhibitors of iron absorption are key to the bioavailability of non-heme iron. A brief review of the types of iron in the diet is needed in order to understand iron absorption and illustrate the potential differences in iron absorption in relation to the type of complex meals an infant might consume.

The two forms of iron in the diet – heme and non-heme iron, differ with respect to bioavailability (Hallberg, 1989; Rossander-Hulthen and Hallberg, 1996). Heme iron which is present in animal tissues is absorbed at a high rate (~25%) and this absorption is generally independent of iron status and dietary inhibitors and promoters of iron absorption (Monsen et al., 1978). Non-heme iron, which is found in non meat sources including dairy foods, has a wide range of absorption of 5 – 20%, and the absorption of non-heme iron depends on the individual's iron status and the composition of the diet (factors enhancing or inhibiting absorption). It has been generally agreed that the major factors enhancing non-heme iron absorption include ascorbic acid, meat, poultry and fish and organic acids (citric, lactic, malic, and tartaric acids) (Hallberg, 1989; Lynch, 1997). Engelmann et al., (1998) investigated the influence of meat on non-heme iron absorption in a cross-over design with 8, 43-49 week old infants and found that non-heme iron absorption was significantly increased (15% from 9.9%) from the vegetable mixture when meat was added. The major factors that inhibit non-heme iron absorption include phytates, which are found in all cereals and soy products, polyphenols in tea, coffee, vegetables and fruits, some proteins (egg albumin and legume protein) and some inorganic elements (calcium) (Fairweather-Tait, 1989; FAO/WHO, 1988). Further, data are available to suggest that

solid food feeding patterns may interfere with the absorption of iron from breast milk, and hence influence the iron status of the infant (Osiki and Landaw, 1980). Continued research on 'food combinations' that promote non-heme iron absorption may better elucidate the link between food mixtures that are fed to infants and the absorption of dietary iron (Fairweather-Tait et al., 1995; Fox et al., 1998; Fuchs et al., 1993).

The general effects of diet composition on the relative bioavailability of iron have been described (FAO/WHO, 1988). Diets have been divided into low, intermediate, and high iron bioavailability that corresponded to absorption rates of about 5%, 10%, and 15% respectively (in the presence of low iron stores). Monsen et al., (1978) state that a diet with low iron bioavailability has a high inhibitor content with few promoters in the form of meat, fish or ascorbic acid. Using the model described by Monsen et al., (1978), the percentage of iron absorbed from a typical single meal from the Canadian diet is assumed to be 12.5% (Health and Welfare Canada, 1990). The recommended dietary iron intake for 5 – 12 month old infants is 7.0 mg/day and is derived from the total iron requirement of 0.7 mg/day with an assumed factor of 10% for absorption (Health and Welfare Canada, 1990). However, the solid food transition diet of young infants (4 – 9 months) contains predominantly iron of low bioavailability (5%) (FAO/WHO, 1988; Yeung et al, 1981). The following figure emphasizes the effects of diet composition on the relative bioavailability of iron from food and highlights the 'vulnerability' of infants to low iron status due to adequate iron intake and absorption from typical weaning foods.



**Figure. 2.** The influence of diet composition on the relative bioavailability of iron. Diets of low (5%), intermediate (10%), and high iron bioavailability (>15%) are shown (adapted from FAO/WHO, 1988).

An understanding of how complex meals are fed to infants and why mothers chose the feeding strategies that they do could facilitate an understanding of how to increase non-heme iron absorption through food combinations. However, research is lacking on the infant solid food feeding strategies that promote the consumption of an appropriate quantity of dietary iron from solid foods, or feeding strategies that might enhance the bioavailability of the non-heme iron present in the infant diet.

### 2.2.3. Dietary consumption patterns

Very little information has been published on the food intake of Canadian infants during the second six months of life. Over the past 20 years there has been a definite trend away from the early introduction of solid foods. In the late 1970's, Clark et al., (1981) and Yeung et al.,

(1981) found that solid food had been introduced to 78% and 70% of infants, respectively, by 3 months of age. In the early 1980's, Tanaka et al., (1987) and Greene-Finestone et al., (1989) reported a trend to later introduction, with only 42% and 33.8%, respectively, of infants introduced to solid foods by 3 months of age. In a recent study in Vancouver, this trend toward later introduction of solid foods was even more apparent. Williams et al., (1996) found that only 7.8% of infants in Vancouver had been given iron-fortified infant cereals before 4 months of age. This trend to later introduction of solid foods is more closely aligned with the current Canadian Pediatric Society (CPS) Nutrition Committee recommendations and coincides with the societal shift towards an increased initiation and duration of breast-feeding. However, Williams et al., (1996) also found that iron-fortified cereal had not been given to 6.7% of the infants by 7 – 9 months of age, and meats, chicken or fish had not been given to 33%, 24% and 62%, respectively, of the infants by 9 months of age. Possibly, the later introduction of heme iron containing foods beyond recommended ages in some infants could impact on iron status at 9 months of age. Two studies have reported that feeding infants iron fortified cereals for less than 3 months (Greene-Finestone et al., 1989) or less than 6 months (Lehamnn et al., 1992) was associated with an increased risk of IDA. However, there appears to be no published data on whether the mother's knowledge or perceptions about the importance of feeding iron containing solid foods influences subsequent feeding practices.

The last Infant Nutrition Survey (1977-78) in Canada found that a segment of the infant population could have diets deficient in iron (Yeung et al., 1983). To assess the adequacy of dietary iron intakes, the mean iron intake was compared with the current recommended intake of 7 mg/day for infants 5 to 12 months of age. The probability of iron deficiency was then approximated (biochemical data were not used). The proportions of 6, 8, 10, and 12 month old infants with an inadequate intake of iron were 35%, 33%, 37% and 53%, respectively, and the probable proportions of infants with iron deficiency anemia were 21%, 18%, 20% and 33%, respectively (Yeung, 1983). However, since the iron provided by breast milk was not included in the analysis of the mean dietary iron intake, the values are most likely higher than would be expected. From 3 – 10 months of age, 70% to 93% of the infants in this study were receiving

infant cereals and the amount they consumed averaged 18 – 20 grams per day. This amount of cereal would contribute about 70% of the total iron requirement, assuming 10% absorption (70% of 7 mg is 4.9 mg of dietary iron). However, if the non-heme cereal iron was absorbed at only 5% rather than 10% only about 30% of the iron requirement ( 0.7 mg per day) would be met. Yeung (1983) suggested that the main cause of the high prevalence of iron deficiency as the infant grew older was the replacement of iron-fortified infant cereals with adult cereals and table foods, which contain only 50 – 35% of the iron found in infant cereals. However, the lack of data on the amount of iron absorbed from iron-fortified infant cereals, possible adverse effects of cows' milk in the infant diet, and the amounts of cereal consumed over time limit the interpretation of population data on dietary iron intake.

More recently, several studies have suggested that there are differences in the solid food consumption patterns between breast-fed infants and infants fed formula. Walter et al., (1993) reported that formula-fed infants consumed 27gms, 30gms, and 31gms/day of infant cereal compared with 10gms, 20gms, and 23gms/ day by breast-fed infants at 5, 6, and 7 months of age, respectively. Further, the cereal intake was also significantly different between the 2 groups at 8 months of age. It seems possible that the cumulative impact of lower infant cereal consumption could increase the risk of iron deficiency among breast-fed infants. Longitudinal studies to show this, however, are lacking. Heinig et al., (1993) also found differences in solid food feeding between breast-fed and formula-fed infants, but the differences were in introduction of solid foods 'other' than cereals, that are important to iron nutrition. At 9 months of age, meats, fish, and poultry had been introduced to 87% of the formula-fed infants but to only 52% of breast-fed infants. Furthermore, 63% of the breast-fed infants compared with 31% of formula-fed infants had been given dairy products at 9 months. As would be expected, these differences disappeared by 12 months (Heinig et al., 1993).

In summary, the available literature suggests that infants may be fed solid food differently depending on whether the infant is breast-fed or bottle-fed with infant formula. Breast-fed infants appear to consume less iron-fortified infant cereal, to be introduced to heme iron sources later, and to be introduced to dairy products (which inhibit iron absorption) sooner than formula-fed

infants. It is not clear from the available literature why these differences occur. In order to develop nutrition education strategies to prevent iron deficiency a greater understanding of the factors that influence the solid food feeding practices as well as the perceptions, attitudes and beliefs of mothers, is needed.

The possibility that early exposure to the varying flavors in mother's milk rather than the constant unvarying flavor of formula affects later food preferences, the development of food habits and the acceptance of new foods at weaning or later is a new and exciting area of research. Infant acceptance of iron-fortified infant cereal, as a transitional food, is pivotally important to its efficacy as the primary source of dietary iron for infants during the transition period (4 – 9 months). Mennella and Beauchamp (1998) stated that infants are clearly not passive receptacles for early flavor experiences. Studies on 'taste' generally agree that infants have the ability to detect sweet tastes very early and there appears to be an innate preference for sweet tastes and rejection of bitter tastes. Less is known about infant texture preferences. Food taste and texture preferences may be key factors in the infant's solid food selection patterns and in the quantity of food that is consumed.

Sullivan and Birch (1994) have reported information on infant acceptance of first solid foods with respect to milk feeding method and repeated exposure on acceptance of the same or similar foods. These authors found that after repeated exposure, all infants (n=36) increased their intake of vegetables. In addition, the finding that breast-fed infants had a greater intake of vegetables than formula-fed infants led Sullivan and Birch (1994) to suggest that breast-feeding facilitates the acceptance of solid foods. However, Birch et al., (1998) found that the number of feedings needed to increase intake of a 'novel' similar food in 4 to 7 month old infants (n=36) nearly doubled after only one exposure. The infants were much less responsive to a 'novel' different food. This finding suggests that infants can be particularly sensitive to small changes in food flavors. Mennella and Beauchamp (1997) reported that infants consumed significantly more cereal if the cereal was prepared with the mother's milk, and ate at a faster rate than when the cereal was prepared with water. Further, 30 minutes later the infants continued to prefer the milk-cereal combination over the water-cereal combination. Observation of videotaped infant cues

also showed milk-cereal mixture preferences. This study suggests that the cereal preparation method (i.e., altering flavors) influenced the infant's acceptance of the cereal.

Stephenson et al., (1994) compared the effects of feeding a low-density porridge (2.15 kJ/g), a thick high-density porridge (4.09 kJ/g), and an amylase reduced viscosity porridge in 15 non-breast-fed infants of 7 – 15 months of age. Although the mean daily consumption of the thickened porridge was significantly lower, the daily energy intake was significantly higher. Further, the meal duration was almost twice as long with the thick porridge meal compared with the low-density porridge. Since the 'thinned' viscosity porridge did not increase energy intake, these authors suggest simply making weaning foods thicker and adding such foods as oil, or peanut butter can be used to increase the energy density of food eaten. This study suggests that the texture, in addition to the flavor, of the food can influence cereal consumption.

Cohen et al., (1995) reported that delaying the introduction of complementary foods until 6 months when compared with introduction at 4 months did not affect appetite or food acceptance among exclusively breast-fed infants when studied later at 9 and 12 months of age. There were no differences found in the breast-feeding frequency, the amount or number of foods consumed at the midday meal, the amount of food offered that was consumed, the usual daily number of meals and snacks, the number of food groups consumed, or the overall food acceptance score at 9 and 12 months of age. However, the interpretation of this data is limited since the infants' food responses during the transition period from 4 to 9 months was not described.

The verbal or non-verbal cues which infants display when offered food and during feeding are responses to a complex set of factors (for example, developmental readiness, food preferences, satiety or tiredness). Further, feeding dynamics may play a critical role in food acceptance and thus consumption patterns. Satter (1990) has noted that effective feeding includes allowing the infant to determine food timing, amount, preference, pacing, eating capability, and providing the opportunity to explore the food. She states that supportive positive feeding dynamics are important for prevention of feeding problems. Satter (1990) has characterized infant developmental principles that guide feeding over the first 36 months of life. Of note, the 'separation individuation' stage that begins at about 6 months of age is a developmental stage

when infants “exert increasing control over their environment and the people in it”. Satter (1990) has described 13 parental behaviors that support infant opportunities to explore, yet give structure and limits to feeding. These behaviors appear to focus around the concepts of engaging feeding behaviors rather than overwhelming behaviors, appropriate pacing of feeding, exploring, sensitivity to food preference and satiety cues, and giving control and support. Although these behaviors seem common sense, infant feeding can be both complex and challenging for mothers during the transition period. The available data suggest that the ‘interactional’ characteristics of the feeding relationship could cause poor feeding dynamics and consequently inadequate dietary intake. Research is lacking on determinants of mothers’ solid food feeding behaviors, such as the characteristics of the feeding relationship.

#### **2.2.4. Breast-feeding and weaning practices**

Breast-feeding is considered the optimal method of feeding infants up to 2 years of age and beyond, with the introduction of complementary solid foods recommended to begin starting at 4 – 6 months of age (CPS, 1998). Although the breast-feeding initiation and duration rates in Canada have both increased in the last 25 years they still fall short of the current recommendations to exclusively breast-feed for at least 4 (CPS, 1991; CPS, 1998; Vancouver Health Dept. 1993), or 6 months (O’Brian et al., 1998; WHO/UNICEF, 1989). Data on breast-feeding trends in Canada are available from the national study from 1963 to 1982, as well as from local and regional studies. McNally et al., (1985) summarized the results of 9 cross-sectional rates in breast-feeding trends in Canada from 1963-1982. In 1963, only 38% of women initiated breast-feeding compared with 75% in 1982. A study during 1984-85 by Tanaka and colleagues (1987) found that 88% of mothers in metropolitan Toronto initiated breast-feeding. The National Population Health Survey (NPHS) and the National Longitudinal Survey of Children and Youth (NLSCY), both conducted in the early 1990’s, found initiation rates of 73% among a random sample of women across Canada (Maclean and Miller, 1998). Williams et al., (1996) found that although about 83% of mothers in Vancouver started to breast-feed in hospital, only 30% of mothers exclusively breast-fed until 6 months and only 18% were still breast-feeding at 9 months

postpartum. The definition 'exclusively' breast-fed in the latter study was breast-feeding with no bottle-feeding of formula or cows' milk. Breast-feeding duration rates have also increased from 14% to 44% breast-feeding to 4 months and from 7% to 31% breast-feeding to 6 months, from 1963 to 1982, respectively (McNally et al., 1985). Although breast-feeding initiation rates in Canada have improved dramatically during the last 20 years, the number of mothers breast-feeding to 6 months of age has stayed at about only 30% since the early 1980's, (McNally et al., 1985; Tanaka et al., 1987; Williams et al., 1996). Whether solid food feeding practices impact breast-feeding practices, in particular, breast-feeding duration is unclear.

The proportion of infants fed solid foods before 4 months of age has decreased substantially over the past 20 years. In 1977 – 78, the median age at which mothers introduced solid foods was less than 2 months, with 65% introducing solid foods by 1 month of age (Tanaka et al., 1987). In contrast, by 1984-85, the median age for solid food introduction was 4 months. By 6 months of age, about 90% of infants in studies between 1977 and 1996 were receiving infant cereal (Tanaka et al., 1987; Williams et al., 1996; Yeung, 1981). Greene-Finestone et al., (1989) reported that 3 times more infants of low socioeconomic status (SES) received solids prior to 3 months of age when compared to infants of a high SES. These authors also showed that mothers who did not breast-feed introduced solids about 1 month earlier than mothers who breast-fed and bottle-fed, or who only breast-fed. This suggests a link between lower education level, lower income and socio-economic status, bottle-feeding and earlier introduction of solid foods (Beaudry et al., 1989; Bergerman et al., 1979; Greene-Finestone et al., 1989; Stewart et al., 1987).

Numerous studies have examined factors that are associated with a mother's decision to breast-feed and to wean. These studies have identified demographic factors such as maternal age, education, income, marital status, ethnicity and psychosocial variables such as attitudes, stress and support as important determinants of infant feeding practices. Successful breast-feeding involves a complex interaction of factors that are reciprocally determined by internal personal and socio-environmental factors. The internal personal factors that may determine breast-feeding duration include; cognitive/affective (e.g., knowledge, attitudes, beliefs), outcome

expectations (e.g., best for baby), self-efficacy (e.g., confidence, previous experience), biological (e.g., age) or psychosocial (e.g., embarrassment) (Williams et al., 1999). The socio-environmental factors that may influence breast-feeding duration include; institutional (e.g., health care practices, supportive work place environments and policies), social (e.g., supportive partner/family/dynamics), socio-demographic (e.g., education, income, ethnicity, marital status), physical (e.g., discomfort or pain, tiredness) and others (e.g., distance from work) (Williams, et al., 1999). However, research is lacking on the internal personal and/or socio-environmental factors that determine solid food feeding practices or how breast-feeding practices might influence solid food feeding practices. The World Health Organization (WHO/UNICEF, 1989) has emphasized the importance of supportive environments in hospitals and the community to promote both increased initiation and duration rates of breast-feeding. To implement their recommendations health care institutions are asked to put in place policies that comply with the "10 steps to Successful Breast-feeding" (WHO/UNICEF, 1989) and The WHO International Code of Marketing of Breast-milk Substitutes (WHO, 1981). Although more supportive breast-feeding work environments (Katcher and Lonese, 1985; Kearney and Cronenwett, 1991; Morse et al., 1989) and social support (Rousseau, 1982) may enable mothers to breast feed longer, a better understanding of how mothers feed their infants solid foods between 4 – 9 months of age may also promote breast-feeding duration since the liquid and solid food practices are so closely intertwined during the transition period.

Previous studies have shown that breast-feeding is often discontinued early due to insufficient milk (Henly, 1995; Maclean and Miller, 1998; Williams et al., 1999) and mothers' perceptions of infant hunger cues (Schwartz and Evers, 1998). A recent study in Vancouver that examined the factors influencing mothers' decisions to wean, reported that the main reasons for weaning before 3 months were the mother's concern for the baby's nutrition, and being uncomfortable with breast-feeding. The main reasons for discontinuing breast-feeding at 3 to 6 months were the need to return to work, concern about the baby's nutrition and concern about milk supply. In contrast, mothers who weaned after 6 months, did so primarily based on their need to return to work and their personal choice (Williams et al., 1999). The available data are

not clear if the mother's concerns about infant hunger, nutrition and milk supply are related, in some way, to the solid food feeding process rather than issues specific to breast-feeding alone. A better understanding of how mothers' feed infants solid foods during the transition process might further our understanding of the influence of solid foods on the liquid diet, or alternately the influence of liquid foods on the solid food diet.

Numerous studies have used primarily a quantitative approach (e.g., survey) to examine the demographic and social correlates of mothers' breast-feeding behaviors. The survey method is limited in its ability to identify the meaning of complex issues, such as breast-feeding, because the response formats are close ended and have usually been derived from the research literature that is not necessarily relevant to the context of the mother's situation. Although the survey method is important for identifying demographic predictors of breast-feeding choices, only a partial understanding of the 'breast-feeding' experience can be expected. Maclean (1990), however, suggests an alternative framework for thinking about the breast-feeding experience. Using experientially focused research, mothers talked in-depth about the variety of reasons that contributed to their decision to wean early. One complex set of factors that evolved was linked to the *overwhelming experience of having a baby* (turbulent emotions and vulnerability). Another set of factors was linked to the *cultural context* (the cumulative work of mothering and conflicting social values). Lastly, *changes in self identity* (self worth, social isolation, feelings of reward and anxiety, physical discomfort or pain, sense of time) were closely linked to mothers' breast-feeding experiences and early weaning. These themes may also impact the 'transition experience' and influence the age solid foods are introduced, as well as how solid foods are fed to 4 – 9 months old infants. Further advances in understanding weaning practices might come from a deeper understanding of how mothers experience the solid food feeding process.

### **2.3. Infant feeding guidelines**

Recently, three expert groups: the Canadian Paediatric Society Nutrition Committee, Dietitians of Canada and Health Canada have prepared a National statement on nutrition for healthy term infants from birth to 24 months of age (Canadian Paediatric Society, 1998). It is

important to note, however, that the infant feeding recommendations are based on scientific evidence when it is available, but are otherwise based on "accepted common practices". The guidelines provide health care professionals with current reliable nutrition information on breast-feeding, alternate milks, transition to solid foods, the prevention of iron deficiency anemia and other topics (CPS, 1998). The guidelines are used by many sectors, including industry for preparation of education materials and comments on food packaging. The popular press also uses this information (i.e., parenting magazines). Hospitals and physician offices, as well as public health departments provide this information for mothers. As a result, mothers receive infant feeding information through many channels. However, the infant feeding guidelines do not focus on the practical issues around how to feed solid foods.

With regards to the transition to solid foods, the current feeding guidelines for healthy term infants (Canadian Paediatric Society, 1998) state that "infants between 4 and 6 months of age are physiologically and developmentally ready for new foods, textures and modes of feeding". Thus, two specific recommendations are given. Mothers are recommended to introduce complementary foods at 4 to 6 months of age to meet the infant's increasing nutritional requirements and for developmental needs. Second, to prevent iron deficiency, iron-containing foods such as iron-fortified cereals are recommended as the first foods. In addition, the working group recommends that the early use of weaning foods, that is prior to 4 months of age, may increase the risk of iron depletion and anemia since iron absorption from human milk is depressed when the milk is in contact with other foods in the proximal small bowel. This statement implies that the timing of feeding breast milk and solid foods is important to iron absorption. Further, with regards to the prevention of iron deficiency anemia, the guidelines state "iron deficiency is preventable through appropriate feeding choices". Consequently, six recommendations are given, three pertaining to the primary milk source, two regarding the age of introduction and duration of feeding iron containing solid foods, and one refers to screening for IDA and supplementation with medicinal iron. The first recommendation is to continue exclusive breast-feeding for at least 4 months. The guidelines recommend that mothers introduce complementary foods containing iron at 4 to 6 months of age. The third recommendation advises

that the preferred breast-milk substitute for infants who are not breast-fed or who are partially breast-fed is iron-fortified infant formulas. The guidelines recommend delaying the introduction of whole cow's milk until the infant is 9 to 12 months of age. The fifth recommendation is to continue to offer iron-fortified foods beyond 1 year of age to provide sufficient dietary iron for the infant. The last recommendation is that where informed parents choose not to adhere to these recommendations, the infant should be screened for anemia at 6 to 8 months of age and provided with medicinal iron drops, if necessary (CPS, 1998).

In addition to the National guidelines, Provincial infant feeding guidelines have also been developed. The current guidelines for British Columbia (B.C. Ministry of Health, 1996), recommend feeding solid foods 1 – 2 times per day, from 4 to 6 months of age starting with 1 teaspoon of iron-fortified cereal and increasing to 4 tablespoons per day. From 6 to 9 months, mothers are instructed to feed their infant solid foods 3 – 4 times per day. Specifically, the guidelines recommend to feed infant cereal in the amount of 4 to 8 tablespoons daily, as well as introduce other iron containing foods such as meat, fish, and poultry starting at 6 months of age (Appendix A).

The weaning recommendations can be considered in three overlapping periods: 1) the *exclusive milk (breast or formula) feeding period*, 2) the *weaning period* and 3) the period of a *modified adult diet* (Cameron et al, 1990; ESPGAN, 1981; Wharton, 1989; WHO, 1988). The concept of 'overlapping periods' is illustrated by listing the progression of foods recommended for introduction into the infant diet, according to age of the infant (i.e., 0 to 24 months). The main public health messages conveyed in the infant feeding recommendations are a) when to introduce solid foods, b) what foods to introduce and c) the feeding progression. The feeding progression refers to increasing the quantity and variety of solid foods that the infant eats so by about 1 year of age the infant is consuming a 'modified' adult diet. However, research is lacking on how mothers in the natural setting feed their infants solid foods and what determines their feeding practices.

Some light may be shed on the causes of the prevalence of iron deficiency among infants by exploring determinants of solid food feeding practices that may influence the infant's

consumption of iron-fortified cereals. Research identifying the key behavioral factors that influence the consumption of iron containing solid foods by infants and thus possibly contributing to the development of iron deficiency in the second 6 months of life is lacking. The conceptual frameworks needed for this type of behavioral research have not yet been fully articulated in the literature. Further, solid food feeding practices have not been studied using a qualitative approach and, therefore, the infant feeding literature reflects this gap in knowledge. Research in this area is necessary to build frameworks that can facilitate the investigation and understanding of important behavioral and cognitive factors that influence the feeding of solid foods, particularly those high in iron, to infants during the transition process. Research to gain a better understanding of mothers' solid food feeding practices during the transition period is, therefore, needed to address the gaps in the current research literature.

## Chapter III

### 3.1. Introduction to qualitative research design

An exploratory research design was used to investigate mothers' complementary solid food feeding experiences. This research design was chosen because qualitative research can expand knowledge and theory about the infant solid food feeding process in a natural context through learning about mothers' personal day-to-day experiences. Additionally, qualitative research has the most potential to identify and develop relevant concepts on which to build hypotheses that are time and context bound. Qualitative inquiry increases understanding of participants' perceptions and experiences in their natural setting, providing research findings that are relevant and practical. As a result, findings can be very useful for informing nutrition, dietetic and public health nursing practice. Further, qualitative research can be used to create new data gathering techniques to guide future research.

A qualitative research design has major differences in methodological assumptions compared with a quantitative research design (Creswell, 1994; Lincoln and Guba, 1985). Briefly, qualitative research is *descriptive* in that the inquirer is interested in understanding how individuals make sense of their personal experiences, the conditions that influence their actions, and the consequences of their actions. The data are not, in the conventional sense, quantifiable. Theory or hypotheses in qualitative research are not established *a priori* since the focus of this research is not to verify or falsify hypotheses using statistical formulas. Instead, the process of qualitative research is *inductive* and *emergent*. It is inductive in that the inquirer, as the primary data collection and analysis tool, attempts to build abstractions, concepts, hypotheses and theories that are time and context bound. It is emergent in that the researcher's interpretations (findings) are a reconstruction built from multiple voices (Annells, 1996; Lincoln and Guba, 1985; Merriam, 1988). Bearing in mind, that the researcher is the primary data collection and analysis instrument, qualitative inquiry is *value-bound* (Munhall and Boyd, 1993). A 'reflexive' journal of evolving theoretical thinking about the data is used to understand how personal experiences may

shape the values and biases brought to the research through the 'instrument' itself. The assumption here is that the researcher's personal biases can not be eliminated in qualitative research, rather their influence on the data interpretations can be better understood and reflected upon. Lastly, the critical issue of judging the research process and product quality differs between qualitative and quantitative research. The four major *criteria* used in qualitative research for establishing trustworthiness are credibility, transferability, dependability and confirmability (Lincoln and Guba, 1985). These criteria are used instead of the traditional validity and reliability measures used in quantitative research because the data generated and the analysis procedures in the qualitative research designs are dramatically different from that of quantitative research.

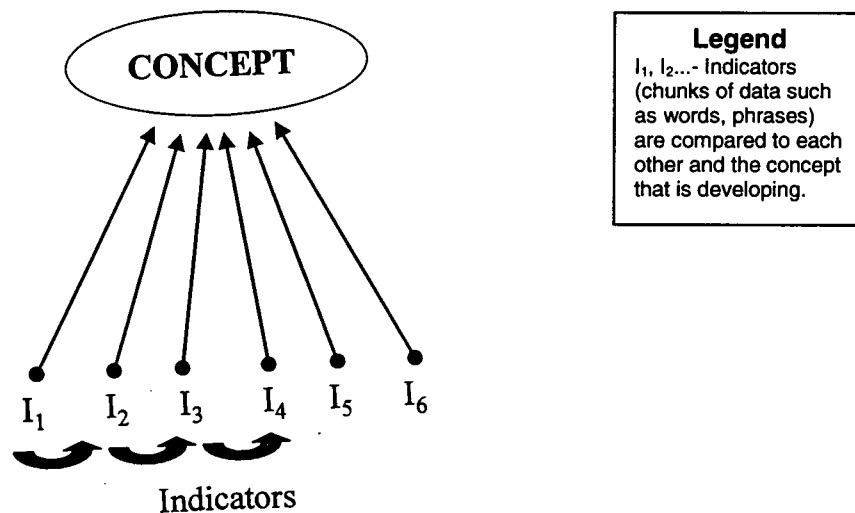
Grounded theory methodology is used to collect and analyze data on human behavior. Because of the absence of published research on mothers' solid food feeding practices during the transition process, the variables relevant to the infant feeding concepts have not yet been identified. Therefore, theory testing is not the best approach. Because of its unique data collection and analysis procedures, the grounded theory method has the most potential to identify concepts and develop theory to explain basic feeding practices and patterns common in mothers' day-to-day activities. This is important, because it is possible that mothers' solid food feeding practices and feeding patterns over time may be related to the infant's consumption of iron containing solid foods.

The grounded theory method has its roots in the social sciences, specifically in the symbolic interaction tradition of social psychology and sociology. Grounded theory as a methodology was originally developed by two sociologists, Barney Glaser and Anslem Strauss, and published initially in the seminal work, *The Discovery of Grounded Theory* (Glaser and Strauss, 1967). Again, the primary aim of grounded theory is to generate explanatory theory that furthers the understanding of social and psychological phenomena. Thus, grounded theories are systematic statements of plausible relationships (Denzin and Lincoln, 1994; Hutchinson, 1993).

The grounded theory procedures provide a highly systematic research approach for the collection and analysis of qualitative data that differs somewhat from other qualitative approaches. First, greater emphasis is placed on the development of theory (hypothesis).

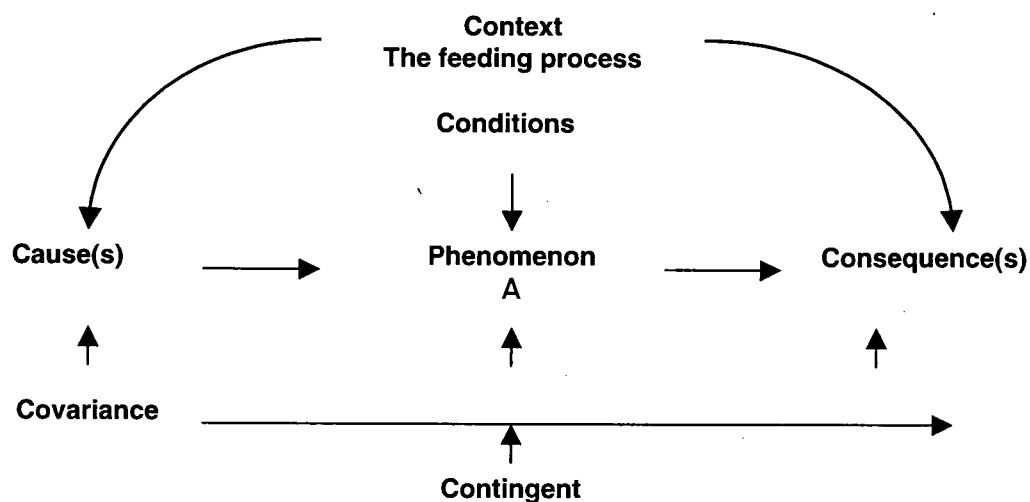
Second, there is an explicit mandate to strive toward verification of the resulting hypotheses (statements of relationships between concepts). Third, verification is emphasized throughout the research process, rather than in subsequent studies. The causal-consequence model (Glaser, 1978) aids in identifying and stating plausible relationships among the categories that have been discovered. These relationships are verified with the original interview data. Finally, within the emerging data set, emphasis is placed on developing 'conceptually dense' theory versus description. Conceptual density refers to enhanced concept development and the subsequent integration of relationships between the concepts (Denzin and Lincoln, 1994; Streubert and Carpenter, 1995). The most distinguishing characteristics of the grounded theory procedures are: the constant making of comparisons across cases, including the systematic asking of generative and concept-related questions, systematic coding procedures, guidelines for attaining conceptual (not merely descriptive) "density", variation, conceptual integration, and subsequent theoretical sampling. Integration, here, means specifying conditions and consequences of the phenomenon being explored (Strauss and Corbin, 1990).

Two models that are fundamental to data analysis are used in the grounded theory method. The first is referred to as a concept-indicator model. As illustrated in Figure 3, the model aids in the generation of conceptual codes. In order to build a concept and its properties slowly from the data, the indicators are constantly compared to each other and to the emerging concept once the conceptual code has been generated.



**Figure 3.** Concept – Indicator Model (adapted from Glaser, 1978, p.62).

The second model that is used to guide the analysis is the causal-consequence model. This model aids in identifying the 'process' from the data. Process refers to a happening that takes place over time, such as a mother feeding her infant over time. The model aids in organizing the stages, phases, progressions, shaping or transitions of the phenomena so that the process can be conceptualized. What causes or makes the process move forward, backward or remain static are then investigated. Hence, the context, consequence(s), cause(s), and conditions of some action are discovered. This set of procedures also aids in making connections between the concepts and the higher order of more abstract categories. The model is illustrated in Figure 4. The context represents the set of conditions within which the action/interactional strategies are taken. Conditions are events or incidents within the context that influence the phenomenon. The causal conditions identify events or incidents that lead to the occurrence or development of a phenomenon, whereas intervening conditions are structural conditions that are contingent or conditional, meaning that they facilitate or constrain the strategies taken within a specific context. The phenomenon (A) is the central idea, event or incident about which a set of actions, or interactions, are directed at managing, or to which the set of actions is related. The consequences are the outcomes or results of the action and interaction. The covariance is the individual variation between the people. The arrows in the model indicate the direction or movement of the variables described above (Strauss and Corbin, 1990).



**Figure 4.** The Causal-Consequence Model (adapted from Glaser, 1978 p.74)

The 4 criteria suggested for establishing trustworthiness in qualitative research are; credibility, transferability, dependability and confirmability (Lincoln and Guba, 1985). The credibility of interpreting the research data is enhanced through several procedures. A reflexive journal that includes a detailed dialogue about the meanings of the data being analyzed and a description of how the analysis evolved, with the coding procedures, gives some insight into how findings were interpreted over the analysis process. A journal also aids in developing the analyst's skills (i.e., theoretical sensitivity). External checks done during the analysis of the data aid in 'balancing' interpretations on concepts, categories and the relationships that are conceptualized. Feedback from peers on data interpretation improves the constructions. Negative cases of situations, events or experiences should be identified throughout the analysis. The identification of negative cases keeps the analysis broad and facilitates the identification of contextual factors that may influence the phenomenon that would otherwise be lost. Persistent, systematic analysis procedures are essential to allow not only identification of the most relevant issues, but for them to be analyzed in detail. In this way, scope and depth of analysis can be achieved. In-depth interviews provide ample data to obtain conceptual density of the emerging categories, but it is the analyst, who by using a systematic procedure discovers meaning from the data (reconstruction of multiple voices).

In qualitative research, transferability is the term used instead of external validity to describe the degree to which the findings can be applied in other settings, or to other groups of people. Since it is not possible in qualitative research to state statistical confidence limits to represent the external validity of results, 'thick' descriptions of the interview data and the participant characteristics are provided. This allows the audience to judge the transferability of the study findings to other situations or populations.

The third criteria proposed by Lincoln and Guba (1985) is dependability. To ensure findings are dependable an evaluation of the research process is proposed. A series of documentation procedures are followed to aid in the data organization, the analysis procedures and the analysis itself. The dependability of findings can be judged from these procedures.

The aim of the confirmability criteria is to evaluate the research product, the data, findings, interpretations and recommendations. The data obtained from in-depth interviews are very 'rich' and thus, the descriptions and conceptualizations of human experiences should reflect this richness. The results of a qualitative study can be judged in light of the numerous procedures followed to promote high quality data management, data analysis and interpretive integration.

Strauss and Corbin (1990) have outlined a double set of criteria for judging a grounded theory study. The guidelines these authors suggest center around two components, the research process and the empirical grounding of the theoretical findings. Briefly, Strauss and Corbin (1990) evaluate the research process through examination of the sample selection criteria, categories that emerged and how they were formed, theoretical sampling procedures, hypothesis formation and testing, and core category selection. In addition, the grounding of the theoretical findings is based on the examination of the degree to which the identified concepts are grounded from the data, rather than from conjecture. The development of conceptual linkages, the inclusion of variation into the theory, and emphasis on 'process' that identifies and specifies change to build the conceptual density needed to go beyond descriptive analysis, are all critical to a grounded theory study. The data can also be analyzed macroscopically. This includes some degree of analysis of the greater social, environmental and institutional factors that influence individual behavior. Lastly, the research is evaluated on if, or to what extent the findings appear significant from the perspective of contribution to knowledge, theory, tool development, practice or other relevant endpoints (Lincoln, 1995).

### **3.2. Design and Methods**

A qualitative research design was used to study mothers' complementary solid food feeding practices during the liquid to solid food transition period that usually occurs when the infant is 4 – 9 months of age. A grounded theory methodology was used to guide data collection and analysis of human behavior. In addition to the interviews, an infant-feeding questionnaire

was developed to gather additional information to complement the qualitative data. Statistical quantification of questionnaire responses was not the focus of the research, nor would it be appropriate with the sample size used. The research design was cross-sectional. A convenience sample of mothers who were in the process of weaning their infants to solid foods (transition stage) was recruited. Data on current as well as retrospective feeding experiences were collected. Mothers were asked to articulate their solid food feeding practices over time (from the age solid foods were first introduced to the present time) to gain a more in-depth understanding of the solid food feeding process.

### **3.2.1. Ethics**

The study protocol and procedures were approved by the University of British Columbia Behavioural Sciences Screening Committee for Research Involving Human Subjects (Appendix B). Written informed consent was obtained from each participant before the interview session began. The research student explained the purpose of the study and the data collection procedures to each mother. The mother was then asked to read the consent form (Appendix C) and sign two copies if she agreed to participate in the study. One consent form was kept for research records and the other was given to the participant. The research student explained how confidentiality and anonymity in all oral and written research reports would be achieved. Participants were informed that, at any time during the interview or later, any written or taped information could be erased if they so chose.

### **3.2.2. Study participant inclusion criteria**

Criteria for inclusion in the study were that the infant was healthy and born at term (born greater than or equal to 37 weeks gestation) gestation, and had no disease or recurrent infections that could affect feeding solid foods or appetite. Mothers were breastfeeding or formula feeding. The participants recruited were residents of the City of Vancouver, were Caucasian and were fluent in English. Only mothers who were fluent in English were recruited because the researcher

was only fluent in English and in-depth interviewing was a primary component of the research design.

### **3.2.3. Participant recruitment**

Public health nurses facilitating infant group clinics were approached face-to-face about the research project and were asked to help recruit mothers who met the study inclusion criteria. Public health nurses introduced the research student to mothers who were attending an infant group clinic and who had infants within the selection criteria. The student then briefly explained the research project. If the mother was interested in participating, she was asked for her home phone number for the student to contact her later. The potential participants were telephoned and the study procedures were explained. A recruitment checklist was used to facilitate appropriate participant selection (Appendix D). Interview sessions were scheduled at the participant's convenience. Twelve mothers participated in the study. Two mothers were recruited through personal referral. Ten mothers were recruited with the assistance of public health nurses at community centers. Four recruitment sites were used for this study. From the 10 mothers who were recruited from the public health community centers, 2 were from the False Creek Community Center, 3 were from the St. James Community Center, and 5 mothers were recruited from the U.B.C. Infant Drop-In Center. There were no participants from the fourth site: U.B.C. Little Goslings Daycare. An additional 'potential' participant, recruited from the U.B.C. Infant Drop-In, declined after several rescheduled interview times.

### **3.3. Data Collection**

Data were collected using two methods; interviews and questionnaires. The total interview session took from 65 to 120 minutes to complete, but averaged about 90 minutes in length. First, each participant completed a 30-45 minute tape-recorded semi-structured interview. Participants then completed a structured interview (infant feeding practices questionnaire) that took an additional 30-45 minutes. The infant feeding practices questionnaire was only fully developed after the third interview, thus only the last 9 participants completed the questionnaire.

The interview sessions concluded with the participant filling out a confidential personal and demographic questionnaire that took a further 5-10 minutes. All of the interviews, except one, were completed in the mother's home. One interview was completed at a quiet coffee shop selected by the mother.

### **3.3.1. Semi-structured interview guide**

The interview sessions began with a discussion introducing the research topic. The warm-up discussion is illustrated in the interview guide below. The mothers were each asked 5 general questions that guided the conversation onto the research topic (Munhall and Boyd, 1993). The questions were designed to obtain information about the mother's solid food feeding practices (i.e., her actions), and on her perceptions (her constructions) over time.

---

#### **Interview guide**

---

◆ Warm-up discussion (When was your baby born? I am interested in understanding more about the infant weaning process, can you tell me about your experiences feeding your baby solid foods).

#### **Guiding Questions:**

1. Can you tell me about what the infant weaning process is like? Or tell me about your experience with the infant weaning process (what is it like)?
  2. What difficulties have you encountered (if any)? i.e. Family/friends/baby/health care professionals
  3. What is working well for you?
  4. What would you tell a new mother about the weaning process?
  5. What would you tell health care professionals about the weaning process?
-

### 3.3.2. Infant feeding practices questionnaire

The questionnaire was developed using concepts from the review of current literature and through feedback from 4 infant nutrition and/or survey design experts. The feedback provided by these experts was used to revise the questionnaire. Three mothers not involved in this study provided feedback on the clarity of the questions and the format. Two question formats were developed for the questionnaire. Single response and short answer questions were used to obtain data on the mother's present feeding practices and perceptions. Other questions were developed to elicit multiple responses on feeding practices that had been used over time, for the purpose of obtaining data on the changes in the feeding process according to infant age. A summary of the questionnaire content is provided below and the complete tool is provided in Appendix E.

#### Infant Information:

Birth date, gestational age, gender, birth weight, birth length, sibling number & ages

#### Single Response Format:

1. Liquid feeding practices (6 questions)
2. Infant/toddler cereal feeding practices (12 questions)
3. Other solid foods infant is eating (2 questions)
4. Mother's current infant/toddler cereal purchasing practices (7 questions)
5. Mother's perception of infant's acceptance of commercial cereals (8 questions)
6. Information received or obtained by the mother about infant solid food feeding and her perceptions about the usefulness of the information (15 questions)

#### Spreadsheet (multiple response over time) Format:

1. Types, brands and quantity of liquid infant received over time
2. Types, brands and quantity of cereal infant received over time
3. Types, brands and quantity of other solid foods infant received over time

### **3.3.3. Personal and Demographic Questionnaire**

The demographic questionnaire (19 questions) was adapted from Innis et al. (1993, 1994) and the Statistics Canada 1996 and 1991 Census. The questionnaire obtained information on the mother's age, marital status, education, maternity leave and the family household size, occupations, income, languages spoken, ethnic background, food related practices, daycare use, where the parents had been born, and how long they had lived in Canada. The complete questionnaire is provided in Appendix F.

## **3.4. Interview Data Management and Analysis**

### **3.4.1. Transcription from original data source**

Each interview was recorded in full on tape. The tape was then transcribed verbatim. All the transcripts were then re-checked for accuracy by the researcher. The transcription time varied between 8 and 16 hours per tape. Transcription time was determined by several factors; interview length, skill (that increased with practice), recording quality (background noise), conversation characteristics (low tones, quick answers), and the degree of nonverbal transcription (expressions).

### **3.4.2. Data Analysis**

Grounded theory procedures are based on two analysis models: the concept-indicator model and the causal-consequence model (Glazer 1978; Strauss and Corbin, 1990). The concept-indicator analysis model directs the conceptual coding of the identified line code indicators and links them with the evolving concepts. The constant comparison of the meaning of indicators to each other slowly builds a concept and its properties to be labeled by the analyst (Figure 3 pg. 27). The causal-consequence model directs the reassembling of the data in new ways and is used as a framework to specify the connections between the categories (Figure 4 pg. 28). The causal – consequence model of infant solid food feeding is illustrated in Figure 15 in the

results. These 2 models guided the development of 5 data management spreadsheets for the data analysis process and concurrent data management procedures. The spreadsheets aided in the organization of and familiarization with the text, and then with the thinking, interpretation, understanding and integration of the evolving concepts and categories.

To aid in tracking data throughout the analysis process, line numbers were used on each page of transcript (348 pages) for the identification of any coded material so that it could be traced back to the original interview data source for verification. Figure 5 illustrates the organization of the transcript data. Margin space was used on the right side of each page of the transcript to hand write line codes (LC) of important words and sentences (indicators) identified from the text.

<b>Interview Transcript with Line Codes in the right Margin Space</b>	
Interview number (0001) and Date (7 months, Breast-feeding, Male, St. James Community Center)	<b>Line Codes (indicators)</b>
1 (line number 1)	
2	
3-starting at 4 months we gave	<b>3-starting (a process)</b>
4-him rice cereal but then when	<b>4-cereal type – rice</b>
5-he didn't like that we switched	<b>5-didn't like it (food rejection)</b>
6-to Milupa he never liked Pablum	<b>5-switching</b>
↓	<b>6-cereal brands</b>
1000...	
↓	
2000 (line number 2000)	

**Figure 5.** Transcript organization and line coding (LC) procedures.

Participant numbers and descriptive data (e.g., infant age and gender, milk feeding method, recruitment site) were written at the top of the page. Page line numbers were inserted on each page to track data throughout the analysis process. Transcription text was typed on half of the page. Margin space on the right side of the page was used to efficiently transfer indicator line codes from the text to the margin space, for analysis.

The resulting line codes, as illustrated above, were transferred to an indicator index summary spreadsheet (IIS) (Figure 6). These spreadsheets were used as a quick reference of all line codes with the identifying line number from the original data source. The indicator index summary spreadsheets were used to aid in the first analysis procedure – open coding (Strauss and Corbin, 1990). The aim of this procedure was to systematically pull apart important words, sentences and paragraphs from the transcript in order to understand the data. A key analytic procedure used to enhance analytic sensitivity is to ask generative questions. The typical questions often asked are; who, where, what, how and why some behavior or event has happened. In this way, the constantly comparing of new 'indicators', allowed the properties and dimensions of important emerging concepts and categories to be discovered. The IIS spreadsheet aided in efficiently analyzing the large amount of data from the transcripts, systematically, both within and across the interviews.

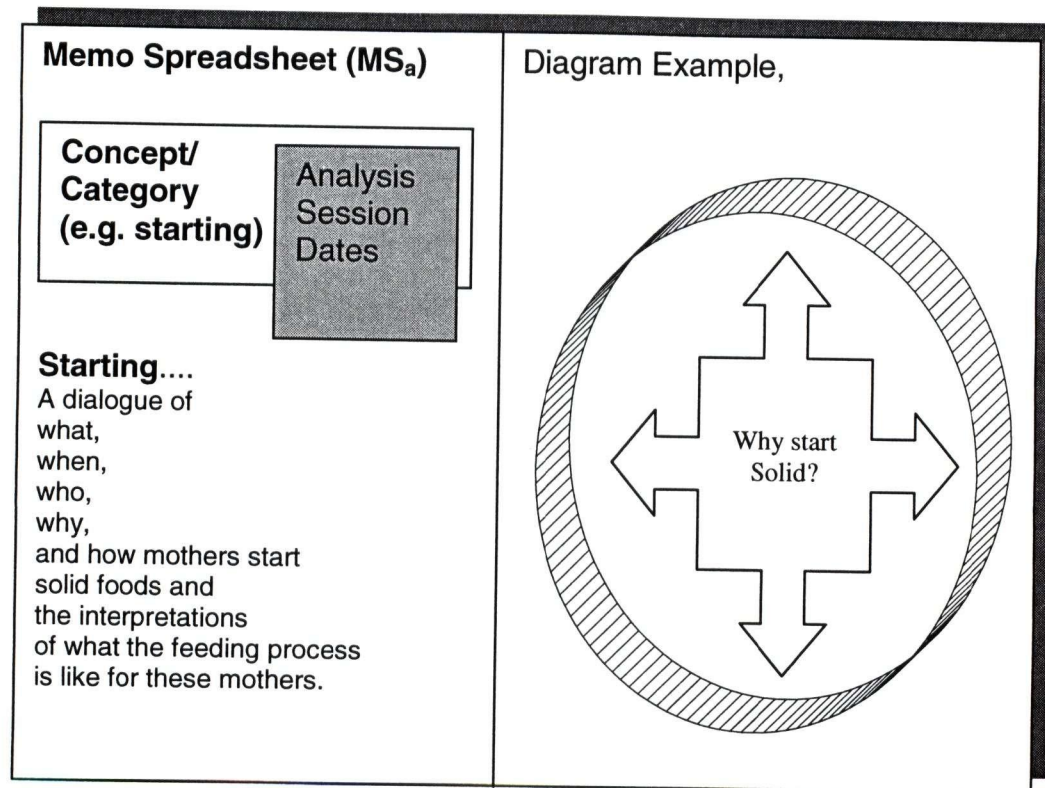
Indicator Index Summary Spreadsheet (IIS)					
Interview 0001 3-starting (a process) 4-cereal type - rice 5-didn't like it (food rejection) 5-switching 6-cereal brands	0002	0003	0004	0005	0006

Indicator Index Summary Spreadsheet (IIS)					
Interview 0007	0008	0009	0010	0011	0012

**Figure 6.** Indicator Index Summary Spreadsheet (IIS) for line code organization. The line codes from each interview were transferred into 2, 6 column indicator index summary spreadsheets (IIS). The interview number was used as the heading of each column. The original line number was also transferred to track the original source of the data throughout the analysis process. Constant comparative analysis within and across cases was started using the open coding procedures.

A reflexive journal was kept to document evolving concepts, categories and their relationships. This journal became the avenue for evolving theoretical thinking about the data, including cross comparisons and preliminary interpretations. The two data management spreadsheets were used to record the analyst's thinking and were labeled memo spreadsheet a and b (MS<sub>a</sub> and MS<sub>b</sub>), respectively. An example of the first memo spreadsheet is provided in Figure 7. The second memo spreadsheet (MS<sub>b</sub>) is described in more detail in Figure 9.



**Figure 7.** The memo spreadsheet (MS<sub>a</sub>) was used for the organization of analyst's theoretical thinking during the open coding analysis procedures. The concept or category was placed as a heading along with the date of the analysis session. Reflective thinking on the meanings of the data was written and successive revisions were documented as the analysis continued. Generative questions (when, why, what, who, and how some behavior happened) were asked of the data to provide a framework to write from. Diagrams and figures were included in the journal to aid in integrative thinking about relationships of concepts or categories to each other, and to aid in making explicit, unconscious personal biases that may influence the analysis. The journal entry revisions reflected increasingly sophisticated reconstructions of the previous versions.

The major concepts and categories that evolved in the open coding procedure were used as the guiding framework to gather subsequent data systematically from across the interviews. In order to manage this data, a third spreadsheet, the concept/category summary spreadsheet, was developed (Figure 8). All of the data from within and across the interviews that could potentially 'fit' into a specific concept/category were transferred to the concept/category summary spreadsheet (CCSS) with the identifying line number from the original transcript. Then, the original quote within its fuller context was transferred, again including the identifying line number, to this summary spreadsheet. Because analysis quality could vary from interview to interview

due to analyst fatigue, each interview transcript was purposely sifted a final time for each identified category. In this way, each transcript was 'equally' searched and sorted for all of the data that could fit into the identified concept or category. The axial coding procedures were started from the data in this spreadsheet.

Concept/Category Summary Spreadsheet (CCSS)	
<b>Mixing</b>	
0001 - all the potential data (including source) from interview number 1 on the concept <i><b>mixing</b></i> .	0007
0002	0008
0003	0009
0004	0010
0005	0011
0006	0012 -all the potential data (including source) from interview number 12 on the concept <i><b>mixing</b></i> .

**Figure 8. The Concept/Category Summary Spreadsheet (CCSS) was used for the organization of data for the main concepts and categories of this study. All data from each interview that could potentially fit into the major concept/category identified was transferred to the CCSS. The interview number and source of the data were included. An illustration of the concept 'mixing' is shown.**

As would be expected, the interpretations recorded in the reflexive journal evolved during the analysis process. The first analytic memos (MS<sub>a</sub>) focused on articulating interpretations from the open coding analysis procedures. As the analysis continued and progressed to the axial coding procedures the memo spreadsheet now reflected the inclusion of the conditions within a specific context and the consequences of actions and interactions of the phenomenon. The second memo spreadsheet (MS<sub>b</sub>) was designed to capture the interpretations from the axial coding procedures (Figure 9).

Memo Spreadsheet (MS <sub>b</sub> )					
Concept/Category;		Starting			
Interview #	When	Why	What	Why	How (process)
0001					
0002					
0003					
0004					
0005					
0006 ...					
↓					
0012					

**Figure 9.** The memo spreadsheet (MS<sub>b</sub>) was used for the organization of analyst's theoretical thinking during the axial coding analysis procedures. The concept or category was placed as a heading, illustrated in this figure is 'starting', and the interview number was placed on the left column. Data derived from the generative questions (e.g., when, why, what, who, and how some behavior happened) were systematically sorted into this framework. Plausible relationships between concepts or categories were identified and documented across all of the interviews. The journal entries were revised numerous times and reflect improvements in the analyst's interpretations.

Additional integrative data displays were developed to illustrate the analysis of the concept/category summary sheet data according to the causal-consequence model (Glazer 1978; Strauss & Corbin, 1990) and the researcher's interpretations. The integrative data displays also evolved to reflect a more sophisticated understanding of the mothers' solid food feeding practices. The axial coding procedures were used to discover 'process' from the data. These results are illustrated in Figure 15 of the causal-consequence model (adapted from Glaser, 1978). The proposed statements of plausible relationship (hypotheses) between the mother's feeding practices and the infant's cereal consumption patterns evolved, in part, from the sorting of the infant's solid food transition graphs into low, medium and high cereal consumption groups.

### **3.5. Questionnaire Analysis**

The infant feeding practice questionnaire was completed with 9 of the 12 mothers who participated in the study. The questionnaire data were used to complement the interview data. Data from the questionnaires was not used to statistically quantify responses because the sample was too small, and this was not the intended purpose. The questionnaire data were used to complement portions of interview data, such as in the case of the transition graphs (checking responses to interview data). The questionnaire data aided in understanding the different responses and types of data that can be obtained from using the 3 different formats (close response questions at one point in time, spreadsheet responses over time, and interview responses). The personal and demographic questionnaire was used to provide demographic data on the characteristics of the study participant.

## Chapter IV

### 4.1. Participant characteristics

A total of 12 women participated in this study. Of the 12 women, 7 had infants who were between 6.5 and 7.5 months of age, 3 had infants who were between 8 and 9 months and 2 had infants who were 9 months of age (Table 1). Two thirds (9/12) of the infants were male. Half of the women had a gross family income greater than \$70,000 and 2 women had an annual family income less than \$20,000. Of the 12 women, only one woman had two children. Most of the women were married or living with a partner, 2 were single. All of the mothers and all but 1 father had completed post-secondary education. Two thirds of the mothers and three quarters of the fathers had completed University. The majority of mothers (9/12) were between 25 and 34 years of age. Less than half of the mothers used daycare. Of those who used daycare, 3 used it part time and 2 full time.

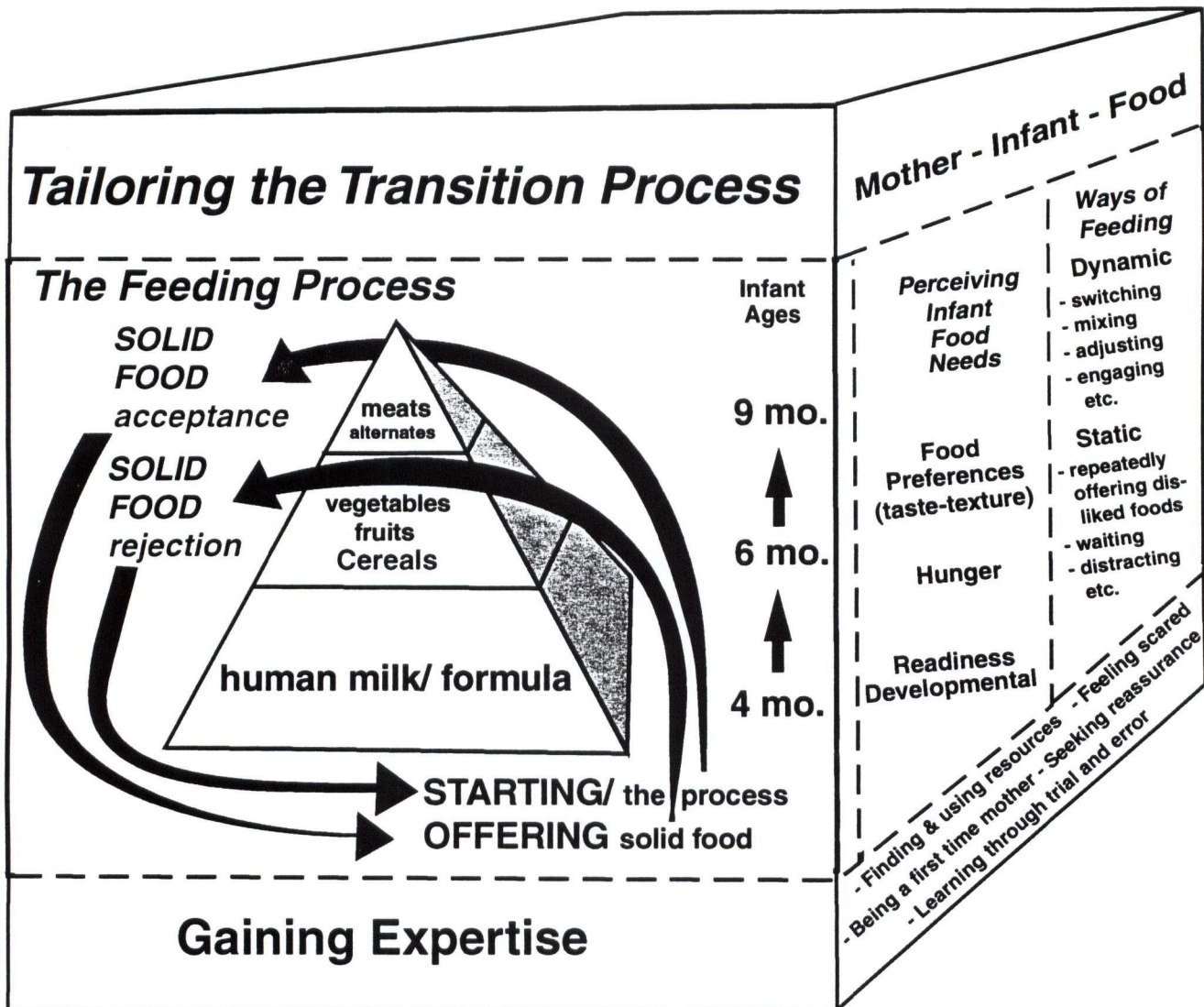
**Table 1**  
**Participant Characteristics**

	<b>Number<sup>1</sup></b>
<b>Infant age (months)</b>	
6.5 - 7.5	7
>8 - <9	3
9	2
<b>Infant Gender</b>	
male	9
female	3
<b>Gross Family Income (x \$1000)</b>	
<10	1
10 - 19	1
20 - 29	1
30 - 50	2
50 - 59	1
≥70	6
<b>Birth Order</b>	
first	11
second	1
<b>Marital Status</b>	
Single	2
Married/common-law	10
<b>Mother's education</b>	
College	4
University	8
<b>Father's education</b>	
High School	1
College	2
University	9
<b>Mother's age (yrs)</b>	
20-24	2
25-29	5
30-34	4
35+	1
<b>Alternate Infant Care</b>	
Part time (1-2 d/wk)	3
Full time (5d/wk 8hrs/d)	2

<sup>1</sup> A total of 12 mothers participated.

## 4.2. Overview

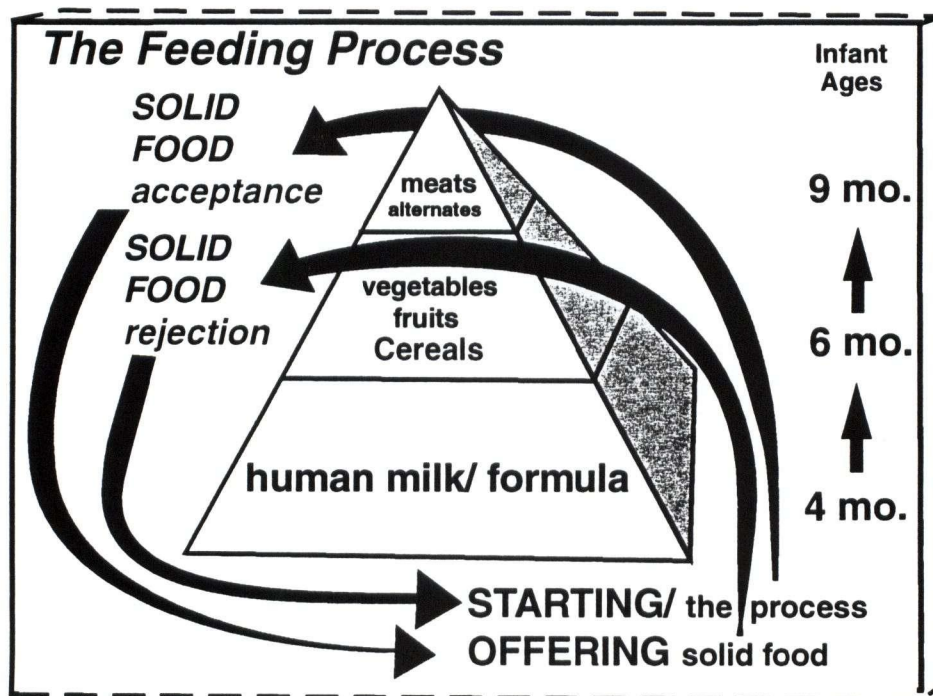
The interview data were analyzed using grounded-theory procedures to describe the mothers' solid food feeding processes and to explore the plausible relationship between infant solid food feeding practices and infant nutrition. During the constant comparative analysis, five themes were discovered. The 5 themes – *the feeding process*, *perceiving infant food needs*, *ways of feeding*, *gaining expertise* and *tailoring the transition process* are described in the following sections. The last theme – *tailoring the transition process* was identified as the core theme because it accounts for the most variation in the mothers' behaviors within the context of the solid food feeding process. The 5 themes are illustrated in the following 3-dimensional model (Fig. 10). The model provides a visual presentation of the findings. This conceptual model aids in refining plausible relationships among the themes and enhances understanding of the numerous conditions that potentially influence the solid food feeding process. The available data clearly suggest that the 'way' that the mother 'tailors' her feeding strategy during the transition process could impact on the infant's acceptance of solid foods and thus, potentially, the infant's solid food consumption patterns.



**Figure 10.** The 3-dimensional model links the 5 themes – the feeding process, perceiving infant food needs, ways of feeding, gaining expertise and tailoring the transition process of infant solid food feeding. The first theme, the feeding process includes 3 concepts (food acceptance/rejection, starting the feeding process and infant age). The second theme, perceiving infant food needs includes 3 concepts (the mother's perception of infant food taste and texture preferences, infant hunger and developmental readiness such as risk of allergies or choking). The third theme, ways of feeding identifies infant feeding strategies that appear to be dynamic or static in promoting solid food acceptance. The fourth theme, gaining expertise includes 5 concepts (finding and using resources, feeling scared, being a first time mother, seeking reassurance and learning through trial and error). The fifth theme and core category, tailoring the transition process, describes the key determinant influencing the outcome of the solid food feeding process. The theme 'tailoring the transition process' explains best the potential variations in solid food acceptance and consumption patterns described by the 12 mothers in this study.

### 4.3. The feeding process

The first theme – *the feeding process*, of the 3 – dimensional infant solid food feeding model is illustrated in Figure 11. The first theme is comprised of 4 major concepts – starting the feeding process, the infant's acceptance or rejection response, the infant's age and the solid food offered. The model emphasizes the connection between the mother – infant pair and food as the integral part of the dynamic (interactional) feeding process. The mothers in this study described their experiences feeding their infants as they progressed from the exclusive liquid diet to the combined liquid and solid food diet.



**Figure 11.** The first theme of the 3-dimensional infant solid food feeding model is *the feeding process*. The first theme includes 3 concepts (food acceptance/rejection, starting the feeding process and infant age).

The mothers described 'starting' the feeding process and 'offering' their infants solid foods. In turn, the infants either accepted or rejected what was offered. The process appeared to be circular in nature and thus, is highlighted by the 2 arrows in the model. These arrows indicate different behavioral pathways, depending on how the infant responded to the solid food(s) being offered. The subsequent themes in the study that build the conceptual model are related to the context – *the feeding process* – as either conditions, action/interactional strategies, or consequences. The mothers described their experiences of 'starting' the feeding process and the factors that influenced their feeding decisions.

#### 4.3.1 Starting the feeding process

Three mothers first introduced infant cereals at 3 months, six mothers introduced cereals between 4 and 5 months and three mothers between 5 and 5 ½ months. Most of the mothers (9/12) introduced solid food to their infant within the recommended age range of 4 to 6 months. Interestingly, the mothers described the meaning of 'starting the feeding process', however, the age of solid food introduction provided only a vague description of 'starting'. The following mothers described distinct 'starting' patterns in their feeding that they articulated as "sporadic" versus "routine" feeding. The age these mothers started solid food feeding was described not as the initial age of 'introduction', but rather as the age when they were actually feeding solid food on a regular basis or 'routinely'. Initial feeding attempts were not considered as 'really starting' solids. The following quotes illustrate the mother's conceptualization of initial feeding attempts as being 'sporadic' and then the subsequent 'routine' feeding of solids on a regular basis.

*"We, I think we tried as early as 3 months...we tried [cereal]<sup>2</sup> a couple nights [to get him to sleep at night] and then we stopped. Because we realized that it wasn't really making a difference and it was just more hassle than it was worth. I think we tried it...sporadically as he got a bit older, like after four months between 4 and 6 months but nothing really on a regular basis until 6 months...(7-147)"<sup>3</sup>.*

<sup>2</sup> Parentheses indicate added context to increase reading ease and understanding.

*"Started [cereal] at about right at about four months and he wasn't taking it too well so I sort of held off for another couple weeks so we really didn't probably start till he was about 4 ½ months. And then I started with the cereals first ...<sup>4</sup> (10-87)".*

'Starting the feeding process' was described by the following mother, again not as the age when foods were initially introduced, but as the age of 'routine' solid food feeding. During the following mother's initial feeding attempts she described both the irregular start – stop nature of 'feeding' solids, in relation to her perceptions of her infant's food needs (i.e., infant hunger). The following quote also illustrates the concept of 'starting' in several distinct ways. For example, this mother appears to be starting 'sporadic' initial feeding, starting 'routine' feeding and 'starting the feeding process'. Starting the feeding process, in this mother's case, also seems to include the mother's progression to feeding increasing varieties of solid foods, such as from cereals to vegetables, as well as food color variety, such as within the vegetable food group. This quote highlights the time it took between the initial introduction of solid foods to feeding solids on a regular basis ('routinely'). With respect to iron nutrition, it is of interest that the mothers in this study took from 2 weeks to over 3 months after the initial solid food 'introduction' attempts to start feeding iron fortified infant cereals on a regular basis.

*"He's always slept at least 5 hours a night. And at six weeks he started sleeping 8 or 9 hours and then at 14 (weeks) he started waking up again so ummm we started giving him a little bit of... ah rice cereal....he seemed to not need it after a little bit, so we stopped... so we've actually had to do that a few times... before we really started feeding him at ahh 4 ½ months we did it again...And then, let's see, when did we start, actually feeding and food. At roughly 6 months we started giving him...oatmeal, baby oatmeal and baby mixed cereal and then we started giving him squash very shortly after that and then we tried green beans and when he was used to that we would alternate...what we gave him, the green and the yellow (9-90-132)".*

The mothers in this study, as the quotes illustrate, describe the infant's age and the type of solid food they offered as important factors within the context of the feeding process.

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<sup>3</sup> Numbers in parentheses indicate the participant interview and the page line number (e.g., 7 indicates the quote is from participant number 7 and 147 indicates that the quote is found on line number 147 in the interview transcript).

<sup>4</sup> ... indicates either pauses in the mother's conversation or the joining of different quotes on the same topic.

Therefore, these 2 concepts in the “feeding process” theme are illustrated in the conceptual model as intertwined with 2 other concepts: ‘starting/offering’ and ‘acceptance/rejection’ of solid food(s). The previous, as well as the following quotes, highlight the relationship between the infant’s age, the solid food offered and the mother’s actions – ‘starting’ the feeding process.

#### **4.3.2. Reasons for starting solid food**

In general, the mothers in this study stated that they had ‘started’ solid food at the age they specified for one or more of three main reasons. They usually described a combination of reasons as important in influencing their feeding practices. The three main reasons identified from the data were advice (from reading or verbally), perceived infant food needs, and wanting the infant to sleep through the night.

The majority of mothers (10/12) stated that they had started first foods at the age they specified because of the advice they had obtained either from reading or verbally. The majority of advice obtained by mothers appeared to be specific to the age of introduction of solid foods.

*“Introducing the solids has been based on what I have read and a bit of information that you do get which is 4 to 6 months, start on the cereals (6-124)”.*

*“Oh, I just figured at 4 months I’d try it, so that’s what happened...I just, from reading books, you know, between 4 and 6 months they try cereal, so...I always tend to read ahead (2-174)”.*

Many mothers (7/12) also started feeding solid foods because of their perceptions that the infant behaviors that they observed meant their infant was ‘ready’ for, or their infant ‘wanted’ solid food. As illustrated in the following quote, the infant’s signs of ‘readiness’ appeared to influence the mother’s subsequent solid food feeding decisions. When the mothers observed infant ‘signs’ that they perceived as the infant ‘wanting’ solid food they responded by starting the feeding process.

*"I started right at 4 months because she was ready for it but she took it from a spoon no problem. You know she could sit you know propped up. She couldn't sit by herself, but she could sit propped up, she umm so she was ready. She's a strong big kid (5-689)".*

Developmental behaviors (i.e., infant being 'interested') and physical cues (i.e., infant sitting) appear to be 'trigger' behaviors that influenced mothers to start solid foods. Mothers' perception of infant 'readiness' is described in more detail in the next section on 'perceiving infant food needs'. The concept 'fits' into both sections since, in this section, the mother's perception of her infant's 'readiness' appeared to influence the age that solid foods were introduced and in the next section, the mothers appeared to perceive that the infant's 'readiness' influenced their acceptance of solid foods. Consequently, these perceptions appeared to influence the mother's feeding decisions initially, when 'starting' the feeding process, as well as at later stages of the feeding process.

One quarter of the mothers (4/12) stated that they had introduced solid foods at the age they did because their infant was not sleeping through the night. External factors, specifically advice from family and peers seemed to be very influential to these mothers' feeding decisions. As the following quotes illustrate, the infant waking in the night appears to have been perceived by these mothers as a hunger cue and a 'sign' of readiness to start solids. It is of interest that most (3/4) of the mothers who started solids because their infant was waking in the night also stated that starting solids was not successful in helping their infant subsequently sleep through the night. The connection between the mothers' perceptions concerning daytime solid food feeding and uninterrupted night time sleep hours is clearly important because these perceptions appeared to strongly influence solid food feeding decisions (i.e., 'too' early of introduction).

*"Everyone was saying once you start that then they will sleep through the night so that was my incentive to start it but truth be told she didn't sleep through the night. So I don't think it's food I think it's habit (5-76)".*

*"Start, um like the Pablum. We actually tried it a little bit early, just the rice Pablum to see if he would sleep though the night with it...and that didn't work...We, I think we tried as early as 3*

months...(7-77). [The] doctor told us not to and we did it anyway (7-98)...Because my mother-in-law said "it really does work", "everybody in the family has done it". So we tried it and it didn't make him sleep any more and he didn't seem to really take to it because he was still kind of spitting it out (7-100)".

Multiple external factors, such as advice, comparing with other mothers, rapid infant growth, breast-feeding frequency and sleeping through the night, appeared to influence when the following mother started feeding solid foods. The quote also highlights the complexity of factors that influenced this mother's solid food feeding decisions. Interestingly, although this mother observed that her infant was growing very well on breast milk she chose to introduce solid foods at 3 months ('too early'). The infant's positive growth response to the milk feeding method did not appear to influence her feeding decisions as much as the other external factors, such as her mother's advice and comparing feeding practices with other mothers at work.

"At three months because he was growing so fast he I started him on a regular Pablum at night before he went to bed...which was my mother's idea. Because she was a public health nurse back in the sixties and that is what they did back then (8-34)".... Because we were breast feeding every two to three hours he was only seven pounds twelve ounces when he was born. But he was I think twenty almost twenty pounds by the time he was four months. So he put on a lot of weight very quickly. Ya and he didn't [sleep through the night]. But he really seemed to like the Pablum...so I just kept doing it. He didn't start sleeping through the night until I had him completely weaned...at about 6-6 ½ months (8-311). Friends at work said...Their baby was sleeping. Part of the reason I started Pablum so early...I thought...[He's] got to be sleeping (8-665)".

#### 4.3.3. Reasons for solid food selection.

The first solid food that most mothers introduced (11/12) was commercial iron-fortified infant rice cereal. The only mother who didn't introduce rice cereal first introduced mixed cereals instead because of a purchasing error. The mothers in this study appeared to follow the current infant feeding recommendations, with regards to the type of solid food they offered their infants first. The two most common reasons the mothers in this study stated for selecting the solid foods

that they did was infant solid food acceptance (12/12) and rejection (6/12) and concern about allergies (8/12).

The infant's acceptance of the solid foods offered clearly influenced the mother's solid food selection choices. Further, half of the mothers' food selection decisions were specifically determined by the infants' rejection of the solid food offered. The arrows in the model highlight the circular relationship between the mother – infant pair and solid food. The arrows in the model symbolize the mother starting the solid food feeding process, the infant responding to what was offered, the mother then responding to her infant's food cues and so on – the circular process. The quotes below highlight the infant's rejection response to the solid food that was fed. Again, the mothers appear to be adapting 'what' they fed their infants in response to the infant's solid food acceptance or rejection response. For example, they either continued to feed what was accepted, switched foods or brands, or mixed foods together to promote acceptance. The feeding strategies that the mothers used to gain solid food acceptance are further developed later in the third theme – ways of feeding. Interestingly, the transcripts suggest that both the mother and the infant influenced the progression of solid food acceptance (i.e., the solid food feeding process).

*"So, we just kept offering it every couple of weeks (3-116). What we offered him first...because that's the safest thing to start with is rice. So I started with rice and I went on to oatmeal [commercial cereal] and then I went on to oat cereal and then I went on to barley cereal and he didn't like any of them (3-621)...I tried making some homemade food for him, so like mashed bananas or pureed carrots or applesauce and he didn't like any of that either... Earth's Best... He loves it...So that's what he eats (3-199)".*

*"[I] was giving her the Milupa, and I ...wasn't having any success with that at all so I started giving her the Gerber and some days she'd like it and some days she wouldn't. And now I have the Gerber with fruit and she just loves it (12-223)".*

*"He didn't really like the rice cereals and then I, I think I switched to an oatmeal cereal for a brief time. Neither one did I finish the box and he didn't like it that much and now I use the Milupa mixed cereal and it's a lot more expensive but he likes it a lot better (10-87)".*

Consistent with information provided in the public health guidelines, most of these mothers (8/12) also expressed an awareness of and/or concern about allergies as a major reason for introducing the first foods that they did. Thus, the information from the guidelines appears to have influenced the mothers' solid food selection decisions and subsequent solid food feeding practices. The following quote emphasizes, in general, how strongly mothers adhere to the feeding guidelines with respect to allergy awareness, food selection and allergy prevention. Many common phrases that mothers used that reflect guideline 'adherence' include, "we went with the list...that they recommend starting with the least allergenic...like what we're told and then went on to..." and "during this time I was testing for allergies". The interview data clearly suggest that mothers follow guidelines for direction regarding the age to introduce specific solid foods and for the progression of increasing the variety of solid foods in the diet, but they appear to be following the guidelines with a focus, in particular, on allergy prevention.

*"He has been taking solid foods starting with just some rice cereal at 4 months he had no troubles, there has been no allergies or any difficulties with any of the food we've introduced...We went with the list of vegetables that they recommend starting with the least allergenic like squash, and sweet potatoes like what we're told and then went on to peas and beans and so on (4-50)."*

Most mothers were concerned about the possibility of their infant having a food allergy. This concern appears to be a major determinant of not only what foods were fed first, but also how solid foods were fed, with respect to increasing variety, increasing quantity, and the transition pace. The following two quotes describe how the mother's perception of 'testing for allergies' could impact on how quickly solid foods are introduced.

*"Started off with rice...he had gone through this episode with the Enfalac, umm, so I was, you know, I was a little concerned as to whether he was going to have any allergies...So I just, I was being cautious, as far as how quickly I introduced things (6-143)".*

*"When she was getting to 6 months then she could have a bit more variety...like cause during this time I was testing for allergies so that's why you know you do one fruit...So at six months there was more variety and umm her meals were getting larger (5-246/263)".*

The following quote also highlights the mother's concern about the possibility of her infant having a food allergy and the impact that this concern had on when she 'routinely' started solid foods (i.e., at 6 months). The quote illustrates potential confusion about food and allergies, since this mother had started 'sporadic' solid food feeding by 3 months of age, in order to get her infant to sleep through the night (quote not included). The concept starting 'routine' feeding versus 'sporadic' introduction is important here since the mother's early solid food introduction appeared to be perceived by her as not putting her infant at risk for food allergies. Although the mother clearly articulated that her feeding practices were focused around allergy prevention and appeared to follow the guidelines with respect to the type of foods she selected, she did not appear to follow the infant feeding guidelines, with respect to the age of introduction.

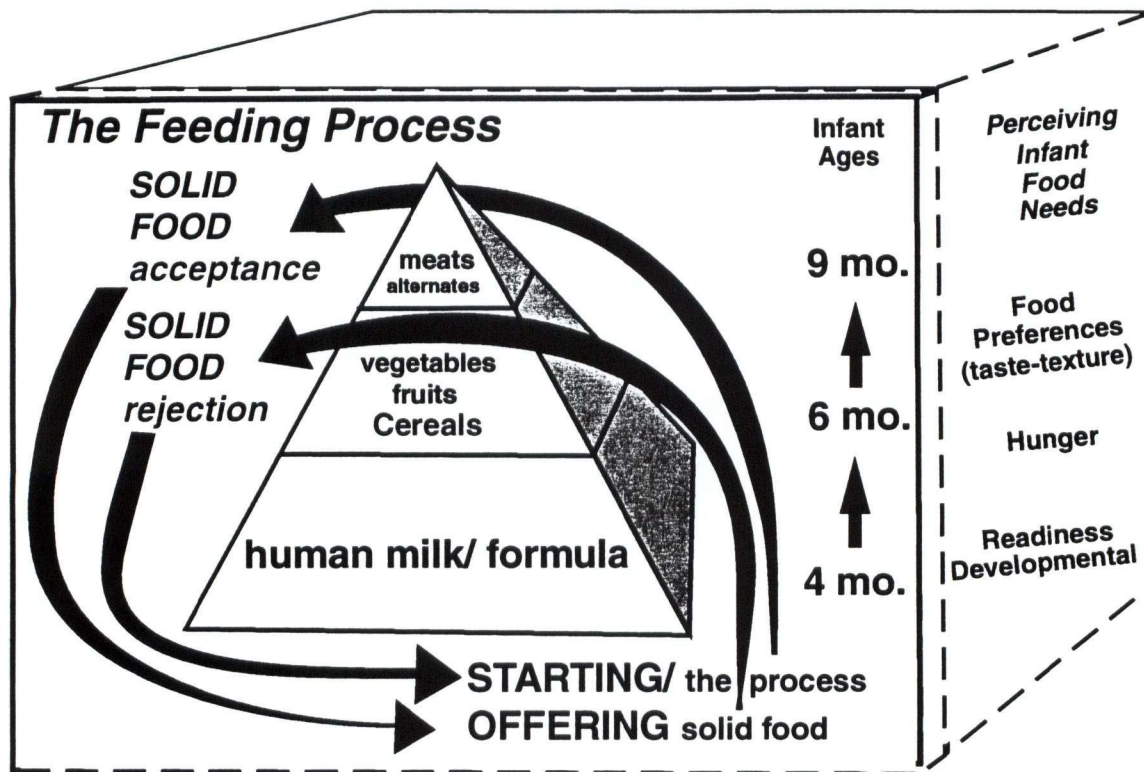
*" We didn't start him on solid foods until 6 months...because allergies run in the father's side...he didn't tolerate milk formula well or my breast-milk (7-39)... Started on the rice Pablum (7-77)... Once we started him on that, then we went on to yams because it was listed by the nutritionist, it was the least allergenic type of food (7-184)".*

The first theme – the feeding process describes the context surrounding solid food feeding. The available data suggest that the mothers interpreted 'starting' the solid food feeding process as 'routinely' feeding solid foods, and not necessarily as the age that solid foods were first introduced. Therefore, it seems possible that there may be a preliminary period prior to establishing routine feeding or food acceptance, when the infant is being fed solid foods 'sporadically'. The concept of 'sporadic' versus 'routine' feeding of solid foods may or may not have nutritional implications, depending on the infant's total diet and age. Further, the mothers' reasons for starting solid food at the age they chose differed from the reasons for solid food selection. The mothers were strongly influenced to start feeding their infant solid foods by the following conditions – the advice they had received, the infant's readiness and wanting the infant to sleep through the night. In contrast, food selection decisions were clearly influenced by the infant's acceptance or rejection of the type of solid food, or brand, offered and the mother's

concern about food allergies. The feeding process clearly appears to be influenced by many factors within the mother's proximate environment.

#### **4.4. Perceiving infant food needs**

The second theme in the 3-dimensional infant solid food feeding model is *perceiving infant food needs*. The model (Figure 12) illustrates the link between the 2 themes – the feeding process and perceiving infant food needs. The second theme consists of 3 major concepts: the mother's perception of the infant's developmental readiness, the infant's food taste and texture preferences and the infant's hunger. The mothers observed and then responded to their infant's cues, the infant is ready, prefers a specific food, wants food or is hungry, or the infant is not ready, does not like a specific food, does not want food or is not hungry. Thus, the mothers' perceptions about the infants' food needs were related to the mothers' subsequent solid food feeding practices or how they moved forward or responded in their feeding decisions (starting and offering). Further, the mothers perceived that the major determinant of infant food acceptance was infant 'readiness', solid food preferences and hunger. The interview data suggest that the mothers' perceptions and the infants' food responses 'caused' the mothers' subsequent solid food feeding behaviors.



**Figure 12.** The 3-dimensional infant solid food feeding model links the second theme '*perceiving infant food needs*' with the previous theme '*the feeding process*'. The second theme includes 3 concepts (the mother's perception of infant food taste and texture preferences, infant hunger and developmental readiness such as risk of allergies or choking).

#### 4.4.1. Perceiving infant 'readiness'.

The mother's response to her perception of her infant's readiness cues (both physical and cognitive cues) was to 'start' the solid food feeding process. The particular infant 'readiness' cues many mothers observed were: reaching or trying to grab, turning his/her head towards food, taking food from a spoon, sitting "propped" up, being interested in food, watching, fussing, being a "strong big kid", growing fast, and waking in the night. The following quote is an example of the

interconnection between the cues the mother observed and her subsequent feeding response – ‘starting’ solid food.

*“At about 5 months old he was ah...I guess showing signs of wanting solid food cause we would be eating and he would be, you know, reaching out, or whatever, so umm so we started with the basics you know...Pablum (1-48) ...sitting with us and he’d be reaching for our food, and kinda... he was doing a lot (chewing on things) with his fist so you know... (~1-181).”*

The following 2 mothers’ perceptions of their infant’s solid food needs and their subsequent solid food feeding practices appeared to be influenced by their infant’s growth patterns. The following quotes also illustrate how infant growth and possibly being physically large may be perceived by mothers as a sign of physical ‘readiness’ (i.e., cue) for starting solid foods. It is not clear from the available data if the quantity of food fed or the introduction age differs between physically large versus small infants. Although the rapid growth or the infant’s size appeared to influence these mothers’ solid food feeding practices it is not clear if their feeding practices were influenced by awareness of their infant’s increased requirement for dietary iron during this rapid growth phase.

*“At 3 months because he was growing so fast he I started him on a regular Pablum at night before he went to bed. Waking more for additional feeds...that would be a big baby...(8-35)”.*

*“I think he was just going through a growth spurt and he needed extra food (started rice cereal) and so we’ve actually had to do that a few times... (9-108)”.*

The mothers also observed specific infant behaviors and perceived them as characteristic of the infant not wanting solid foods. The phrases the mothers used to describe these infant behaviors included turning down food, spitting it out, not opening his/her mouth, retching, clearly shutting his/her mouth, turning his/her head away, not being interested, “not taking it” or “fighting it”. The following quotes illustrate these mothers’ perceptions. However, the first quote possibly illustrates an incorrect perception. It is not clear if the infant was not ‘ready’ for solids, if the infant just disliked the food offered, or if the mother was placing the spoon too far

back in the infant's mouth and thus causing him to retch and spit the food up. The third quote illustrates how infant food refusal could influence the feeding dynamics, or vice versa, how feeding dynamics could influence food acceptance.

*"[He] wouldn't have any Pablum (3-115)... I would just keep offering him you know rice cereal and he kept turning it down and spitting, you know, like not opening his mouth or just kind of like retching on what you put in his mouth and so I just thought, oh, well he's not ready for food (3-166)... He will always taste what you have to offer... If he does not like what you offer he will clearly (3-611) shut his mouth and turn his head (3-608).*

*"Started, um, like the Pablum (o'kay). We actually tried it a little bit early... (7-77). He didn't seem to really take to it because he was still kind of spitting it out (7-104)".*

*"From the beginning at 4 ½ months she just wouldn't feed. She would turn her mouth and she'd turn her head and she'd just fight it. And it was pretty much that way up until about a month ago (12-252)".*

Several mothers perceived that their infant was showing 'interest' in food (i.e., cognitive readiness cues). The concept '*becoming interested*' was articulated in the following two quotes. It seems possible that 'becoming interested' in solid food (learning to accept food) is a process over time that is influenced by the infant's developmental stage, age and exposure to food. The circular arrows within the model connecting the mother – infant interaction around food during the feeding process emphasize that feeding is a dynamic process. The mother's perception of her infant 'becoming interested' is possibly a catalyst that 'triggers' her subsequent feeding decisions (starting/offering). Further on in the results this concept is presented again with the feeding strategy 'waiting' because both concepts are related. The mothers appear to be 'waiting' for the infant to respond or become interested in the food that they are being offered.

*"I started when she was probably about 4 ½ months but she was not interested at all. She didn't actually become interested until about... probably about four weeks ago. At six months (12-239)".*

*"He's really interested in our food now and so once they show an interest and [you] start giving them a little bit. Let them try it (10-599). [I] started right at ~4 months...wasn't taking it too well held off [for a] couple of weeks (10-87)".*

The available data suggest that there may be differences in feeding practices that are determined by the mother's needs rather than the infant's food cues. Interestingly, several mothers' solid food feeding practices appeared to be influenced by the mother herself 'wanting to feed' solid foods. The mother 'wanting' or her 'readiness' to feed solids could be considered 'mothers' readiness'. It is not known from the available data what the consequences may be for an infant versus a mother driven feeding process. The following quote illustrates how this mother's perceptions about cereal feeding influenced her initial feeding practices in a negative way. As well, the quote emphasizes the high level of concern the mother experienced when her infant refused cereal. It seems possible that mothers' perceptions are not only determined by observation of infant behaviors at specific ages, but also by other factors related to food and feeding within the feeding context (i.e., personal factors). For example, the mother below describes her initial feeding behaviors of forcing the infant to eat Pablum that he appeared to dislike, instead of the toast he appeared to like.

*"Pablum which he never seemed to really like but I kept trying to stuff in his mouth, thinking I had to do this (1-48). Just recently I guess we just I just go more liberal with stuff and just I said well why am I forcing him to eat this when look he is reaching for my toast right now actually he wants to taste that toast you know, so let him try it, that kind of thing (1-98)".*

A further example of mother 'wanting' or 'readiness' to feed solids and progress in the feeding transition process is illustrated by the following quote. In this case, the mother's perceptions about her context (i.e., the workload of a second child, going back to work) appeared to have influenced her solid food feeding decisions and her practices. The mother describes the impact of having to return to work on 'the feeding process'. Her use of the phrase " *we started becoming*", illustrates that although the infant may be 'ready' to start solid foods the mother may

also be 'wanting' to feed solid foods. The dual meaning of 'wanting/readiness' highlights the interactional aspect of solid food feeding (mother – infant – food).

*"I started at work... so that I could know that he would be fine when I was away we needed to have him be eating solids... Umm, and that's sort of when (sitter) started watching him, that's sort of when we really started becoming... that's when I went and bought the food for him, you know, when I was leaving him for a full day but not just 4 hours or whatever... and I knew he was gonna to sort of be in a hard spot if he didn't have some food when I was away (3-513). To be brutally honest, with two children you know, you sort of look forward to slowing down on the feeding process (breast-feeding) (3-361)".*

Although many mothers perceived their infants were ready for solid foods based on the behaviors they observed, they seemed to be puzzled or concerned when the infant did not accept the solid food that they offered. Some mothers' solid food feeding experiences clearly did not progress as they had expected because the infant refused the food. The first quote illustrates the mother's recognition of infant developmental readiness cues. However, there seems to be less recognition of her infant's food preference cues. The second quote illustrates a mother's frustration at her infant's food response. She describes her feelings in comparison to her expectations and her perception of her friend's infant's positive response to the solid foods he was being fed. These mothers compared their infant with other infants that they knew. They remarked on the differences between their infants. The interview data suggest that mothers have expectations about the feeding process and that these expectations may have been influenced by the comparisons that they make among their peers.

*"We waited for the same signs type of signs [as their first baby]...like you know, reaching for the food, watching you put the food in the mouth, trying to grab...you know just real a lot of attention around the food. I guess the other one was sitting up. You wait for them to sit up strongly before you offer food to them. I wouldn't have introduced him to food unless I felt he was physically ready or interested and he did appear interested. So I was surprised when he wasn't interested in what I was offering. I just thought, oh, o'kay, I am wrong, you are not ready. I talked to my doctor about it because I said, you know...he keeps turning down this food, and you know,*

*what's going on. Because I have done it for, I consistently would offer it every couple of days for about a month or more and sort of you now, like, I was just a bit surprised...(3-1007-1033)".*

*"Difficulties just his .. his not ummm accepting the food the way I though it should be...so sort of a frustration or whatever like I never, or just seeing my friend's baby eat like yum yum yum like he is in heaven you know then [my baby] kinda like Waaaaaahhhh his head going back and forth get this out of my face you know... and I'm worried he's not getting enough...(1-1960)".*

The mothers in this study observed what they perceived as infant 'readiness' cues. The cues they observed appeared to influence their subsequent solid food feeding practices, such as 'starting' solid foods. The mothers' 'readiness' to feed solid food or start the transition process appeared to also be an important determinant of solid food feeding decisions. It is not clear from the available data if the infant's acceptance of solid food differs between a mother versus an infant driven feeding process. Further, although many mothers identified infant cues that they perceived as the infant either being 'ready' or not 'ready' for solid foods, the difference between food refusal cues (food preferences) and 'readiness' cues (not ready for solids) appeared to be more difficult for the mothers to distinguish. The mother's ability to recognize food 'readiness' cues correctly is clearly critical, since solid food feeding practices (i.e. introduction age) appeared to be influenced by infant food cues.

#### **4.4.2. Perceiving infant food 'preferences'.**

All of the mothers in this study discussed their observations of their infant's food taste and texture preferences, which they perceived as a major determinant of their infant's acceptance of solid food. The phrases used to convey their perceptions included, "anything sweet [he likes]", "doesn't like the taste", "too tart", "a stronger taste and he liked that", "it had a lot of flavor [meat]", "metallic kind of taste [meat in jars]", "so that she is happier taking it [cereal] we try putting some flavor into it for her", "bland" and "rice [cereal] was too boring". The following quotes illustrate the plausible relationship between the mother's perception of her infant's taste preferences, her feeding strategy and the final consequence – cereal acceptance. The mothers clearly appeared

to have been 'tailoring' their feeding strategies over time according to their food related perceptions.

*"Never liked [Pablum]... (1-54). So he eats it much better now because I will mix it with I make it a lot the consistency is a lot thicker and I think in the beginning it is so watery it...just so you know he didn't like it (1-140)... So then, we rice was too boring, ...so we went on to the oat the oatmeal and mixed it with applesauce and she took to that because it was sweet (1-386)".*

*"7:30 she gets umm a cereal breakfast. And umm mixed with formula because she likes the taste better that way...this morning I tried mixing it with yogurt too. Just cause she doesn't seem to particularly like the cereals so...so that she is happier taking it, we try putting some flavor into it for her (11-161)".*

The mothers also used numerous phrases to convey observations and perceptions about food texture preference. The mothers used phrases such as; "the consistency is a lot thicker [cereal]", "watery", "runny", "doesn't like the chunky stuff – the feel [prepared foods]", "stinky", "tacky", "grainy", "pulpy", "[he's] not into hunks of anything", "likes stuff fairly smooth", "toolumpy" and "he really wanted something a little bit smoother". The mothers expressed two distinct ideas within the 'texture preferences' concept. Texture was either expressed by mothers according to solid food types (i.e., differences between cereals and meats) or as a component of infant development (i.e., the infant's progression from one consistency to another, such as from 'watery' to 'thicker' cereal or pureed to mashed fruits and vegetables). The following two quotes emphasize the importance of food textures to infant's preferences. The infant's acceptance of the solid food offered seems to be dependent on the texture and flavor of the food. The mother's feeding strategies (i.e. mixing) appeared to be determined by her perceptions of what textures her infant liked and accepted. Interestingly, the first quote also suggests that the infant's progression in food texture may be food specific (i.e., viscosity, from runny and smooth to thicker and lumpier foods). Thus, progression during the feeding process from pureed to lumpy foods may differ depending on the individual food fed (cereals, fruits, vegetables and meats), because each food has unique texture characteristics.

*"And then I guess just...3 weeks ago I started chicken and beef (7 months)...I made it myself. Home made. Mashed or pureed it up and I really have to mix it. I would almost say like ...a ratio of one to four with vegetables. For him to eat it otherwise the consistency is too ummm, too strong, or not too strong but too umm, thick like, pulpy kind of deal. He likes his stuff really pureed even now. He's not into hunks of anything (6-197)... He still likes stuff fairly smooth, although, like his cereal we have it a lot thicker now, but veggies and stuff like that he seems to like umm fairly pureed ... Consistency....new for him [meats]... More difficulty with the texture (6-221-299)*

*"She didn't like them because they have a sort of metallic kind of taste... those little jars [commercially prepared meats]...the meat it's umm...it's very tacky...it's grainy. I have to hide it in like a lot of vegetables or something...She bouck's on it. ...So I buy her a combination or I make my own (5-483 -518)".*

The following quotes illustrate how the mothers' food perceptions influence the 'way' the infant is fed. These mothers are using the feeding strategy 'mixing' in response to the infant's refusal of solid food. The food preferences between the two infants, for whom the following quotes refer, differ. The first quote describes an infant who disliked cereals, whereas the second quote describes an infant that disliked applesauce, yet both mothers used the cereal fruit mixing strategy in order to promote the disliked food's acceptance. It seems possible that the infant's food preferences, such as a dislike of some iron-fortified cereals, may have negative consequences for the amount of food consumed. The mothers' feeding strategy, with regards to promoting solid food acceptance appears to be clearly important.

*"He takes [oatmeal/rice] doesn't like the taste of it so we do have to mix it with fruit to camouflage it (4-68)".*

*"Usually now I just give him mixed with fruit because he doesn't always like fruit and I usually put applesauce in the cereal (2-215)... Because he won't eat it by itself, not usually, the applesauce. I think he just finds it too tart, a lot of fruits (2-22)... Carrots, broccoli, sweet potato, cauliflower, yams. He didn't like potato, but I haven't tried that in a long time anyway. And he tried turnips. It had a stronger taste and he liked that (2-299)".*

The mothers' perceptions of their infants' food taste and texture preferences appeared to be a key determinant influencing their solid food feeding strategies. Consequently, since the data suggest that the mothers' perceptions of infant food needs were related to feeding decisions it seems possible that the mothers' feeding strategy may impact (promote or decrease) the level of solid foods the infant consumes.

#### 4.4.3. Perceiving infant 'hunger'.

Many (8/12) of the mothers perceived that hunger influenced their infant's acceptance of solid food. The following mothers fed cereal in the morning to their 'hungry' infants, before they fed a bottle of formula and described how well the infant ate the cereal in the morning. The mothers used phrases such as "timing is everything", "if she's hungry she eats very well, she eats lots, she eats very cooperatively" and "sometimes she's just not interested" to describe their experiences. The available data suggest that some mothers are aware of the connection between the length of time between feedings, hunger and the subsequent acceptance of solid foods.

*"So I don't give her another [bottle] one in the morning. So at breakfast time she's ...ya she's hungry, she's hungry at breakfast so that's she has the cereal then and she really likes it (5-429)".*

*[If I give] cereal before I give a bottle...[she] doesn't eat much cereal...[so] I don't give a bottle...[I] wait for an hour (11-192)... I think it's just its all timing, how hungry she is, how active has she been. 11-343... Could shovel it in, I mean you're amazed at how quickly she's consuming this you couldn't eat it this fast... Gobbling (11-391)... Sometimes she's just not interested. And I think it is more a matter umm just because it is lunchtime doesn't mean I'm hungry. Because with babies timing is everything... (11-481)... If she's hungry she eats very well, she eats lots, she eats very cooperatively and ahh that's been the best part I mean sometimes it's like I said she can eat it more quickly than you or I could I'm sure (11-495)".*

Some mothers seem to adjust the time between meals in response to their perceptions about their infant's hunger, whereas other mothers appear to find the management of 'feeding'

challenging. The first quote describes a 'flexible' solid food feeding style where the mother appears to feed solids in response to her infant's degree of hunger. The mother in the second quote appears to be having some difficulty trying to 'coordinate' the timing between the liquid and solid foods in the diet. These quotes reflect the differences between the mothers' feeding strategies, even though their perceptions about infant hunger were similar. These mothers appeared to be aware of the importance of the timing between meals and the infant's degree of hunger. Further, they seemed to be aware of the importance of the infant's degree of hunger to subsequent food acceptance.

*"We feed him when he is hungry. Like dinnertime can be anywhere from 4:00 till 7:00 depending on...on when he's hungry (9-760)".*

*"Milk, enough to be content...can't feed solids... Voracious appetite (7-724)... It depends how he is in the morning because usually umm, he wakes up happy and I give him a bit of milk...formula or some...solid food. But then sometimes he will just wake up screaming ... for food he is just so hungry and umm, like, I find it hard...I find he has gotten to the stage now where I can't he doesn't want to sit still (7-494)... Gets hungry...too upset...bottle quick... (7-880)... When I can get him in a good mood or, you know, try to coordinate it so that he hasn't just had a bottle,.. you know, so that we've got enough space and time kind of between bottles that where he is hungry. You know there are times where he'll just like, eat, eat, eat (7-662)".*

Learning to identify the infant's food cues appeared to be an important and ongoing task for mothers during the feeding process. The following quote highlights this aspect of solid food feeding. The mother is clearly 'figuring out' or distinguishing between the various food cues in order to understand her infant's refusal of food. The available data suggest that the mothers move through 2 steps when 'perceiving their infant's food needs'. The first step involved gaining an awareness of the 'signs' that infants may display during the feeding process. This appeared to be necessary for the mothers in order to start as well as to make decisions throughout the feeding process (e.g., interested, sitting up, reaching and taking food from a spoon were 'signs' mothers associated with solid food feeding 'readiness'). The second step consisted of observing and recognizing the food cues and then distinguishing between them (readiness, food taste and

texture preferences, and hunger). In order for the mothers to respond appropriately in their subsequent feeding strategies they clearly needed to understand their infant's food cues. The following quote describes a mother learning to understand her infant's food cues (not hungry or disliked what was offered). In order for this mother to promote solid food acceptance she clearly needs to be able to distinguish between the various food cues that she is observing.

*"I want to try and figure out if ... is he hungry, or is he...is he not hungry or is he just doesn't like the food you know at the time. Whether he is you know he is turning his head is he turning his head because he doesn't like it or is he turning it because he is full... Sometimes like he would be hungry he just wasn't ... he didn't like what we're feeding him (10-827)".*

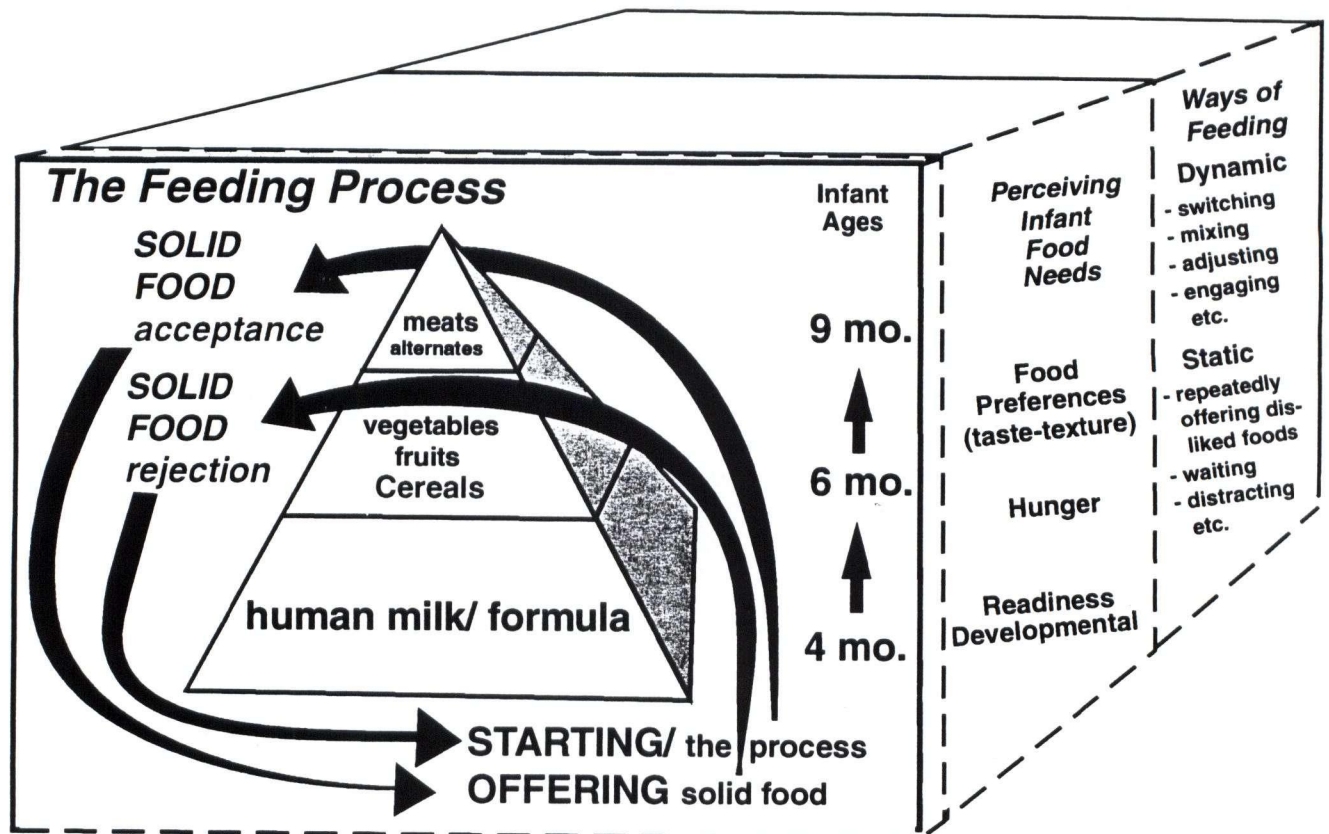
The infant's food cues are the essential link to understanding their unique food requests. Despite this importance, the reality is that the mother must interpret these intricate and often mixed, food cues, within the infant's changing environment. The data suggest that there may be a 'plausible' relationship between the mothers' perceptions of her infants' food needs and her subsequent solid food feeding strategies. However, appropriate feeding responses appeared to be highly influenced by if or to what degree the mother understood her infant's food cues.

#### **4.5. Ways of feeding.**

The third theme in the 3-dimensional infant solid food feeding model is illustrated in Figure 13. The model links the 3 themes – *the feeding process* and *perceiving infant food needs*, to the third theme – *ways of feeding*. Within the context of the solid food feeding process, how the mother feeds her infant solid foods appears to be contingent on the feeding strategy and/or technique(s) that she uses during this process. Thus, the third theme identifies the mothers' solid food feeding procedures. Further, the 'way' the mother feeds her infant solid foods appears to be shaped, in part, by her perceptions of her infant's food needs as well as the infant's solid food acceptance or rejection responses. These relationships are illustrated in the 3-dimensional model. The mother's level of expertise or feeding 'capability' also appeared to have influenced

the 'way' the infant was fed. The relationship of the fourth theme, 'gaining expertise', to the other themes is described in the next section.

The range of solid food feeding strategies/techniques that the mothers used were identified and described. Fourteen feeding techniques were identified and labeled as; *offering, waiting, switching, mixing, adjusting feeding management, socializing, modeling or mimicking eating, engaging, playing, positioning (including restraining), distracting/sneaking or camouflaging, prying/stuffing/ forcing, pushing and holding back food*. The feeding strategies/techniques describe the range of procedures the mothers in this study used to feed solid foods to their infants and potentially reflect the solid food feeding skills, inclination and competence (solid food feeding capability) of the mother. Further, the available data suggest that many of the mothers were 'adapting' their feeding strategies/techniques over time. The concept 'adapting' reflects the interaction around infant feeding (mother – infant – food). The mother's infant feeding actions (or reactions) appear to be in response to specific contextual factors (the mother's perceptions of infant food needs, the infant's response to the solid foods fed, the age of the infant, the level of feeding expertise and the environment). Thus, the mother appears to have been 'tailoring' her feeding strategies/techniques by 'adapting' the 'way' she fed her infant during the transition process. Consequently, the concept 'adapting' can be further described along a dimension since the mother may or may not decide to adapt the way she feeds her infant in response to the unique contextual factors of her current situation. Interestingly, specific solid food feeding strategies/techniques appeared to influence the acceptance of solid foods differently.



**Figure 13.** The 3-dimensional infant solid food feeding model that links the third theme, *ways of feeding* with the previous two themes, *the feeding process* and *perceiving infant food needs*. The third theme identifies infant feeding strategies that appear to be dynamic or static in promoting solid food acceptance.

#### 4.5.1. Ways of feeding; 'Offering' and 'Waiting'.

Two mothers articulated one 'way' of feeding that was labeled as 'offering'. The term offering, in the context of the feeding process, reflects the mother's behavior of repeatedly offering previously rejected food to the infant. The infants of both of the mothers using this feeding strategy did not appear to accept cereals for a month and a half or longer. The transition graphs (Appendix G) suggest that the infants were accepting only very low levels of cereal during the time when these mothers were repeatedly 'offering' the previously rejected cereals to their infants. The 'offering' strategy/technique is illustrated in the following quote. It seems possible that repeatedly offering some infants previously rejected foods does not lead to its acceptance. It is also possible that the mothers' behavior of repeatedly 'offering' solid foods reflects an infant development stage when the infant may be 'testing' the food. This stage may occur prior to the infant's actual acceptance of the food. If this was the case, the quantity of solid food consumed by the infant during the 'testing and offering' stage would be 'appropriately' low for the stage. The following quote was used previously to illustrate the infant's lack of solid food acceptance. Here, the purpose of reusing this quote is to emphasize the mother's feeding technique – repeated offering and the consequence of the strategy that was used. In the case of food refusal, repeatedly offering the same solid foods to the infant may be reflective of the mother not 'adapting' or tailoring her feeding strategy to the infant's food response cues.

*"Wouldn't have any Pablum (3-115)... I would just keep offering him you know rice cereal and he kept turning it down and spitting, you know, like not opening his mouth or just kind of like retching on what you put in his mouth and so I just thought, oh, well he's not ready for food (3-166").... I wouldn't have introduced him to food unless I felt he was physically ready or interested and he did appear interested. So I was surprised when he wasn't interested in what I was offering. I just thought, oh, o'kay, I am wrong, you are not ready... I consistently would offer it every couple of days for about a month or more and sort of you know, like, I was just a bit surprised... (3-1033)".*

The second feeding technique, labeled as 'waiting' was described by the following mother. This technique, as the label suggests, means the mother is 'waiting' for the infant to

accept specific solid foods. The quote suggests that the mother may have been 'waiting' for the infant to 'become interested' in the infant cereal that was being offered. Further, the mother seems to have been waiting for the infant to accept the cereal willingly. 'Becoming interested' is a 'cognitive readiness' cue that was discussed in the previous section. The mother appears to be 'adapting' her feeding strategy in response to her perceptions of her infant's food needs. At first she states that she would 'give in' and breast-feed her infant when he was not accepting enough cereal and was crying. She then learns to adapt her strategy and does not 'give in' and feed liquids instead of the cereal. The mother seems to perceive that her infant understands that he won't be breastfed in place of being fed solid food. It seems possible that the 'waiting' technique may be a key preliminary step in the process of the mother learning how to feed her infant solid food. In another quote, this same mother later uses the 'mixing' technique to increase food acceptance. These mothers seem to be 'tailoring' their feeding strategy by adapting the 'way' they feed their infant in response to the infant's food cues.

*"Difficulties just his his not ummm accepting the food the way I thought it should be...so sort of a frustration or whatever like I never, or just seeing my friends baby eat like yum yum yum like he is in heaven you know then (my baby) kinda like Waaaaaaaahhhh his head going back and forth get this out of my face you know ..and I'm worried he's not getting enough...ya so that was definitely a difficulty just making sure he is getting enough and I would often give in and breast feed him you see (1-1960)...So now we've reached that point where ... he knows that this is his feed and I'm not going to breast-feed him you know what I mean I used to give in so if he only had two bites of cereal and he is crying and wailing I would take him out of the high chair and rush over and sit down and feed him breast-feed him so he'd know what was coming see but now I don't do that and he is at that point where I think he is eating enough... (1-2000)".*

#### **4.5.2. Ways of feeding; 'Switching' and 'Mixing'.**

'Switching' types and brands of cereals and 'mixing' cereals into combinations were identified as the most common feeding strategies/techniques used by the mothers in this study. Many mothers described using the 'switching' (7/12) strategy and the 'mixing' (6/12) strategy in response to their perception that their infant disliked infant cereal. However, all of the mothers

(12/12) in this study described using the 'mixing' strategy in order to change the taste or texture of different foods.

The mothers who used the food 'switching' strategy also appeared to do so to promote solid food acceptance. Five of the seven mothers in this group cited 'switching' as a feeding strategy that they specifically used with commercial infant cereals. One mother finally switched food groups from infant cereal to single fruit and vegetables before the infant accepted solid foods. Another mother articulated 'switching' within her meat feeding practices to promote meat acceptance by her infant. The following quotes illustrate the common feeding strategy/technique 'switching'. These mothers switched to another type of cereal, for example, rice to oat cereal, and brand of cereal, for example, Milupa to Gerber. The 3 mothers are clearly tailoring their feeding strategies in response to their infant's food preferences.

*"He didn't really like the rice cereals and then I think I switched to an oatmeal cereal for a brief time. Neither one did I finish the box and he didn't like it that much and now I use the Milupa mixed cereal and it's a lot more expensive but he likes it a lot better (10-112)".*

*He didn't like the rice a first but then he loved barley and oatmeal [cereal] (2-214).*

*"I was giving her the Milupa, and I wasn't having any success with that at all. So I started giving her the Gerber and some days she'd like it and some days she wouldn't. And now I have the Gerber [mixed] with fruit and she just loves it (12-223)".*

Some infants were less 'accepting' of the cereals they were fed. 'Acceptance' can be identified by the length of time it takes the infant to eat the food routinely. It seems possible that the variations in the transition pace identified among the mothers may be related to the use of specific feeding strategies/techniques. The mother in the last quote (12-223) stated that it took a month and a half to finally find a cereal the infant would eat. The following mother described the 'mixing' strategy. However, this quote illustrates a negative case since the infant continued to refuse the infant cereal even though the mother used the 'mixing' strategy. The transition graph (number 3) (Appendix G) for this infant shows continuously low cereal consumption between 5 and 7 months of age. This mother finally, after 2 months, switched to giving fruit alone rather

than mixing fruit with cereal. It is not clear from the available data 'how' the mother 'mixed' the foods together. Although infant cereal acceptance appears to be increased by using the 'mixing' strategy, the way the mother mixes the foods together is also clearly important.

*"We have established that he doesn't like cereal and the only way we can really get him to take it is by mixing it with the fruit or vegetables...but he will still turn it away (3-647). He just doesn't like cereal, so I kind of think he was ready before...he just wasn't getting what he wanted because as soon as we offered him a jarred pureed fruit he loved it, he loved it... like right away (3-667)".*

The most frequent 'way' that the mothers in this study 'tailored' their daily feeding strategy or technique was by 'mixing' foods. Similar to 'switching', the reason mothers gave for mixing foods together was to promote food acceptance. The following quotes illustrate the mother and infant responses, specific to feeding cereals and emphasize the link between the technique used and the mothers' perceived responses. The second quote illustrates the complex mixtures that the mother created in response to her infant's refusal of solid food. The second quote and the previous quote, again suggest that the 'way' that the mother mixes foods into combinations may have decreased the acceptance of cereal. The available data suggest that it is clearly possible that the mother may create mixtures that the infant dislikes.

*"So he eats it much better now [cereal] because I will mix it...(1-140)... So either I mix it with a vegetable or I mix it with a fruit (1-407)".*

*"He takes oatmeal and rice cereal and he doesn't like the taste of it so we do have to mix it with fruit to camouflage it...so I have been trying to give him a fair bit of cereal mixed with his fruit, when he has breakfast, and with his dinner fruit and with his lunch fruit actually, I just put it into all the fruit (4-70) Initially he really liked it (rice/oatmeal cereals) and then he just wouldn't take them any more (4-235)... Probably 5 ½ months he wasn't interested in any cereal... I tried different ones the ones with banana, the ones with vegetable and I was you know and then someone suggested trying the Milupa and he didn't ever like Pablum for some reason but he's always liked Milupa and ya and then I started mixing it with a little bit of fruit juice and then I thought maybe I shouldn't do that but ahhh there is so many question marks, whatever they will take, so then I don't know if that is what's given him a sweet tooth because I started to mix cereal*

*with pear juice or apple juice or and I buy the baby juice and mix it a little bit to make it a bit sweeter and then when he stopped taking that then...about 5 ½ months then it wasn't sweet enough for him or something so then I started mixing it I would mix it with fruit juice AND with his fruit....so double wammy (4-242-268). Around the Cheerio time started giving him yogurt but he doesn't like the plain yogurt by itself so I mix it with the fruit and cereal and hide it in there (4-671)*

Infant cereal 'mixing' was a consistent theme across the interviews. Thus, 'mixing' techniques were sorted in order to describe them in more detail. The mothers described 3 'ways' that food mixtures were fed to their infants. It seems possible that the different mixing techniques that the mothers used could potentially influence cereal acceptance differently. The first mixing variation described by the mothers (4/12) was feeding 'commercially pre-mixed combinations of infant cereal or meat with added fruit or vegetables. The first quote illustrates the first mixing variation. The second mixing variation identified from the sorting was where the mother (6/12) 'made her own mixture' using some combination of breast milk, formula, fruit, vegetables, or yogurt mixed with the commercial infant cereal. The second quote illustrates the second mixing variation. In contrast to the previous quote, these quotes illustrate increasing infant cereal acceptance.

*"He just kind of, in the last week probably, really kind of jumped up on his quantities. Before we would have been doing say, 2-3 tablespoons and now we are doing a full 3 – a full 4 tablespoons, so he will have 4 tablespoons of cereal in the morning... I mix that with formula.. we either do the mixed cereal with banana or with mixed fruit (6-234)".*

*"Twice a day morning and night (cereal)... Just with fruit I have never mixed it with vegetables. And I mix it with formula too. I've been mixing it with formula umm since he started eating more at about five months (8-121)".*

The third mixing variation described by the mothers' (4/12) was feeding infant cereal with fruit or vegetables 'on the side' of the plate during the mealtime. The following quote illustrates the 'on the side' mixing technique. The sequence that foods are fed is of particular interest, since the quantity of infant cereal accepted by the infant may differ depending on the sequence in which it is fed. The mothers in the following quotes fed the infant cereal after the other solid

foods they were having at that particular mealtime. It seems possible that if infant cereals were fed last in a feeding sequence, less iron fortified infant cereal may be consumed due to satiety.

*"One meal in the evening...a big portion like about ...three quarters of a cup...oatmeal [commercial cereal] ...mixed, but it was mixed quite dry [with formula]...we had like a teaspoon [fruit or vegetable] it would sort of be on the top. I wouldn't mix it in but I would give him both in one spoonful until he finished the vegetable and then he'd just get oatmeal (Heinz Mixed Greens) (9-175)."*

*"What I do when I give him a meal is I give him umm...first off I give him I offer him the vegetable like say it's carrots and then I'll offer him the combination of the vegetable with the meat one and then usually between those two I will get in about eight bites on the average I would say between those two eight little baby spoonfuls. An then and then when he seems to fuss and he doesn't want anymore I know he's just fed up then I give him then I always have the fruit mixed with the oatmeal one it's about ½ and ½ or maybe 1/3 oatmeal 2/3 rds fruit I just use oatmeal Milupa mixed with a wee bit of fruit juice (4-781)".*

The quotes illustrate variations in food mixtures between mothers. The 3 'ways' of mixing cereals, although slightly different, could be considered a 'complex' food combination. Interestingly, of the numerous food mixtures fed, none of the mothers mixed infant cereals with meats. The mother's mixing combinations may influence infant acceptance and would differ in dietary iron content and food components that enhance or inhibit iron absorption. Clearly, the food 'mixing' techniques that mothers use could influence iron availability (i.e., depending on the infant's acceptance and the ratio and the types of foods mixed together). The following quote illustrates a mother 'tailoring' her feeding strategy by adapting the food mixture in response to her infant's food preferences. The total dietary iron content of the food combination from this mixture is related to the ratio of heme iron provided from the meat mixed with the amount of non-heme iron provided from the vegetables. Food 'mixture' variations – the ratio of fruit or vegetables to cereal or meat, differed between the mothers in this study.

*"...3 weeks ago [at 7 months] I started chicken and beef ...I made it myself. Home made. Mashed or pureed it up and I really have to mix it. I would almost say like ... a ratio of one to four with vegetables for him to eat it ... (6-197)"*

The available data suggest that the feeding techniques 'offering' and 'waiting' may be less effective feeding strategies than 'switching' and 'mixing' at promoting infant cereal acceptance. Further, the infant's transition pace appears to be slower when the former strategies were used. However, although the 'mixing' food technique was described by many mothers as one way of promoting infant cereal acceptance, several mothers appeared to have some difficulty creating mixtures that their infant accepted.

#### **4.5.3. Ways of feeding; adjusting feeding management**

Half of the mothers in this study described using a feeding strategy/technique that was labeled 'adjusting feeding management' as a 'way' to promote solid food acceptance (i.e. cereal). The mothers described two different feeding management behaviors. The mothers' behaviors included either limiting the liquid food in the diet and/or adjusting the timing between feedings. The following quotes illustrate the 'way' that these mothers were 'tailoring' their feeding strategy in order to promote cereal acceptance. The following two mothers discussed limiting the liquid portion (breastmilk, formula) of the diet.

*"And just that I would give in because I felt he wasn't getting enough (1-2079). You see but now he is at this stage he is...I don't give in and he'll eat a substantial amount [cereal] that I know he has had enough and then if we are out for the day I will bring that sort of a bottle of juice...and ummm you know I really limited the breast-feeding to I think let's see...like maybe 4 or 5 feedings a day so I don't like I don't like whip it out [breast] and feed him any old time like I did before (1-2073)."*

*"So I don't give her another [bottle] one in the morning. So at breakfast time she's ...ya she's hungry, she's hungry at breakfast so that's she has the cereal then and she really likes it (5-429)".*

Three mothers discussed adjusting the timing of feeding. The following quotes highlight the importance of the 'timing' between solid and liquid foods and the mother's perception of her infant's hunger. The last quote describes a mother 'tailoring' her feeding strategy by adjusting the timing between meals. This mother describes a flexible 'on demand' solid food feeding style, using food hunger cues to guide mealtimes, whereas the first 2 quotes describe 'limiting' the liquids in the diet to influence solid food consumption. In this last quote, the mother's 'mealtime' flexibility is emphasized by her statement that "dinnertime can be anywhere from 4 – 7pm".

*"In the morning I want to make sure she gets the cereal into her before I will give her her bottle and if she doesn't eat very much cereal I don't give her a bottle. I will wait for another hour maybe (11-191)... I think it's just its all timing, how hungry is she, how active has she been (11-343)*

*When I can get him in a good mood or, you know, try to coordinate it so that he hasn't just had a bottle,... you know, so that we've got enough space and time kind of between bottles that where he is hungry. You know there are times where he'll just like, eat, eat, eat (7-662)".*

*"I don't know that we are necessarily doing anything that is working well. We're just basically following his...his lead, if he likes something we go with it. If we don't, it's not that big a deal. ...for us and for the way (the baby) is, it works really well to do that. To let him tell us when he is hungry ... We feed him when he is hungry. Like dinnertime can be anywhere from 4:00 till 7:00 depending on...on when he's hungry (9-760)...Then to sometimes he'll fuss at 4:30 and we think he is hungry so we get everything ready and then he doesn't want to eat. But so we just, that's not it. So we just put it back in the fridge (9-784)".*

#### **4.5.4. Ways of feeding; socializing, modeling, engaging, playing**

Several mothers used feeding strategies that appeared to be related to the 'social' aspect of the feeding experience. These strategies focused on using positive reinforcement and were interactive. These strategies were labeled as socializing, modeling, engaging and playing. 'Socializing' means the parent(s) were encouraging 'family mealtimes'. 'Modeling' means the feeder was teaching the infant how to eat the food. 'Engaging' refers to letting the infant play with the food utensils while feeding the infant to give the infant some 'control' during the mealtime. Lastly, food 'playing' refers to allowing the infant to explore and play with the food itself. The

following statements highlight the connection between the mother's feeding strategy and her perception of the feeding experience; "it's more relaxed that way...not having to rush around" and "he definitely enjoys his food more". The mothers seemed to feel, in particular, that 'eating together' was an important factor that increased the infant's mealtime enjoyment. One mother in this group articulated a detailed account of the four techniques in this section. The text has been included to illustrate the use of multiple 'social' feeding techniques (Appendix H).

*"And we always eat at the same time, we try and eat together like when he's having breakfast I'm having breakfast and when he's having dinner we are usually having our dinner. And I find he's a lot more relaxed that way like. Sort of make mealtime, mealtime for everybody. And I find it's a lot more relaxing that way and you are not rushing around to feed him and then rushing around to get our dinner ready and then keep him entertained while we eat (10-603)...I read in books...[it is] important...[to] play with food...[I am a] neat freak...[but I am] getting use to ...[the] mess is hard...[but] it's what they like...[To] Explore and stuff every once [in awhile]...you don't have to do it all the time but every once in awhile [to let them] explore with their food (10-894/909)."*

*"He definitely enjoys his food more when we give it to him when we are having our meal and I notice he likes to socialize and as soon as he sees us eating he is quite happy to sit in his high chair, we put it right here in between us. Ya and before we were trying to feed him before we had our dinner and settle him and put him to bed and then have our dinner when it was peace and quiet but now we find that no.. he loves the socialization of the meal you know and...it just makes it more fun than [before]...he enjoys his meal although it's a bit difficult for the mom or dad to eat...but I notice he is much happier if he eats when we are eating (4-843).*

#### **4.5.5. Ways of feeding; positioning**

A few mothers described a feeding technique that was labeled as 'positioning'. The first quote illustrates how one mother adapted her feeding strategy by changing the 'position' that the infant was fed. The infant was fed while lying flat on his back rather than sitting up to eat, in order to increase the quantity of solids her infant consumed. The mother used this technique for the first month of feeding cereal and stated that the infant ate a larger quantity and ate happily in this position. The second quote illustrates another example of the mother adapting her feeding strategy (the 'positioning' technique) to get food eaten by the infant. In this case the mother

appears to be 'restraining' the infant in a car seat to calm him enough to get him to drink a bottle. This mother expressed concern about the difficulty of feeding solid food compared with giving a bottle. Both of the following quotes are examples of the 'positioning' technique. The available data suggest that although feeding in the 'lying position' may increase solid food consumption for this particular infant, 'restraining' the infant and feeding liquid foods replaces the solids and may delay the solid food transition process.

*"As far as the even feeding the cereals and that, umm, he wouldn't you'd start feeding him sitting up or, for a while there he was just sitting in my lap and I was feeding him, and he'd take a little bit of it that way and then he would quit taking it. But if you put him flat on the floor and he was lying flat on his back he would eat and he was like that for about the first month of giving him cereals...I remember we were even doing vegetables when he was flat on his back...quite happy to eat that way. Yeah, because you would almost think he would be more likely to choke on foods but he would eat foods quite happily on his back whereas he would stop eating if you still had him sitting up (6-954)".*

*"umm trying to keep the long term goal and umm and so I guess that's my biggest concern is that it is just so difficult [feeding solid foods], so much easier...to give him a bottle like you know, because I can strap him down for a bottle in his car seat and calm him down enough to get him to focus on eating but right now he just wants to ...play.....he doesn't want to miss anything (7-577)".*

#### **4.5.6. Ways of feeding; distracting, or sneaking/camouflaging food**

Several mothers described using a feeding technique that was labeled as 'distracting'. The mothers used food toys to distract the infant while spoon-feeding, in order to get the infant to eat the solid food. Both mothers, in the following quotes, perceived that the infant enjoyed 'chewing' on the food toys during the mealtime.

*"He really likes, he really likes chewing on his spoon. And so I use that, where I give him his own spoon so he can chew on it and then [i] put in [the] food, so he's playing with that.... (7-662)".*

*"Usually now when I feed him he has his food toys. Some toys are for use when he's feeding. He likes them. He gets bored... So there are 3-4 toys that are just to play with food...he usually chews on it (2-1038)".*

Several mothers also described an infant feeding technique that was labeled as 'sneaking' or 'camouflaging'. The mothers appeared to be tailoring their feeding strategy by sneaking (changing feeding sequence) or camouflaging (mixing disliked with liked foods) the solid food. For example, the following mother fed the 'less accepted' meat rice combination before the 'accepted' yams. The mother in the second quote, mixed liked and disliked foods together, in order to hide or camouflage the disliked solid food in the combination. The food 'mixing' technique has been previously discussed. Mixing foods together into complex food combinations may possibly have 2 different outcomes. As previously described, the mixing technique seems to be used by mothers to tailor the taste or texture of the food combination, in response to the infant's food preferences. Thus, promoting solid food acceptance. Alternately, in this case, the food 'mixing' technique appears to focus on sneaking or camouflaging disliked foods with foods the infant likes. It is not clear if, or to what degree, the food is accepted by the infant, using this strategy. Further, it is not clear, but seems possible, that longer term enjoyment of specific solid foods may decrease when using these strategies – distracting, sneaking/camouflaging.

*"What I will do is if I want him to eat that I'll bring out something that he likes and try to give him a spoonful of the chicken and rice that he wasn't too interested in and then give him a couple of spoonfuls of yam (10-827)".*

*"She didn't like them because they have a sort of metallic kind of taste... those little jars...the meat [commercially prepared meats] it's umm...it's very tacky...it's grainy. I have to hide it in like a lot of vegetables or something...She bouck's [gags] on it (5-483)".*

#### **4.5.7. Ways of feeding; prying, stuffing or forcing**

A few mothers (3/12) commented on their initial use of a feeding technique that was labeled prying, stuffing or forcing solid food. The expressions used by mothers to describe these techniques were "pry with my spoon, shove the food in, and why am I forcing him to eat this".

These mothers appear to have used these strategies initially, and then later tailored their feeding techniques (or maybe adjusted their perceptions about their infant's food needs) in response to what appeared to be negative feeding dynamics. The following quote suggests that the mother seems to be concerned about the infant not 'getting enough' food and not eating cereal. A mother's 'concern' about solid food rejection may increase the use of these specific feeding techniques (forcing, prying and pushing solid foods). The following quote also seems to suggest that the mother is inexperienced in feeding and that she is moving through a learning 'process' possibly trying to figure out 'how' to feed her infant.

*"Just initially when he was...when I was trying to get him to eat stuff [rice cereal] that either he didn't like, or I don't know, he was just fussy, like he would play with this and he would start putting it [a toy] in his mouth and I would shove the food in. But you are not supposed to know that (2-1057)... I remember being worried about, like initially, I guess, when we were giving him cereal and he wouldn't take it and I tried to pry my spoon, but I know I shouldn't have been doing it (2-1169)...Like he would play with this [toys] and he would start putting it in his mouth and I would shove food in (2-1064)... But you are not supposed to know that (1065)... Just like...[I] shook something just to try to get his mouth open ... so I can feed him (2-1088)... I mean, if he doesn't want it he doesn't want it. I mean, he's not going to starve. But initially you think, oh, he has to eat, and you now ummmm the books say you should get so much of this, so much fruit, so much, and that means you have to go by. But I mean it's not a big deal, you know, one day he just eats, you know, crackers and toast (2-1174-1183)".*

#### **4.5.8. Ways of feeding; pushing**

'Pushing' was a strong theme that evolved from across more than half of the interviews (8/12). The concept 'pushing' has 2 different interpretations. The mothers appeared to be 'pushing' the solid food itself and/or 'pushing' the transition pace, from a liquid to a mixed food diet. The two reasons for 'pushing' foods were concern about returning to work and concern about the infant's outcome (food refusal and weight gain). It seems possible that 'pushing' food or the transition pace may reflect the mothers' response to solid food feeding concerns in general.

The mother's work force participation appears to have influenced, to some degree, subsequent feeding behaviors. Four mothers in this study were intending to or had already

returned to work. The available data suggest the mothers were 'pushing' the transition process in order to return to work. These mothers used phrases like, "won't have to worry", and "so that I could know that he would be fine when I was away", to express some of the emotional and organizational issues around solid food feeding and leaving their infant, in order to return to work. The first two quotes illustrate the impact of returning to work on these mothers' solid food feeding practices. It seems possible, that the postnatal time line when the mother must return to work, may influence the age solid foods are introduced as well as the pace mothers 'transition' from the liquid diet to a mixed diet that includes solid foods.

*When I go back to work in September and he is going to go into the daycare, the infant daycare, I mean the philosophy there is the same way. The kids self-help skills start so young and I just think the more you encourage it...independence and doing stuff on their own it just builds their self confidence and you know like food is something that they have power over (1-1084)... I'm thinking maybe he is just still seven months like my friend would say and maybe I am trying to push him too much but then I have to think about when I go back to work...in a daycare probably by August...(1-2337)... [He] will be well on his way [to eating foods independently]...[I] won't have to worry (1-2378)*

*Just once a week (work), but it still meant that there was something that needed to happen if I was going to leave him for the majority of the day because he wouldn't have anything to eat because he was not eating solids at that time and he didn't want to have solids for a long time (3-97)... Just for realism, so that I could know that he would be fine when I was away we needed to have him be eating solids. When I was leaving him for a full day but not just 4 hours or whatever (3-510)... Just physically being away from him has sort of demanded that I find an alternative for him to have when I am not there and that has aided in weaning him from the breast (3-838)."*

The following mother stated that she would not be able to return to work when she expected because of the difficulty she was experiencing with the solid food transition process. The following quote suggests she is concerned about, the quantity of solid foods her infant is accepting, how quickly he is progressing in the transition process and the infant's refusal of infant formula in a bottle.

*I would actually like to breast-feed him to a year but unfortunately it is not going to work with me going back to work and me having to be away for 13 hours (4-114)... Because now that breast milk is being weaned a little bit he's you know he's going to need to have more nutrition from other sources (4-352)... I'm I'm quite worried about getting him he's got to start taking more (4-359)... And that's the other thing we've been trying to kinda get him on the bottle but he won't take the bottle (4-577)... I am suppose to be back to work mid November...casual but I think ahh I probably won't be taking any shifts for a long time until he is off you know because I am not going to let him go hungry (4-639)*

Interestingly, the following mother seems to be tailoring her infant feeding routines to the future daily routines she expects to have when she returns to work. These comments reflect the complex emotional and organizational issues involved in the mother's preparation to return to work. The link between the 'consistency of daily feeding routines' and the infant's as well as the caregiver's 'expectations' about feeding appeared to be important to this mother, in order to make her transition from being at home to being at work, easier. Further, the mother, as the quote suggests, must 'transition' from being the primary feeder to having a caregiver take over the feeding 'role', during the daytime. The mother appears to be consciously tailoring her feeding routines in order to 'push' or promote a successful transition for when she returns to work.

*"Trying to get into stricter routine (11-154)... Back to work (next month) (11-165)... Starting at 6 months I started trying to impose a bit more of a schedule on her...umm but slowly so that it was still flexible and now she's 7 months and I want things to get just a little bit more strict just so that I can let her caregivers know what what to expect in the day and that she's [the baby is] going to know what to expect in a day, even if I'm not there (11-690)".*

Some mothers' (3/12) appeared to be tailoring their feeding strategy by 'pushing' food because of their perceptions about the infant not gaining weight and/or not accepting foods. These mothers used phrases such as "stopped gaining", "trying to feed him a lot" and "I was really worried" to express their concern. The first quote illustrates the mother's food specific 'pushing' behavior where she seems to tailor her liquid feeding strategy to "feed him a lot" because she is "worried about weight". The second quote describes a mother not 'pushing' solids but instead 'waiting' for the infant to 'become interested' in cereals. It is possible that the food

'pushing' strategy would develop further, with dimensions ranging from 'pushing' to not 'pushing' or 'waiting', with more focused interviewing and analysis. It seems possible that a mother may either 'push' or not 'push' foods (i.e. wait) in response to her level of infant feeding experience. Learning to feed solid foods and the mother's process of 'gaining feeding expertise' is discussed in detail in the next section.

*"Stopped gaining weight around 6 months...And the doctor didn't seem too concerned ... he seems to be getting longer but just not heavier...that was bothering me (7-836)... [I am] trying to feed him a lot...worried about weight...I am not trying to focus so much on solid foods....bottle...QUICK (7-872)".*

*"I was really worried... Yeah, and I was going to the mothers groups and asking about it, and they said don't worry about it, don't worry about it (o'kay). And it then at six and a half months she hadn't gained any weight in close to two months (oh o'kay). She had stayed the same weight. And they were still saying don't worry, don't worry, she will get interested and eventually she did, but...I was really worried about the weight gain, and I had heard about other babies that were feeding at four months. You know, infant cereals and were fully interested, and she wasn't (12-526)."*

#### **4.5.9. Ways of feeding; holding back food**

Many mothers described a feeding strategy that was labeled as '*holding back*' foods. Specific foods were 'held back' or not fed to infants for 3 main reasons. The mothers in this study appear to have 'held back' specific foods because of the characteristics of the food (e.g., texture difficulties, the risk of tooth decay, food processing concerns and the risk of food allergy/sensitivity). The mothers also 'held back' food because of their perceptions about infant readiness (i.e., infant not ready for foods) and their personal purchasing decisions (i.e., availability of food). The types of food that individual mothers 'held back' included fruit or juice, mixed cereals, meat, finger foods, dairy, formula and breast milk and processed foods. Half of the mothers in this study described 'holding back' behaviors because of their concern about the infant choking or having difficulty with the texture. The following two quotes illustrate the mothers'

concern about texture and choking. The mothers concern seems to influence the infant feeding process – the introduction of specific solid foods and the transition pace.

*“Actually I haven’t made any of my own food...I was so worried about texture and choking that I’ve just been getting the ultra strained...so very pureed...pureed (4-269)... [I] Haven’t tried [new recipes], because of the texture (4-509)”.*

*“I have been concerned about him choking ...like, how do you start introducing things like toast and bread and Cheerio’s and stuff like that...he tried to swallow it, so of course he choked on it, and threw up, most of all of his other meal that he’d just had. That was the end of the Cheerio’s...Melba toast...he ends up with this big piece broken off. It’s got this really sharp end on it, so I just freak and I figure he’s going to choke on it and I take it away from him...What, how do you get them on, what is there that you can give them that you don’t need to be quite so...ahh afraid of the choking (6-462)... I am taking it fairly slow on the meats...more difficulty with the texture (6-297)”.*

Several (5/12) mothers commented on holding back foods because of health concerns. The sweetness of the food and risk of tooth decay, with regards to juice, was a common concern. Specific foods not being as nutritious as others, was also a concern (i.e., red meats or fruit not being as nutritious as white meats or vegetables). Processed commercial foods with ingredients such as preservatives, were a concern to some mothers. Lastly, concern about future weight problems, was discussed. The following quotes illustrate how the mother may tailor her feeding strategy according to her perceptions about the ‘characteristics of the food’. The quotes also suggest that these mothers appear to be influenced by what they perceived was ‘healthy’ and ‘nutritious’ food.

*“Meats...go towards tofu, cheeses & fish...yogurt (1-920)”.*

*“I didn’t introduce apple juice until umm, quite far along the way. I’m not, although I think that apple juice has a lot to offer I am not that crazy about it for young babies. You know, it’s not good for their teeth and it’s sweet, so (3-969)... We don’t eat a whole lot of meat at our house...red meat anyways. We eat mostly chicken and fish and we do eat red meat only once a week so I’m not...as long as he is having proteins and he is already having breast feeds so I am not too worried about his meat intake (3-740).... I get grossed out when I look at some of the*

*ingredients on like Heinz and those jarred things so I...prefer to keep it as sort of natural as possible so. (3-702)... I try to do things that are healthy...I know that it's healthy for children to be breast fed...It's healthy for them not to have preservatives in their food...that fresh fruit or vegetables are best and those are the things that I think about for my children (3-906)".*

*"I didn't give him apples or pears very much because I think the squash and the...the green stuff is more nutritional. Full of nutrition, is what I'm trying to say. So I would give him that, and I really watch that...So he gets pears and apples and stuff as a treat (9-423)... I look at, umm I look at color. I try to, I try to find ahh, I don't buy anything with any added sugar or salt or anything in it except the vegetable and water ...[I am] worried about giving him too much stuff... He is a big boy... Having him eat too much...I don't want him to have a weight problem (9-1021)".*

Several mothers held back specific foods (mixed cereals, fruits, and dairy) because of their perceptions about the risk of a food allergy. The food's allergy 'likelihood' seemed to influence the mothers' decisions about what was fed. The mothers who were concerned about allergies commented on what not to give their infant at specific ages (e.g., mixed cereals and dairy). The following quote also introduces the concept of feeding 'one food at a time' before moving on to a different food. It seems highly likely that mothers will differ in their feeding practices with regards to solid food progression. Feeding 'one food at a time' before moving on to a different food may decrease the transition pace, depending on how the mother proceeds.

*"I didn't because you are not supposed to until they are 6 months [introducing mixed cereals]. And also I believe in doing like one type of food at a time. And they are mixed so he wouldn't be able to do that, so just for allergy purposes ...(3-628)... I didn't feel that he was ready for it (meat) anyways. I think you are not supposed to start them until 8 months...so I just discontinued it (3-726)".*

Two mothers commented on 'holding back' meats, however, they did so for different reasons. The first quote illustrates the influence of the mother's perception of infant developmental readiness (being hard on the infant's stomach) on feeding decisions, whereas the second quote suggests that the food (meat) availability may influence the mother's meat feeding practices.

*"Sometimes if I give him beef. What I usually do is I try and alternate giving him meat one day and the next day I don't give him a meat, just incase it is hard on his stomach. Like I try, I don't try, I try not to give it to him twice two days in a row...Try not to give 2 days in a row (10-247)".*

*"Doesn't get protein everyday [commercially prepared meat combinations]...if we've got one open...[We] use [it] up once [its]opened (11-805)".*

Two mothers commented on the idea of 'potentially' influencing infant food preferences by 'holding back' specific foods. The following two mothers both 'limited' the liquids in their infant's diet (formula and breast milk), in order to influence cereal acceptance. The first mother also 'held back' fruits because she perceived that it would influence or promote her infant's acceptance of vegetables. 'Limiting' the liquid portion of the diet was previously discussed in the section discussing the feeding technique 'adjusting feeding management'. The quotes are presented here to emphasize the similarity between the two concepts – holding back food and limiting food. Holding back foods, as discussed in this section, is a technique that mothers use, specifically, because of their perceptions about the characteristics of the food itself (concern about choking, texture difficulty, allergy risk, tooth decay, food processing concerns, difficult to digest, and food availability). The mothers who adjusted their feeding management by 'limiting' or 'holding back' liquids or other food such as fruit appeared to do so to influence the infants' food preferences. The 2 concepts – limiting and holding back may develop along a dimension within the 'adjusting' feeding management technique with further interviewing and analysis.

*"So in the morning I want to make sure she gets the cereal into her before I will give her her bottle and if she doesn't eat very much cereal I don't give her a bottle. I will wait for another hour maybe (11-191).... Still hasn't had any fruit... I'm holding off on sweet stuff just cause I know she's gonna take it I know that's not an issue (11-111)... I'm just hoping that umm if she gets to like the vegetables she's not going to decide that she doesn't want them anymore if she can have fruit just cause she's had them for so long and they are just a part of her day (11-120)".*

*"Reached this point...He knows this is his feed... I'm not going to breast feed him (1-2000)... Now he is at this stage he is...I don't give in and he'll eat a substantial amount that I know he has had enough and then if we are out for the day I will bring that sort of a bottle of*

*juice...and ummm you know I really limited the breast-feeding...like maybe 4 or 5 feedings a day so I don't like whip it out and feed him any old time like I did before (1-2079)".*

#### **4.5.10. Solid food feeding strategies summary.**

The number of solid food feeding strategies used by the individual mothers varied from 2 to 7 (Appendix I). Although the absolute number of strategies used by each mother may, to some degree, reflect that the mother is tailoring her infant feeding strategy, it does not convey how the different strategies that the mother uses could potentially influence dietary outcome differently. The summary of feeding strategies in Table 2 lists 14 strategies/techniques that the mothers in this study used to feed their infants. The summary suggests that the mothers in this study used a wide range of solid food feeding strategies.

#### **A summary of mothers' solid food feeding strategies**

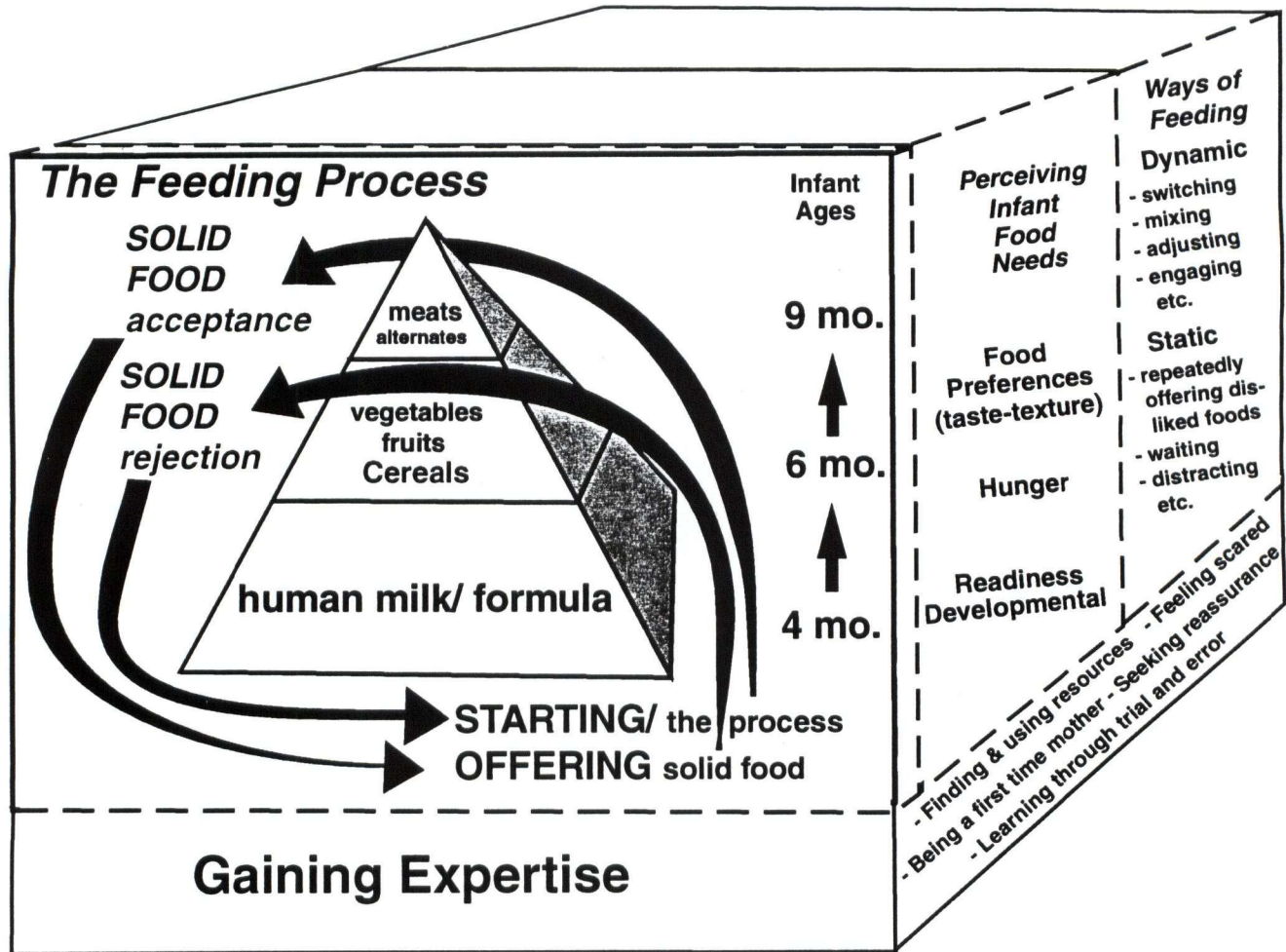
1. offering the same food (repeatedly offering disliked foods)
2. waiting (initially stopping or giving up)
3. switching (food types and/or brands)
4. mixing (to alter taste or textures)
5. adjusting feeding management (feeding routines)
6. socializing (family meals)
7. modeling or mimicking (teaching infant how to eat)
8. engaging (giving some degree of control to the infant during feeding)
9. playing (food play)
10. positioning (feeding lying on back, restraining in car seat)
11. distracting, sneaking or camouflaging (using toys as distracters during feeding to get food eaten, mixing rejected solid foods with accepted solid foods to get food eaten)
12. prying (mouth open), stuffing/forcing (solid food into mouth)
13. pushing (specific foods or feeding transition pace)
14. holding back (specific foods)

**Table 2.** A summary of the solid food feeding strategies used by mothers in this study.

The summary expands our understanding of the 'ways' that mothers feed their infants and how they 'tailor' their feeding strategies in response to their own perceptions, the infants' cues and the 'conditions' within the infant feeding context. This provides a better understanding of the link between the procedures of infant feeding (strategies/techniques), infant food acceptance and the feeding process. Further, an understanding of the determinants of infant food acceptance, in particular, iron fortified cereals, enhances our understanding of determinants of dietary iron consumption over time, from this source. The summary provides a useful list of potential feeding strategies that could be further described along a continuum of strategies that possibly promote or discourage iron fortified infant cereal acceptance. Clearly, some feeding strategies were less effective than other strategies. The available data suggest that the 'way' the infant was fed may have influenced the subsequent acceptance of the solid foods.

#### 4.6. Gaining expertise

The fourth theme in the 3-dimensional solid food infant feeding model is illustrated in **Figure 14**. The model now links the 4 themes – *the feeding process, perceived infant food needs, ways of feeding*, to the fourth theme *gaining expertise*. The feeding process appears to be influenced by the mother's infant feeding knowledge, skills and confidence developed during this transition process. Thus, the mothers' personal learning was labeled 'gaining expertise'. The five main components to this theme include, finding and using resources, being a first time mother and feeling scared, seeking reassurance, and learning through trial and error.



**Figure 14.** The 3-dimensional infant solid food feeding model that links the fourth theme 'gaining expertise' with the previous three themes; *the feeding process*, *perceiving infant food needs* and *ways of feeding*. The fourth theme includes 5 concepts (finding and using resources, feeling scared, being a first time mother, seeking reassurance and learning through trial and error).

#### 4.6.1. Finding and using resources

The mothers used information from numerous resources, print as well as from verbal sources, to guide their decisions with regards to infant solid food feeding. The three main print resources used by these mothers were the popular press such as books, magazines, and recipe books, professional guidelines and charts, and/or pamphlets prepared by baby food companies and infant feeding information on food packaging. The verbal resources that were used were either from the professional sector (public health nurses, nutritionists, doctors, and community groups, parent groups and the nutrition hotline), or the mother's social network (family, friends, and mothers' groups). Of the many resources cited, no mother commented that information from the television or radio had influenced their feeding practices. A summary of the resources used by the participants is provided in Table 3.

**Table 3. Resources used by study participants**

<b>PRINT/PAPER Sources</b>	<b>VERBAL Sources</b>
<b>Popular Press</b> <ol style="list-style-type: none"> <li>1. books (baby)</li> <li>2. magazines</li> <li>3. recipe books</li> </ol>	<b>Professional</b> <ol style="list-style-type: none"> <li>1. public health nurses</li> <li>2. nutritionists</li> <li>3. doctors</li> <li>4. community groups</li> <li>5. parent groups</li> <li>6. nutrition hotlines</li> </ol>
<b>Professional</b> <ol style="list-style-type: none"> <li>4. handouts of infant feeding guidelines and charts</li> </ol>	
<b>Commercial</b> <ol style="list-style-type: none"> <li>5. pamphlets (prepared by infant food companies)</li> <li>6. food packaging (including infant feeding information)</li> </ol>	<b>Social Network</b> <ol style="list-style-type: none"> <li>1. family</li> <li>2. friends</li> <li>3. mothers' groups</li> <li>4. other experienced mothers</li> </ol>

The following quotes give an example of the numerous resources mothers used in this study as well as what they found useful. In the first quote, the mother describes the importance of using a combination of resources. This mother suggested that 3 resources combined were important, community nurses, friends and reading. The second mother, as in later quotes, expressed concern about having to do so much guessing and that it was difficult to find information. In addition to these concerns, the mother reflected on the reality of being a 'first time mom' and being inexperienced with feeding babies.

*"What to Expect when You are Expecting" that's the big one...all the mothers have that one... My cousin gave me [a book] by Lousie Lambert...its about nutrition and children...there is just a whole bunch of them that I have a whole library of books and I just keep flipping through each one (1-264)... I probably do too much reading...that's the problem (1-294)... I'm actually learning a lot from another friend who has a ten month old and I see what she does and I really like...she is very liberal and I really like that and her baby is ten months and he eats all natural foods and he doesn't eat baby food any more and he is just a really he is like a solid baby you know strong solid what ever and ummm (1-1009)... I see the community groups that I have been going to and friends and books I mean all three combined but I would never suggest to any one just follow one you know what I me... Ya community health nurses, friends, and and reading and education (1-1435)".*

*Books... My mother... Women who looks after him (9-892)... Pamphlets from doctor (9-899)... Pamphlets... Baby Food Companies Send You... "What to Expect in the First Year" (9-935)... Babysitter reads us a lot out of [a book by] Penelope Leach (9-940)... I find doctors aren't very helpful...or any of the doctors that I have talked to haven't been very helpful in terms of baby food questions... They don't seem to know the answers... transition formulas... it's like 3 dollars cheaper a can. Which is a huge difference for us... I look at all the pamphlets that the baby food companies send you because. I find they're actually quite informative. Then we have that "What to Expect the First Years....[and a book by] Penelope Leach (9-935). [It's] Hard to find information (9-1028)... You just have to... figure out and guess... hope that it works (9-1062)... Nobody has any idea? I wish that there was somewhere saying ...5 months...[is] definitely too early for cottage cheese,...6 months is too early,...7 months probably o'kay,...8 months is good...I wish I didn't have to do so much guessing (9-1080-1090)... I've never had any experience with babies...this is the first time I've ever had anything to do with babies (9-1095)".*

#### 4.6.2. Being a first time mother and feeling scared

The mothers in this study appeared to be moving through a learning process from being a 'first time mother' who may be inexperienced feeding her infant solid foods to becoming experienced. Five mothers who described themselves as 'first time' mothers used the following expressions to reflect their infant feeding concerns, "You just don't know if you are doing it right", "Everything is new", "I feel like I don't know a thing", "You're not really sure what to do", "It's like going into something blind", "Confusing...I totally feel like I don't know what I'm doing", "It's just so difficult", and "I am unsure...". These expressions seem to reflect a degree of inexperience and possibly a lack of confidence possibly due to the absence of critical experience that is needed to understand how to feed solid foods during the transition process. The following quotes describe common feelings about being a 'first time' mother. Further, the third quote suggests that this mother's inexperience may have increased her level of apprehension, such as feeling scared about the infant feeding process itself. "Feeling scared" was a concern reported by several mothers.

*"Food in general seems to be a very big issue among moms. Being a first time mom it's like you know, going into something blind you [know]. You're not really totally sure what to do because you get all this advice and you get conflicting advice you know and stuff like that (5-675).*

*"Confusing... I totally feel like I don't know what I'm doing (7-30)... Never been exposed to babies (7-794)... my biggest concern is that it is just so difficult [feeding solid foods] (7-577)... So that's just what I've found lacking because, you know, from the general information that I've got on how to feed a baby [he] doesn't...He doesn't do it. Like the books say. He hasn't read the book...So and I haven't been around babies a lot at all so he... [I am] guessing myself (7-626)".*

*"I'm just learning...no idea what to give...its scary... Just starting out...we don't know...how much to give...what kind (12-806)".*

### 4.6.3. Seeking reassurance

The mothers in this study described the importance of feeling 'reassured' from external sources about how they were feeding their infants. The following quotes illustrate how the mothers used different resources for 'reassurance'. These mothers appeared to be seeking specific information, possibly in order to provide support and reassurance. The information appeared to be important because it provided reassurance that they were 'on track' with 'what they were suppose to be doing', feeding their infant. Further, although the mothers used print resources they seemed to seek, in particular, verbal reassurance from health care experts.

*"[Its] Just not knowing everything about your first baby is just not knowing right...everything is new and people can tell you this, people can tell you that the book can say one thing the nurse can say another...but when it is your first like you said I have all this knowledge in nutrition [but] I feel like I don't know a thing (1-1877)... Like for me I go to several drop-ins I might hear about nutrition a couple of times but then I get reassured o'kay that I am doing everything right you know (1-2801)... I need to feel reassured that I'm like...if I never went to these meetings and I never asked and never got support then I wouldn't be reassured and [that] I'm sort of on the track with what I'm suppose to be doing (1-2819)".*

*"I have had some stuff sent to me from like, ummm Carnation and the formula people... And actually I found those books to be quite helpful (baby club, baby steps: Enfalac) and then some handouts from the group meetings (VPHD) ... And then I talked to my doctor about introducing some of the foods and some of the concerns I had as far as...how to introduce him to ...a more extensive range of foods and that. She gave me a sheet which, actually I kind of found it very reassuring because while a lot of the other things that you read tend to say umm 4-6 months to start off with and 6-9 months and stuff like that, they start at 6 months. ...but it takes the later age so that you don't feel like you are missing something or you are being too slow with introducing foods (6-514)".*

Several mothers commented on the advice that they received from different sources. In particular, learning from other mothers, especially 'experienced' mothers appeared to be extremely useful. These mothers seemed to be saying that the advice they received or sought from other mothers was particularly useful because it was practical. The following quotes also suggest that the first time mother's social network may be very important since it may provide the

needed opportunities for experiential learning, in order to discuss experiences and thus 'gain solid food feeding expertise'. The following mother used a combination of resources, one of which was an 'experienced' mother of 4 children. This mother, as did others mothers, 'received' information from baby food companies or public health guidelines but also 'sought' information for her specific needs.

*"My mother, and the woman who looks after him...she's got four kids...we ask her a lot of stuff and books, pamphlets that you get from the doctor...I look at all the pamphlets that the baby food companies send you because I find they're actually quite informative... (9-894)".*

*"Always get unwanted advise (5-815)... Peoples experiences actually ...other moms... Friends who had babies (5-861)... Not necessarily first time mom's but should I say experienced moms tend to have really good ideas (5-869)... Helpful for moms to have a guideline ... I did get this one chart but it's very vague (5-895 910)... There was no warning about you know how to teach you child to chew things and stuff like that because I didn't find it didn't come automatic...it's not automatic (5-927)... I learnt that from a mom (giving Rice Krispies rather than Cheerios) (5-952)".*

*"So I don't know try listening to other moms I guess I think is really good. Ya I think that is really key...like ya just little ideas you get from other moms what they do you know (10-563)... What to Expect in the First Year... Mother parent infant groups... nutrition hotline.... Your doctor ....list of ....scheduling of what to do from 4 months...I've got it actually hanging on my fridge... (10-746)*

The mothers in this study had sought advice (print and verbal) from health professionals. In the first quote, the mother sought 'expert' advice from health professionals, both in print and verbal form and had asked questions, however, the quote suggests that this mother was still unsure about how to feed her infant, especially with regards to meat. The quote also reflects the mother's inexperience and that she was trying to figure out how to feed her infant solids through using her print resources and her doctor. Possibly, what this mother was seeking was reassurance and practical infant feeding information, information which does not appear to be provided from the resources that she had used.

*"I went to my four-month appointment with the doctor and she said...oh you should start vegetables too (8-61)... I got the Babies Best Chance from the Government, but it has it broken down into 3 month spans. Which is because kids vary of course but It would have been helpful to me if it said "for a big baby...do this" and I'm still like that right now because I am unsure as to what I should be doing when because my doctor said to me by twelve months he should be eating exactly what we eat, and I'm thinking that's only four months away. Not much time to get him doing that (8-354-367)... No it just says "Feed Solids"...at 6-9 months. It say's to feed solid foods 3-4 times per day and then it just gives a list of what you can try feeding him... It doesn't tell me how much of each thing he should have and I asked my doctor about the meat and she said umm that it was just my personal philosophy on meat. I mean we eat meat but I don't know maybe he needs it (8-375)... And then I got other baby books and everything's different (8-396)".*

A critique of the content of the information received by 'expert' sources is described in the first quote. The term 'they' refers to health professionals. The mother comments not only on what 'they give you', such as starting, slow progression, and goals by one year but also what 'they' don't "tell you", such as "how to get there". The mothers in this study cited the need for more 'specific information' and used phrases such as "go with your instincts...listen to your baby" and "so much information ... contradicting...go with how you feel" to express their experiences. These phrases suggest the mother is 'gaining expertise' and possibly confidence since she appears to have learned how to trust her own judgement. However, the available data also suggest that there are gaps in the solid food feeding information provided for these mothers.

*"Because then some people say that by a year they should be eating sort of basically ...what [do] you do kinda thing (5-963)... [You need a] Map to get there .... like sure they tell you...start...then slowly get up to this...then they say by a year they should be eating what you are. But they don't say how to get there (5-983)... They say Oh don't give babies... The avoid things...I have a bit of a problem with them because umm I don't plan to deny having cookies or ice cream... (5-1016)".*

*"Go with your instincts not books...I mean use the books as guidance but I found, I would say go with the instincts, and listen to your baby rather than...Yah, use the book as a basis but then I think be open to...variations. You know, like, to listen to your baby and listen to yourself, and take care of the needs of both of you... It took awhile to trust (7-751)... To me I didn't have, I*

*have never been exposed to babies...I didn't really know...signs to look for or, or what. So I felt really foreign to the whole thing (7-793)...*

#### 4.6.4. Learning through trial and error

Learning to feed solid foods was expressed by the mothers in this study as a process that took place over time. In general, all of the mothers appeared to have gained experience on how they fed solid foods through 'trial and error'. The first quote illustrates a mother who appeared to be inexperienced and uncertain about what to do and thus may have been lacking feeding confidence. These experiences may have created a high level of frustration for this mother. The second quote illustrates a mother that had been feeding solid foods to her infant for some time and appeared to be 'gaining expertise'. The mother states it is "fun feeding him now". This statement suggests that she has moved along a learning 'curve', a term coined in the first quote, and has 'gained expertise'. Interestingly, the same phrase suggests she may have experienced a period of time when it was not as "fun feeding" her infant.

*"So I guess we're kind of going through a learning curve right now on how to [feed him]...So I still feel I'm kind of fumbling my way through. And hopefully he is getting enough nutrients (7-805)...They emphasize, you know, get a job, and business careers, and that's the training I took...School and even training outside of the home...look at a textbook... what do I do with a baby...I'm suppose to know... You're a mom NOW and you're suppose to know. I haven't the foggiest idea. And so for me, [that] has been the biggest problem all along.... There's not that tribal woman thing...my friends are working...their kids go to daycare (7-990).*

*"It's just learning too because you are always so concerned that they are not getting enough food or what they're getting and part of the concern is you know if he is not eating you think oh you know something must be wrong or why isn't he eating that or he should be eating more. But I mean just have to realize that some days they don't. I'm starting to get more comfortable with some days he doesn't want to eat as much and some days he will want to eat more. But he seems and he doesn't like a lot of ...a lot of fruits but I think it's the pre-made fruits (10-343)... Some days I feel [he's] not eating enough...most of the time generally...I'm always concerned if he is getting enough fat and protein and it's really hard like I have to watch what he eats (10-431)... You just don't know how much liquid they are getting...hard to know...if I'm nursing enough...but I guess the food is compensating for the less nursing but I still get concerned that he is not getting enough proteins or whatever...[so I] read-up...[I am] reading it*

*over and over...what to give...what I could give them and what I shouldn't give...obvious what you can't...[give them things they will] choke on...if they react [allergy]...[you] stop giving [it] (10-532-560)... Ya that's the other thing like I don't follow the books...to the T...sort of like and they say you know when they are four months they should be eating this but he wasn't ready at four months he was ready two weeks later and that's fine. Like sometimes they are ready earlier, sometimes they are ready later and that didn't kinda worry me. I didn't let that, you let it worry you for a little bit and they you just have to step back and think...you know they're gonna let you know and I feel I am a lot more laid back with him now than I was 3 months ago and it's fun feeding him food now...(10-703)...*

The following quotes suggest that some mothers seemed very worried about their infant's slow weight gain. Further, these mothers seemed to perceive that they were more concerned than the health professionals from whom they had sought advice. It seems possible that these mothers were seeking reassurance on "how" to feed their infant. However, the response they received from 'experts' seemed to focus on the infant's weight rather than possibly the mothers underlying concerns, which could have been more about if she was feeding her infant solid foods appropriately. Interestingly, the mothers also did not appear to be fully comfortable with the feedback they received from these health professionals. In the second quote the mother describes a situation where her infant was refusing to eat solid foods. The response she received from the health professional consulted did not appear to address the mother's concerns. Consequently, this mother does not appear to have been reassured about her solid food feeding practices.

*[He] Stopped gaining weight around 6 months...And the doctor didn't seem too concerned ... he seems to be getting longer but just not heavier...that was bothering me (7-836)... [I] guess for myself I would want like, more specific information ... like they did when he was a newborn (7-821)*

*"... I was going to the mothers groups and asking about it, and they said don't worry about it, don't worry about it. And it then at six and a half months she hadn't gained any weight in close to two months. . She had stayed the same weight. And they were still saying don't worry, don't worry, she will get interested and we eventually she did, but...I was really worried about the weight gain (12-530)... Nothing. Not a pound. She was 16.2 up until about, she was weighed*

*about two weeks ago. But the doctors say don't worry, it's o'kay. She's not skinny. She's not scrawny. She's a chubby little thing, so ya (12-550)...*

*Well I know that the nurses were saying don't try umm until five months...don't try anything until 5 months [feeding solid foods], umm, but I don't know I just kind of, I wish there was more knowledge on what to feed your baby and when. Umm...I don't know. It was pretty, it it was pretty tough. I had a hard time when I was, every time I would go down to give her something to eat she wouldn't eat anything and the nurses were saying, oh don't worry about it, and yet she's not gaining any weight (12-621)... I would probably say that they are going to be getting so much information from everyone and a lot of it is gonna be contradicting. Umm and you just kind of have to go with how you feel (12-761)".*

The experience of being a 'first time mother' was a common theme described by the mothers in this study. The mothers described the experience of learning to feed their infants. The mothers appeared to be moving along a learning 'curve' from being inexperienced to becoming experienced feeding their infants solid foods. The learning process appeared to coincide with the mother's level of certainty about 'how' to feed her infant and trust in her own judgement. Many of the mothers stated that reassurance was important to them. Reassurance from health care professionals appeared to be useful to mothers because it seemed to help them 'tailor' their feeding strategies according to the responses they received. Interestingly, although the mothers received and sought information from multiple resources, practical information from 'experienced' mothers, appeared to also be highly valued. It seems possible that the concepts described in this section (finding/using resources, being a first time mother and feeling scared, seeking reassurance and learning through trial and error) influenced the mothers' 'learning curve' and thus if, or how quickly the mother gained her infant solid food feeding 'expertise' during the liquid to solid food transition process. The type of resources used (i.e., print versus verbal) and the source of the resource (i.e., profession versus social networks) appeared to influence the mother's infant solid food feeding decisions. Further, the mothers appeared to need information resources at specific stages of the feeding process to meet their unique individual situation (e.g., food refusal, slow weight gain, texture difficulties, etc.). The available data clearly suggest that the mother's solid food feeding 'capability' was determined, to some degree, by her level of

feeding expertise. The fourth theme – gaining expertise attempts to capture 2 concepts potentially critical to how the mother feeds her infant solid foods. First, the level of expertise and second, the rate that the mother gains expertise. These concepts may be important conditions within the feeding process because they clearly have the potential to influence the mother's solid food feeding decisions.

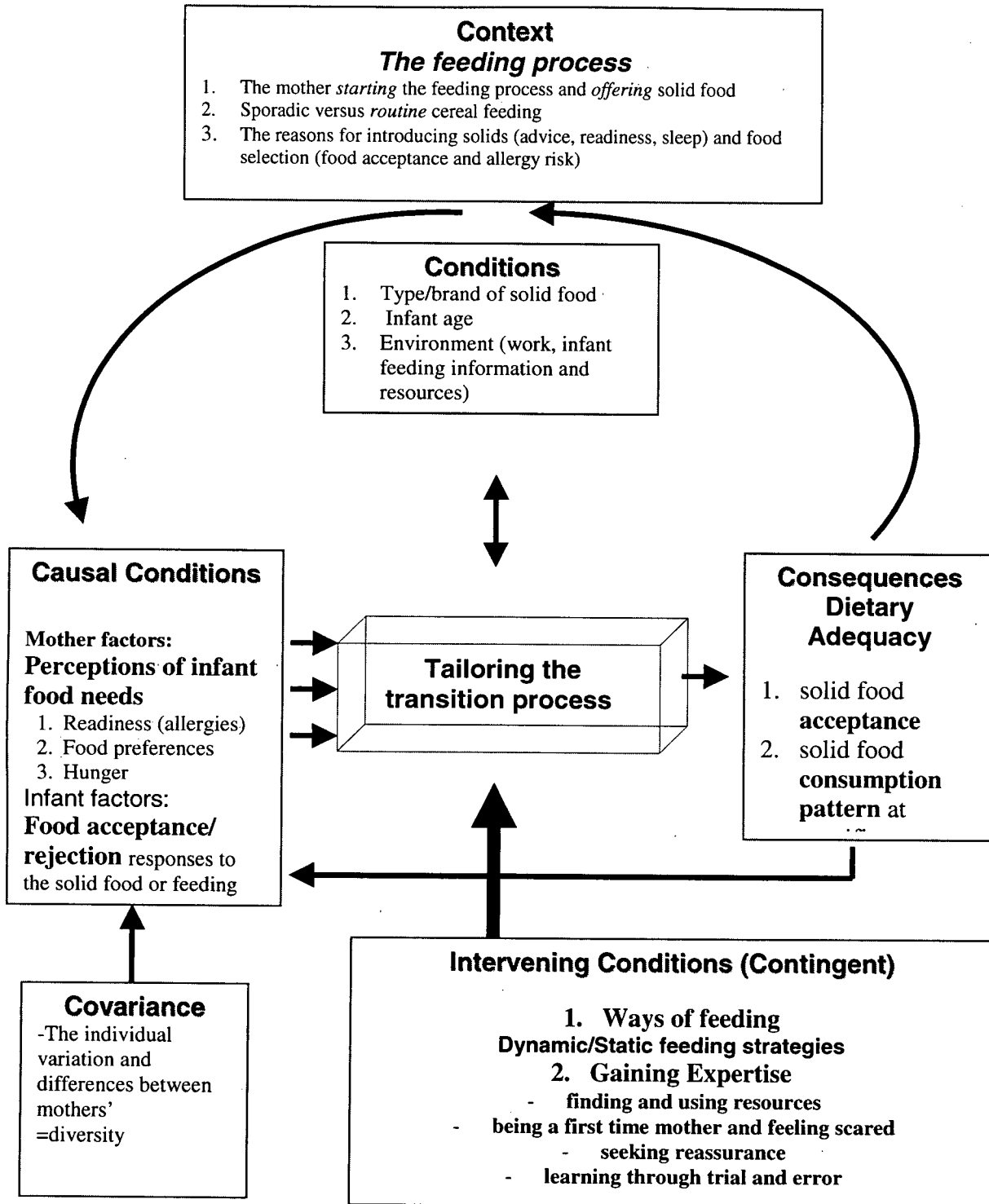
#### **4.7. Tailoring the transition process**

The fifth theme in the 3-dimensional solid food feeding model is illustrated in Figure 10 (page 52). The model links the 5 themes – *the feeding process*, *perceiving infant food needs*, *ways of feeding*, *gaining expertise* and the fifth theme *tailoring the transition process*. The 3 – dimensional solid food feeding model provides a conceptual framework to better understand the complex relationships among the categories and concepts discovered in this study. This figure reflects the interpretation of the interview transcript data and emphasizes the mothers' 'words' within the presented themes. Thus, Figure 10 illustrates the determinants that account for much of the mothers' behavior in this study within the context of the solid food feeding process. The fifth theme – *tailoring the transition process* was identified as the key determinant influencing the outcome of solid food feeding process, and thus was labeled as the 'core' theme. The mothers appeared to be *tailoring* the 'way' that they fed their infants, in order to progress through a dietary transition. This dietary transition is from the time the mother first introduces solid foods to her infant, to the time the infant accepts an appropriate range of solid foods in addition to their usual milk diet.

##### **4.7.1. The causal-consequence model of infant solid food feeding**

Figure 15 provides a similar framework to Figure 10 but it is unique in that it shows the plausible relationships between the 5 themes to dietary adequacy (i.e., iron). The fifth theme evolved into the core theme because it explained best the potential variations in solid food acceptance and consumption patterns described by the mothers in this study. Thus, the core

theme *tailoring the transition process* is illustrated in Figure 15 as 'central' to the solid food feeding process and consequences – dietary adequacy. The plausible relationships among the 5 themes were identified, described and developed using the procedures outlined by the causal-consequence model (Glaser, 1978). These procedures have been described in the design and methods section. The core theme – *tailoring the transition process* was linked to the other 4 themes (*the feeding process, perceiving infant food needs, ways of feeding and gaining expertise*), thus fulfilling its prime function of integrating theory.



**Figure 15.** The causal-consequence model of infant solid food feeding (adapted from Glaser, 1978), showing the plausible relationships between the five themes – *the feeding process, perceiving infant food needs, ways of feeding, gaining expertise, tailoring the transition process and dietary adequacy.*

The core theme has practical relevance to the day to day context of infant feeding because it increases our understanding of not only how infants could be fed solid foods over time, but also why there are variations among infant's dietary consumption patterns. As Figure 15 illustrates, many conditions (i.e., the type of solid foods offered, the infant's age and the environment (e.g., work schedules, available resources) within the infant feeding context, easily influence the core theme, thus making the theme highly variable. Consequently, the core theme can be examined along a dimension from the mother 'tailoring', to the mother not 'tailoring' the solid food transition process, in response to her perceptions of her infant's food cues and responses. Thus, the range of behaviors that the mothers use, or do not use, to feed their infants, represents the 'dimensions' of the fifth theme – *tailoring the transition process*.

The first theme – *the feeding process*, identifies the potential relationship between the mother starting or offering solid foods and the infant's response to what is offered (i.e., accepting or rejecting the food). The interaction (action-reaction) between the mother-infant pair and food is, therefore, the central focus of the theme 'the feeding process'. The link between the first and the fifth theme can be further explored by emphasizing the dimensional aspect of the concept 'tailoring'. For example, if the mother offers solid food but the infant rejects the food, the mother may then tailor her feeding strategy to try and gain acceptance, or she may not tailor her strategy and instead continue to offer the same food in the same way. Thus, the concept 'tailoring' represents the mothers' 'way' of adapting or not adapting the type of solid foods and the feeding strategy that she used. The 'way' that the mother 'adapts' can be considered dynamic (tailored) or static (not tailored) with regards to promoting acceptance of solid foods, by the infant. The first theme – *the feeding process* provides the context within which the many conditions exist, that easily influence if, or how the mother 'tailors the transition process'. Clearly, food acceptance or rejection by the infant during 'the feeding process' is a primary factor that potentially 'causes' the mother to begin 'tailoring' her infant feeding strategy.

The second theme – *perceiving infant food needs* identifies the potential relationship between the mother's perceptions of her infant's food needs and their influence on her subsequent solid food feeding behaviors. Thus, this theme is also considered as key in

potentially causing the mother to begin 'tailoring the transition process'. The mother's perception of 4 key food cues appeared to strongly influence the mothers' feeding decisions. The cues included infant developmental readiness, food taste and texture preferences, hunger and allergy risk. The link between the second and the fifth theme can be further explored by emphasizing the dimensional aspect of the concept 'tailoring'. The mothers' perceptions of their infants' food needs appeared to clearly influence their solid food feeding strategies – '*tailoring*'. For example, the mother who recognized that the infant was not accepting the solid food because he/she may not have been hungry could 'tailor' her next solid food meal time according to her infant's hunger cues so that the food may then be accepted better by the infant. The mother who recognized that her infant was hungry at specific times of the day could, therefore, respond by adapting her feeding schedule according to these cues. In this context, this mother appeared to have been 'tailoring' her feeding strategy by linking her perceptions of her infant's food needs (cues) to the infant feeding techniques that she was using, in order to respond accordingly. The mothers that did not perceive any infant food cues (e.g., hunger cues), or misinterpreted food cues (e.g., food preferences), may not have been able to effectively 'tailor' their feeding strategies to meet their infant's' food needs, in the same way as mothers who were able to recognize these cues. Thus, the mother's perceptions of her infant's food needs appeared to be a 'causal condition' influencing if, or how the mother 'tailored' her solid food feeding response.

The third theme – *ways of feeding* illustrated in Figure 15 identifies the potential relationship between the mother's feeding strategies and the infant's acceptance of solid foods (solid food consumption). A wide range of infant feeding techniques was discovered from the mothers' descriptions of how they fed their infant during the feeding process. Some of the feeding techniques seemed to be better at promoting solid food acceptance than other techniques (i.e., mixing and switching compared to waiting or repeatedly offering previously rejected foods). The concept 'adapting' is the key aspect of the third theme because, like 'tailoring', it emphasizes that solid food feeding is a process over time and that the mother's behaviors are influenced by the rapidly changing conditions within the solid food feeding context. However, the mother's 'way' of feeding solid foods is a 'contingent' factor that appears to directly

affect the core theme. In order for the mother to 'tailor' or 'adapt' her feeding behaviors she must use a feeding strategy(s) or technique(s). Therefore, the mother's solid food feeding behaviors are contingent or conditional to the individual strategies or techniques that she uses.

The link between the third and the fifth theme can be further explored by emphasizing the dimensional aspect of the concept 'tailoring'. It seems possible that the mother may choose to tailor her feeding strategy by adapting her feeding technique(s) to promote the consumption of the solid foods that she is offering during the transition from an exclusive liquid diet to a mixed liquid and solid food diet. For example, positioning the infant on their back to feed solids appeared to be effective for one mother when she was first starting solid foods. Socializing with the infant during mealtime and allowing the infant to have some control over the feeding experience, or 'engaging' the infant while feeding appeared to be effective strategies for other mothers. However, some mothers may not have recognized any relationship between the feeding strategy that they were using and the amount of solid food their infant consumed. As a result, these mothers may not 'tailor' their infant feeding technique(s). Consequently, the transition process for individual infants was highly variable and this variability may be explained, in part, by if, or how the individual mothers were 'tailoring the transition process'.



The fourth theme – *gaining expertise* illustrated in Figure 15 identifies the potential relationship between the individual mother's learning to feed her infant and her capability to 'tailor' the 'way' she fed her infant during the transition process. For example, a 'first time', possibly inexperienced mother, appeared to progress along a 'learning curve' where she learned to feed her infant solid foods. This process appeared, for some mothers, to be through trial and error experiences, and receiving or seeking reassurance from the available infant feeding resources that they used. The experiences that the mother encountered during the feeding process and the resources that she used potentially promoted her learning to become an experienced feeder. The available data suggest that some of the resources (Professional Guidelines and commercial pamphlets and food packaging information) that were available to the mothers, appeared to focus on what type of solid foods to feed an infant at specific ages. Interestingly, most of the resources used by the mothers, in this study, did not appear to focus on describing the practical, day to day,

aspects of how to feed an infant solid foods, during the transition process when the infant is learning to accept a range of different solid foods.

The link between the fourth and fifth theme can also be further explored by emphasizing the dimensional aspect of the concept 'tailoring'. The mother could potentially 'tailor' her feeding strategies and techniques, however, her actual 'tailoring' capability appeared to be clearly influenced by her level of feeding 'expertise'. For 'first time' mothers, it seems possible that early on in the feeding process, when the mother first introduces solid foods, the mother may be inexperienced and, therefore, less skilled and confident at 'tailoring' her feeding strategies. The 'way' that the mother 'tailors' her feeding techniques may, therefore, be less resourceful earlier than later on in the feeding process when the mother has 'gained' more experience and has developed more feeding skills and confidence. For example, the inexperienced mother, early in the transition process, may not have learned yet when in the day to feed her infant solid foods. In contrast, with time and experience the mother may learn when in the day the infant is most hungry and then 'tailor' her feeding strategy by adjusting her feeding schedule to be more closely aligned with when, in the day, her infant is hungry. Thus, it seems clearly possible that the mother's capability to effectively 'tailor' her solid food feeding strategies during the transition process is related to her solid food feeding experience(s) and the level of 'expertise' that she gains over time. The concept 'gaining', is a key aspect of the fourth theme because like 'tailoring' it emphasizes that the mother's ability to learn to feed solid foods is a process over time. It also seems possible that the mother's level of feeding 'expertise' (capability) as well as the speed at which the mother 'gains' expertise influenced her 'tailoring' strategies. Both factors, the 'expertise' itself and the speed at which the 'expertise' is gained, may explain some of the variability among the solid food consumption patterns of the infants in this study. As indicated in Figure 14 the theme 'gaining expertise' was labeled as a rapidly changing 'condition' within the solid food feeding context.

#### 4.7.2. Dietary intake patterns






The importance of dietary iron intake for the rapidly growing infant during the second six months of life is well documented. Therefore, the consumption of iron containing solid foods is of particular interest, during the liquid to solid food transition process that usually occurs between 4 – 9 months of age. For that reason, the cereal feeding practices during this period were identified. A legend was developed from the interview data (Table 4) and was used to identify and graphically represent the sources of solid foods that the mothers fed their infants at different ages consistently across the participants. Where possible, the quantity of solid food that was fed and the feeding techniques (i.e. 'offering' single grain cereals or 'offering' cereal mixtures etc.) that were used were described. The 3 arrows in the legend show the age when the mother fed single grain cereals, cereal combinations, or fruits or vegetables. Thirteen items and variations of feeding were identified and are listed in the legend in Table 4.

Six variations pertaining to iron fortified infant cereal feeding were described by the mothers and included in the legend (numbers 1 through 6). The first pattern was labeled as rice cereal, to reflect the exclusive feeding of infant rice cereal (1). The second pattern (2) refers to the feeding of a variety of other single grain cereals. The solid arrow (  ) was used to indicate that a mother appeared to be feeding single grain cereal varieties only at that age. The third pattern (3) reflects a mother's feeding with mixed grain cereals. The fourth pattern (4) represents switching commercial cereal brands, such as from Heinz to Gerber. The fifth pattern (5) refers to the use of commercial cereal premixed with fruits or vegetables. The last cereal feeding pattern (6) represents 'mixing' cereals with fruits and/or vegetables by the mother. The broken arrow (  ), illustrated in the legend was used to indicate that a mother appeared to have changed from feeding the single grain cereal varieties to feeding mixed cereal varieties and food combination mixtures, at the age indicated.

Four variations of feeding fruit and vegetables were identified from the transcripts (numbers 7 through 10); these were single fruits or vegetables, or mixed fruits or vegetables. Subcategories were used to indicate if the fruit or vegetable was pureed (a) or mashed (b).

**Broken arrows** ( — . . ➔ ), in the individual graphs, indicate when a mother appeared to start feeding fruits and vegetables and corresponds, on the graph, with the approximate quantity of food fed at the different ages indicated. The finger food snacks that were fed to infants included regular breakfast cereals, cheese, crackers, toast and fruit, and are identified as ≡f. The dairy food snacks fed to infants included cheese and/or yogurt, and are identified as ≡d.

Two variations of meat feeding, feeding with single meats and/or meats mixed with fruit or vegetables were identified and divided into 6 subcategories: homemade meat (a1), commercially prepared meat (a2), 'trying' to introduce meat (b), 'routine' meat feeding (c), pureed consistency (d) or chunky consistency (e).

<b>The range of solid foods fed to infants between 3 – 9 months of age.</b>	
<b>1 Rice Cereal</b>	
<b>2 Single Grain Cereals (Oat/Barley/Wheat...)</b>	
<b>3 Mixed Grain Cereals (Oat and Barley)</b>	
<b>4 Switching Cereal Brands (Heinz/Mead/Gerber...)</b>	
<b>5 Grain Cereals (with added Fruit or Vegetables)</b>	
<b>6 Cereals (1/2/3/5) Mixed with fruits or vegetables</b>	
<b>7 Single Fruits</b>	
<b>8 Single Vegetables</b>	
<b>9 Mixed Fruits</b>	
<b>10 Mixed Vegetables (a=pureed/b=mashed)</b>	
<b>≡ SNACKS f (Finger Foods; e.g. regular breakfast cereals, cheese pieces, crackers, toast fruit pieces and d (Dairy snacks; e.g. cheese and/or yogurt)</b>	
<b>⊕ Single Meats</b>	
<b>◇ Meats Mixed with Fruit or Vegetables</b>	
<b>(a1 homemade; a2 commercially prepared; b trying to feed meat; c routinely feeding meat; d pureed; e chunky)</b>	

**Table 4.** The legend identifies the variety of solid foods in the transition graphs that the infants were fed at different ages.

Table 4 was used as the framework to identify and describe the feeding and transition process, graphically. The 12 transition graphs (Appendix G) were developed using the list of foods in the legend above. The individual infant's approximate consumption patterns for iron fortified infant cereal were explored in the most detail because of its importance as a source of dietary iron during the transition period. The underlying assumption is that between the age of 3 – 9 months the most common source of dietary iron from solid foods would most probably be from iron fortified infant cereal. Therefore, the transition graphs for the individual infants were sorted into similar/different groups according to the quantity of cereal consumed per day at specific ages. The within case analysis was based on the mother's self-report of her present and past feeding practices with respect to the approximate quantities of infant cereal and other solid foods the infant consumed.

The transition graphs identified the following solid food feeding practices of the individual infants. As would be expected, the age of introduction of iron fortified cereals differed among the infants. All of the infants in this study were introduced to iron fortified infant cereal between 3 – 5 ½ months of age. Most of the mothers started with rice cereal and progressed from rice to other single grain cereals, such as oats and barley. The mothers then progressed to mixed varieties such as mixed grains or grains with added fruits or vegetables. The transition graphs of the individual infants also identified the mother's solid food feeding practices with regards to the 'routine' feeding of iron fortified infant cereals and meats. As the graphs illustrate, the feeding practices differed among the infants with respect to the time it took them to routinely accept cereal. Two mothers took about 2 weeks, or less (graph number 9 and 5), Two mothers took about 1 month (graph number 1 and 6). Three mothers took about 1 1/2 months (graph number 2, 8 and 12). Two mothers took about 2 months (graph number 4 and 10). Interestingly, 1 mother took about 3 months (graph number 7) and 2 infants (graph number 11 and 3) never accepted cereal in any substantial quantity. The time it took each mother to establish 'routine' feeding of cereal appeared to be closely related to the infant's acceptance of the cereal. The available data suggest that the infant's acceptance of solid food appeared to be closely related to, or influenced by, the core theme – *tailoring the transition process*.

The feeding practices also differed among the mothers with respect to the quantity of cereal consumed. At the time of the interview with the mother, most (10/12) of the infants between the age of 7 – < 9 months consumed approximately  $\leq 3$  tablespoons to  $\geq 1$  cup of dry cereal per day. The remaining 2 infants consumed about  $1/3$  cup dry – 1 cup wet cereal per day, at 9 months of age. Within 1 month after introducing cereals, most of the mothers (7/12) introduced either vegetables or fruit, or both to their infants. The remaining 5 mothers introduced vegetables later (between 1 and 4 months after cereal introduction). Single fruits or vegetables were fed to the infants first, and then as the infant got older, some mothers fed mixed varieties. Several mothers intentionally fed alternating colors of fruits or vegetables (e.g. green and orange), as well as a variety of different fruit/vegetables of the same color (i.e. green beans, peas, and spinach) in order to give variety in the diet. As illustrated in the graphs, only 1, 9 month old infant, was fed meat on a 'routine' basis (graph number 5). Seven infants between 7 and 9 months of age were 'trying' meats but their mother had not yet progressed to 'routine' meat feeding. The remaining 4 infants, who were between 7 and 8 months of age, had not been given any meat products. For those who did feed meat, it was usually fed mixed in a combination with a fruit or vegetable (i.e. in a combination of 1:4 meat with vegetables) in order to increase acceptance.

The transition graphs were sorted into 3 groups according to the approximate quantity of cereal the infant consumed. The 3 groups identified reflect low, medium and high cereal consumption levels (Figure 17). A high cereal consumption group (graph numbers 5, 8 and 9) was identified for 3 infants who were 7 ½, 8 ½ and 9 months of age. The mothers reported that their infants consumed approximately  $1/3$  cup (~8 tbsp.) – 1 cup of dry iron fortified infant cereal per day, from 6 months of age to their present age. The transition graphs of the 'high' cereal consumption group of infants suggests that the mother's solid food feeding strategies/techniques over time appeared to promote acceptance of a high quantity of infant cereal. Further, acceptance of infant cereal at a higher quantity continued for a much longer duration than the other 2 groups (medium and low consumption). The transition graphs for this group of infants appears clearly different from the other 2 groups.

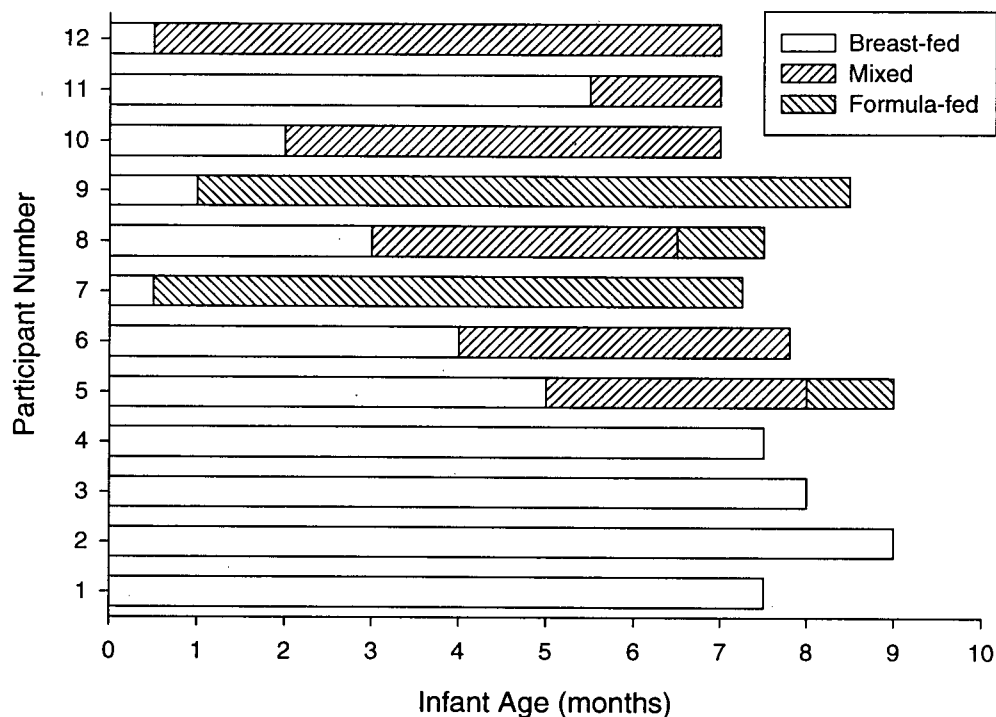
A medium cereal consumption group (graph numbers 1, 2, 4, 6, 7, 10 and 12) was identified for 7 of the infants who were between 7 – 9 months of age and reflects the consumption of about  $\leq 4$  tablespoons of dry cereal per day at 6 months of age. Five of the infants in this group received approximately 1/4 cup (~5 tablespoons) of dry cereal per day between 7 – 8 months of age. Although one infant (graph number 1) consumed about 1/2 cup of dry cereal per day at 7 1/2 months of age, the amount consumed at 6 months was more reflective of the medium consumption group than the high consumption group. The data available for one 9-month-old infant (number 2) was limited between the 6 – 8 month period and therefore the graph indicates a question mark for the quantity of cereal consumed during that time. However, the interview data suggest that the earlier transition process was reflective of a slower acceptance curve, compatible with the medium rather than the high cereal consumption group.

Two mothers in the medium cereal consumption group expressed concern about their infant's weight gain (graph numbers 7 and 12). The cereal consumption pattern in graph 7 indicates that the infant was introduced to solid food before 4 months of age and then not 'routinely' fed cereal until 6 months of age. This infant appeared to have been consuming about 4 tablespoons of dry cereal per day between 6 and 7 months of age. The mother's feeding strategy, shown by the solid arrow, indicates that this mother used only the first of the six cereal feeding variations listed on the legend. This infant was formula fed from 10 days after birth. The cereal consumption pattern in graph 12 indicates that this infant was introduced to solid food at about 4 months of age, yet didn't appear to accept a larger quantity until about 6 months of age. Acceptance appeared to increase when the mother first switched cereal brands at 5 months, and switched to feeding premixed cereals with added fruit or vegetables at 6 months. The infant in graph 12 was breast fed exclusively to 1 month of age and then introduced to 2-4 ounces of formula per day from 1 – 7 months of age.

The acceptance of cereal by infants in the medium consumption group appeared to take longer, in general, than in the high cereal consumption group, that is, the transition graphs for this group of infants reflect the slower pace of infant cereal acceptance. The transition pattern for this group of infants also appears clearly different from the high and low cereal consumption groups.

A low cereal consumption group was identified for 2 (graph numbers 3 and 11) infants who were 7 and 8 months of age. The low cereal consumption pattern reflects the consumption of approximately 3 tablespoons or less, of dry cereal per day, from the age of introduction to the infant's present age. The transition graphs of the 'low' cereal consumption group suggests that these mothers' solid food feeding strategies/techniques over time appeared to not promote acceptance of infant cereal when the cereal was introduced at 4 and 5 months, nor throughout the next 3 months. One mother appeared to use single grain cereals until approximately 6 months and then switched to cereals mixed with fruit or vegetables (i.e. she used 2 of the 6 cereal variations listed in the legend). Neither strategy increased cereal acceptance. However, at 7 months, this infant received 4 variations of the fruits and vegetables that are listed on the legend as numbers 7, 8, 9, and 10. The infant was described as readily accepting of these solid foods. The other mother in this group used single grain cereals, other than rice cereal. The available data are unclear as to whether or not she used other cereal feeding strategies listed in the legend. However, the infant appeared to accept a generous amount of vegetables each day by 5 months of age. Interestingly, both of these mothers appear to be feeding a larger quantity of fruits and/or vegetables than infant cereal per day. The 7 month old infant (graph 3) was exclusively breast-fed until 6 months, and then switched to 'mixed' feeding with low iron formula. The other infant (graph 11) was exclusively breast-fed to 8 months. The available data suggest that these 2 infants may not have accepted adequate quantities of iron containing cereals for an adequate duration.

The mothers' liquid (milk and formula) feeding practices over time were also identified because the milk feeding practices may be closely linked to subsequent solid food feeding practices during the transition process. For example, the frequency and quantity of milk or formula fed to the infant during the day could influence the quantity of solid food that the infant will accept due to satiety. In general, mothers progressed from exclusive breast-feeding to mixed feeding (feeding both human milk and formula), or formula feeding. Three exclusively breast-feeding mothers progressed to exclusively feed infant formula. As would be expected, the liquid feeding patterns varied with regards to duration among the study participants.



**Figure 16.** The type of milk fed to 12 infants from birth.

Since the iron content of infant formulas varies the type of formula used was recorded, where possible. At birth, all of the infants were breast-fed. At the time of the interview, 4 mothers were breast-feeding their infants of 7, 7 ½, 8 and 9 months of age without feeding any formula. Six mothers breast-fed exclusively for a shorter duration, and then switched their infant to mixed breast and formula feeding at <1, 2, 4 or 5 months of age. Of these 6 mothers, 2 then switched to exclusive formula feeding when the infant was 6 ½ and 7 months of age. Two mothers fed formula, starting at 10 days and 1 month after birth. One mother in this study fed low-iron formula between 5 and 7 months after exclusively breast-feeding her infant to 4 months of age. The other formula feeding mother didn't state the iron content of the formula. Of the 12 mothers in this study, 7 were feeding various quantities of iron fortified formula to their infants.

#### 4.8. Questionnaire Results

Five questions were developed in section A of the questionnaire to identify the mothers' liquid feeding practices (Section A). All of the mothers in this study breastfed at birth. At the time of the interview, 5/9 mothers were still breast-feeding. Most mothers stated that they had replaced or supplemented their breast milk feeding with infant formula. Unfortunately, the question could have been interpreted differently by the mothers. Mothers' retrospective responses could have been yes to both supplementation and replacement of breast-feeding with infant formula. Most mothers (8/9) stated that breast-feeding was not supplemented or replaced with cow, goat, or soy-milk. One mother misunderstood cows' milk for infant formula. Of the 5 mothers breast-feeding their infant, 1 mother breast fed once per day, 1 mother 3 times per day, 1 mother 4 times per day, 1 mother 5 times per day, and the last mother breast fed 8 times per day. Of the 7 mothers who reported giving infant formula to their infant, only 1 reported the frequency they fed their infant, which was 4-5 times per day. The mothers reported a range of formula feeding practices from feeding 8-10 ounces of formula once per week to feeding 24 ounces per day.

The data obtained from these 5 questions captured data at one time point. The data that was gathered in the spreadsheet format was more comprehensive than the single response format described above. The spreadsheet was more effective at obtaining greater detail, thus potentially giving a better understanding of the mothers' liquid feeding practices over time.

Three spreadsheets were developed for the questionnaire to identify the types, brands and amounts of liquids, cereals, and other solid foods that mothers fed their infants over time. The intent of the first spreadsheet in the questionnaire was to attempt to capture liquid feeding practices over time and identify how mothers' liquid feeding practices progressed as the infant aged. The data from the spreadsheet format appeared promising because it was quick, easy and provided detail on what type and amount of milk was given at different ages. However, further revisions are needed in order to elicit consistent data (frequency of feeds and the quantity). All of

the mothers reported that they breastfed their infant in the hospital. Only 4 mothers reported the frequency that they breastfed their infant over time. One mother started feeding 11 times per day and then decreased frequency to 7 or 8 times per day at 4 months. At 6 months, the mother breastfed her infant 6 times per day and then decreased frequency to 4 or 5 times per day by 7 months. Two other mothers followed similar patterns of breast-feeding 8 times per day to about 4 months and then decreased frequency to 6 times per day at about 5 months, and 3 times per day at 7 months. In contrast, 1 mother breastfed her infant 8 times per day consistently from 1 to 7 months. The mothers who fed formula did not report the frequency. Four mothers also did not report the quantity of formula they used. For the two mothers who reported the quantity of formula they used, 1 mother fed 1125 milliliters per day from 1 to 6 months and the other fed 750 milliliters per day to 7 months of age. No mother reported using cows' milk (whole, 1%, or skim), soy-milk, or goats milk.

Five mothers reported using iron-fortified formula. Each mother used infant formula at different time points that correspond closely to the mothers' weaning practices. One mother used iron-fortified formula for 1 month when her infant was 6 months of age. Another mother used this formula for 2 months when her infant was 6 and 7 months of age. Two mothers reported using this formula type for 4 months, one when the infant was 5 to 8 months, the other when the infant was 6 to 9 months of age, respectively. The last mother reported using formula for 7 months when her infant was 1 to 7 months of age.

Four mothers reported feeding low iron formula. One mother fed low iron fortified formula for 1 month when the infant was 1 month old. Two mothers fed this formula for 2 months. One when the infant was 3 and 4 months of age and the other when the infant was 2 and 3 months of age. Interestingly, one mother started feeding low iron formula at 8 months after switching from iron fortified formula. Juice was introduced and fed to 1 infant at 4 months, 2 infants at 5 months, 4 infants at 6 months and 3 infants at 7 months of age, respectively.

Twelve questions were developed in section B of the questionnaire to identify mothers' iron fortified infant cereal feeding practices in order to understand better how these practices over time may potentially influence infant iron status. All mothers stated that their infant ate cereal.

When first starting infant cereal many mothers (5/9) used breast milk to prepare the cereal. One third of mothers used formula and only one mother used water to prepare the cereal when they first started to mix liquids with the infant cereal. However, at the time of the interview, 5 mothers were using formula, 3 mothers were using water and a few were using juice or yogurt.

Interestingly, one mother used 4 different cereal preparation methods. Most of the mothers (8/9) stated that their infants ate all the cereal that was prepared. Many mothers (5/9) stated they 'almost always' prepared the same quantity of cereal each time they fed their infants. A few mothers (2/9) stated that they 'sometimes' prepared the same quantity each time they fed their infant. Interestingly, many mothers (5/9) stated that they 'always', 'almost always' or 'sometimes' prepared more cereal if their infant was hungry. Many mothers (7/9) stated that they did not save uneaten cereal. Two thirds of the mothers stated that they 'always' or 'almost always' prepared the baby's food. The person, other than the mother, cited as 'sometimes' feeding the infant was the father, or the nanny or babysitter.

Questions B8 to B11 were developed to identify how closely cereal was fed to other liquid foods such as breast milk in order to identify 'complex food mixtures' that infants were fed. Iron bioavailability is known to differ depending on the type of foods that are combined together. Most of the mothers (5/9) stated that they fed cereals 'always', 'almost always', or 'sometimes' twice per day. Almost half the mothers (4/9) stated that they 'always' or 'almost always' fed cereal once per day. A few mothers (2/9) fed cereal three times per day. All of the mothers stated that they 'always' fed cereal every day of the week. The mothers stated that they fed cereal either at family mealtimes (4/9), mornings only (3/9), evenings only (2/9), between family meals (1/9), or at another time (lunch) (1/9).

Questions 8, 9, and 11 could be combined and asked on a diagram of a 24 hour clock, in order to elicit more accurate data on timing between feeding the various solid and liquid foods. The last question was an open-ended question that asked about what influenced how much cereal the baby eats. The response could have been answered in relation to the mothers' perceptions at the present time, or in general over the last few months. Most of the mothers (5/9) responded that they felt that hunger was a determinant of cereal consumption. Some mothers

responded that infant tiredness (3/9) and family interaction or attention (3/9) was important. Teething (1/9), location of feeding (1/9), and activity level during the day (1/9) were also cited by different mothers as factors important to the amount of cereal their infant consumed. The mothers' timing of cereal feeding (i.e. when the infant is hungry and not tired) as well as the interaction around the mealtime itself appeared to be the key factors cited as important to cereal consumption. These factors were also found to be important from the interview data analysis.

The data obtained from the 12 single response questions in this section captured data, again, mostly at one time point. The spreadsheet format seemed more effective in obtaining greater detail, and thus potentially a better understanding of the mothers' cereal feeding practices (type and brands) over time. The data that were gathered both in the spreadsheet format and the question format, nevertheless, provided important information. However, improvements could be made by using an hourly clock format to obtain data on when in the day infants are fed various foods.

The intent of the second spreadsheet in the questionnaire was to attempt to capture cereal feeding practices over time and identify how practices progressed as the infant aged. Seven mothers responded to the question on what they mixed their cereal with. All of the mothers, who responded to the question (6/6), had mixed cereal with formula. Similar to the single response data, most mothers (5/6) used breastmilk, and half of the mothers used water. One mother used both juice and yogurt. One mother used five different liquids to mix cereal with (breast milk, formula, water, juice, and yogurt). The spreadsheet format captured the different mixing patterns over time. Interestingly, of the 5 mothers who used breast milk to mix cereal with, 2 used it for 1 month each, and 3 used it for 3 months. Most of the mothers (5/7) progressed to mixing cereal with infant formula after having first mixed the cereal with breast milk.

The spreadsheets illustrate the type and brand of cereals the mothers used. Many mothers (5/9) switched between 2 different brands. Some mothers (3/9) switched between 3 brands and only 1 mother used only one brand. In addition, mothers reported using between 1 to 5 different types of cereal. One mother used 1 type, 3 mothers used 2 types, 3 mothers used 3

types, and 1 mother each used 4 and 5 different types of cereals. No mothers interviewed used toddler or other cereals. Many mothers (5/9) used 3 or more types of cereal.

Seven questions were developed in section C of the questionnaire to elicit data on the mothers' cereal purchasing decisions and practices. These questions were included because they may reflect, to some degree, the mothers' cereal feeding practices. All of the mothers stated that they 'usually' purchased the baby cereal. Only one father was cited as purchasing cereals. The mothers stated that they either purchased infant cereal at the grocery store (8/9) or the drug store (7/9). Most of the mothers stated convenience (7/9) and good selection (6/9) as the main reasons for purchasing cereals at the location they did. Almost half of the mothers (4/9) stated that better prices were a factor in the location that they shopped at for infant cereals. Many of the mothers (6/9) said they purchased cereal as part of a routine shopping trip and made specific trips to specific stores to purchase cereals. One third of the mothers said they did not purchase cereal as part of a routine shopping trip nor made specific trips to specific stores to purchase cereals. Interestingly, most of the mothers (7/9) stated that they purchased only 1 box of cereal at a time. Some of the mothers (4/9) purchased several boxes of different types and fewer mothers (2/9) stated that they purchased several boxes of the same type of cereal. Only 1 mother bought a large supply of cereal. There were five main open-ended responses cited by the mothers as important to infant cereal brand and type selection. The responses, in the order of most frequently cited were; brand exposure and packaging information (4/9), what was on sale (3/9), knowledge/advice or baby preferences (2/9 each), and contents (1/9). It is of interest that the 'marketing' (7/9) appeared to have the most influence on the mothers' cereal type and brand selection, compared infant food preferences (2/9) or the content (1/9).

Eight questions were developed in section D of the questionnaire to explore the mothers' perceptions of her infant's acceptance of commercial infant cereals, the infant's diet and appetite and the mother's level of concern about solid food intake. Most of the mothers (7/9) stated that their infant had refused to eat commercial baby cereal. In addition, many mothers stated their infant preferred specific textures (6/9), liked a variety of cereals (5/9), and liked different methods of preparing cereals (7/9). Although two thirds of the mothers stated that their infant ate infant

cereal if they had other choices, one third stated that they did not. Interestingly, many mothers responded that their infant's diet was nutritionally 'very good' to 'excellent' (6/9), that their infant's appetite was also 'very good' to 'excellent' (7/9), yet they also appeared to have concerns about their infant's food intake (6/9). Unfortunately, since these questions were asked at one point in time, it is not clear from the data, at what age cereals were refused, how mothers responded to their infant's refusal of cereal, at what age(s) the mothers had concerns about food intake, or what the food concerns were.

Fifteen questions were developed in section E of the questionnaire to identify what information about feeding solid foods the mother may have used. The questions differentiated between the information that was received versus that which was sought and its perceived usefulness. All of the mothers stated that they both received and sought information themselves on introducing solid foods. In addition, all of the mothers stated that the information that they received influenced their feeding practices and most mothers stated that the information they obtained themselves (7/9) influenced their feeding practices. Of interest, many of the mothers (6/9) stated the information they received and the information they sought themselves (7/9) was not adequate to meet their needs.

Many mothers received information at birth or in hospital (5/9), or at about 3 months post partum (4/9). Most of the mothers (8/9) sought information later between 2 to 6 months, although a few (2/9) did so at birth as well. There were five sites where the mothers received information; the parent infant groups, their doctor, the Hospital, by mail and from friends. The mothers sought information at most of these sites as well, but instead of the Hospital, they sought information at the public health unit, the bookstore, the library, and from formula manufacturers and food packaging. The mothers, in general, appear to have received more information than they sought. Verbal information was received from the public health nurse, doctor, nutritionist, parent infant group, and friends whereas information in print was received by mothers from charts on timing of solid food introduction, handouts on how to make your own food, books and commercial information. Further, the mothers sought information from the public health nurses, the Nutritionist, friends, books and articles. The information that the mothers received and found

most helpful could be described using their own words; "all was useful" and "it's a good introduction". Some mothers mentioned that the time charts were good because they gave the order foods were to be introduced and an age appropriate practical timeline. Other mothers stated that the information was specific and provided some detail, 1 mother stated that the doctors' advice was trusted. Of the information that the mothers sought, they stated that they found other mothers' experiences, ideas, educated judgement and one to one information that was specific and detailed, the most useful. In addition, the comments about what information they would have liked, could be described using the phrase - "more detail". The mothers wanted more detail in the timelines, more detail specific to finger foods and texture, daily meal plans and allergy prevention. One mother stated she would have liked books on nutrition and vitamins.

The format used to elicit responses that could distinguish between information that the mother received versus what she sought attempted to elicit data on the mothers' viewpoint about the available resources. The results of the section E questionnaire data were useful since the data added additional detail that supplemented as well as supported the interview data. Although the questionnaire did not elicit information about the mothers' feelings about being a 'first time mother' (i.e. inexperience) or the importance of 'reassurance' to the mother, concepts discovered from the interview data, they could be easily incorporated into the questionnaire. The information gathered from the questions about what information was received or sought (E1a and E2a) and the location that the mother was given, or had sought, information (E1c and E2c) was answered with similar or the same answers. It may be possible to organize these questions in a table format to help respondents answer, more easily, such questions that are closely related yet slightly different (i.e. what information did you receive versus where did you receive information).

Two questions were developed in section F of the questionnaire to identify solid food feeding practices, other than cereal feeding practices. The questions give an example of the data that would be collected from this format. Although all of the mothers had introduced vegetables to their infant, 1 had not given fruit to her infant. Most of the mothers (7/9) had not introduced egg, and many had not given cheeses (4/9), or yogurt (3/9) at the time of the interview. Interestingly, most mothers stated that they had introduced meats (7/9). The 2 mothers' who had not

introduced meats, indicated that they intended to do so at about 8 months. The results from this format, although highly conducive to quantification, do not provide important detail about the feeding process (i.e. the sporadic feeding of meat over time) that the interview data and/or the data from the spreadsheet format in the questionnaire were able to elicit.

The intent of the third spreadsheet in the questionnaire was to elicit data on the mothers' solid food feeding practices, other than cereal feeding practices, according to the infants' age. All of the mothers fed their infants vegetables and all, except 1, fed their infant fruit at the time of the interview. Of the three mothers who indicated starting fruits and/or vegetables at 4 months, 1 fed about 3 to 4 tablespoons of each per day from 4 to 7 months. One mother fed about 1 tablespoon of each per day working up to 1 small jar of each per day between 7 to 8 months. The other mother fed about 2 teaspoons of fruit only per day working up to  $\frac{1}{2}$  jar of fruit 3 times per week and  $\frac{1}{2}$  jar of vegetables per day at 7 months. Two mothers started fruit or vegetables at 5 months of age. One of these mothers fed about one half a teaspoon but worked up to  $\frac{1}{4}$  cup of each per day by 7 months and  $\frac{1}{3}$  cup of each per day by 8 months of age. The other mother fed about 6 tablespoons of vegetables per day from 4 to 7 months and no fruit. One mother started fruit at 6 months and fed about 1 to 2 teaspoons of fruit per day working up to including 3 ice cube size chunks of homemade vegetables per day 8 months of age. The approximate amounts of fruit and vegetables fed to the individual infants differed substantially at initial introduction, as well as over time. The three spreadsheets were developed for the questionnaire to identify the types, brands and amounts of liquids, cereals, and other solid foods that mothers fed their infants over time. In addition to the interview data, this type of information also aided in identifying the factors within the feeding context that may influence the infant's acceptance or consumption of iron fortified infant cereals.

## Chapter V

### 5.1 Determinants of solid food feeding practices

A mother's solid food feeding practices, which are determined, in part, by the infant's feeding behaviors, her perceptions, knowledge and skills must be appropriate to meet the infant's evolving nutritional requirements during the transition period (4 to 9 months). Previous studies have shown that infants of 9 months of age who are not bottle-fed with iron-fortified formula are at high risk for iron deficiency anemia and low iron stores. It is also known, based on iron needs in the first year of life and the iron content of human milk, that iron from complementary foods is essential to prevent iron deficiency anemia and iron depletion in breast-fed infants of 9 – 12 months of age. The purpose of this study was exploratory, to learn about how mothers feed their infants and what determines the way that they feed solid foods during the transition period. This information is important to develop effective education strategies that will improve complementary solid food feeding practices and hence, the iron intake of infants at risk. This research identified 5 themes that are central to the solid food feeding process, and that occur at 3 main levels – the mother, the infant, and the environment. A 3-dimensional conceptual model of infant solid food feeding has been developed to illustrate these themes (Figure 10). A second conceptual model has been developed using a causal-consequence model (Glaser, 1978) to illustrate the solid food feeding process. The second model (Figure 15) links the relationships between the 5 themes and suggests the potential consequence of the mothers' solid food feeding practices specifically to dietary adequacy (i.e., iron). In this chapter the most important aspects of these findings will be discussed. Further, the study limitations are outlined and the potential application of the findings to future research and practice will be discussed in Chapter VI.

Solid food feeding is complex and involves interactions at many levels. When viewed simplistically, if nutrient needs are to be met then 1) the mother must prepare and offer food of the required nutritional quality, and 2) the infant must eat it. The results of this study clearly show that all mothers started solid food feeding and all the mothers had the knowledge to introduce iron-fortified infant cereal at 4 – 6 months. Thus, lack of knowledge of when to introduce iron-fortified solid foods is not likely

to be the problem that causes a high incidence of iron depletion in breast-fed infants. Previous studies have reported that infants had been introduced to solid foods prior to 4 months of age (Tanaka et al., 1987, Yeung et al., 1981, Greene-Finestone et al., 1989, Clark et al., 1981, Williams et al., 1996). There has been a trend towards a later (more appropriate) age of introduction of solid foods over the past 20 years. Williams et al. (1996) found that only 7.8% of the infants in Vancouver had been given iron-fortified infant cereals before 4 months of age. In contrast, earlier work by Tanaka et al. (1984-85) and Greene-Finestone et al. (1989) found that 42% and 34% of infants, respectively, had been introduced to solids by 3 months of age. Previous to this, studies in the 1970's found that 70 – 78% of infants had been introduced to solids prior to 4 months of age (Clark et al, 1981).

The transcripts from the face – to – face interviews with mothers in this study provide ample evidence of knowledge regarding the recommended ages for solid food introduction, with extensive discussion around the perceived infant's solid food likes and dislikes. The findings of this study suggest more difficulties revolved around the infant eating the iron containing food, than the mother not knowing what food to offer. This can be simplistically divided into how the mother prepares and presents the food, when in the day she offers the food, how she manages the feeding environment (i.e., the feeding dynamic), how she interprets the infant's food cues, and the infant's acceptance of the food.

The mothers who participated in this study took from 2 weeks to over 3 months from the time of initial solid food 'introduction' attempts to achieve (start) routine feeding of iron-fortified infant cereals. This may be due to infant factors (i.e., flexible/inflexible personality, 'good'/'fussy' eater) or mother factors (i.e., feeding strategies). The transcript data clearly show that there was difficulty with cereal acceptance (quantity and rate of acceptance) for some infants. The mothers described this period as 'sporadic' cereal feeding. Review of the published literature on infant feeding indicates that there is a lack of data on the time over which mothers achieve appropriate solid food intakes. Thus, the concepts – sporadic and routine cereal feeding, add to the current body of literature. Large quantitative population studies investigating the growth and/or nutrient status of young infants (Walter et al., 1993; Dewey et al., 1998; Innis et al., 1997; Calvo et al., 1990; Pizarro et al., 1991; Heinig et al., 1993) have used the 'age of introduction of solid foods' as a variable for identifying factors that influence infant iron status or growth. Pizarro et al., (1991), Walter et al., (1993) and others (Siimmes et al., 1984) have shown an increased risk of iron deficiency anemia in infants after about 6 months of age if additional complementary sources

of iron are not provided. However, the findings of this study show that it is important to identify not just the age of first introduction, but also if and for how long the infant has been fed cereals 'routinely' or 'sporadically'. It is suggested that future investigations of dietary iron adequacy should include the quantities of iron-fortified cereal consumed over time.

The transcripts from this study show that the reasons mothers' gave for starting solid food (advice, perceptions of readiness for solids, wanting the infant to sleep during the night) were different from the reasons that they gave for making decisions over what solid foods to feed (selection). The mothers' perceptions of the infants' food behaviors appeared to strongly influence subsequent solid food feeding practices and how mothers' progressed in their feeding behavior (starting the feeding process and offering solid food). The transcripts suggest that the mothers observed their infant's cues and interpreted them as 'yes' (the infant is ready, prefers a specific food, wants food or is hungry) or as 'no' (the infant is not ready, does not like a specific food, does not want food or is not hungry). Comments on food refusal were common and might have been interpreted by the mother correctly or incorrectly as the infant not being 'ready' for solid foods or disliking the food. It seems likely, based on the transcripts that some mothers may have misinterpreted the infants' food refusal cues as the infant not being 'ready' for solids, and this interpretation impacted the rate at which solid foods were fed to these infants.

This study found that the acceptance or rejection of solid foods was the major determinant of mothers' food selection and feeding choices throughout the transition process. The infant's response is, therefore, an important variable in the mother's solid food feeding practices, and as a result it is illustrated as a crucial component of the feeding process in both the 3-dimensional and the causal-consequence models (Figures 10 and 15). The mothers perceived that their infant's food taste and texture preferences influenced acceptance of the solid food that was offered, and they could also link their observations of infant behavior to their current or past solid food feeding strategies. The findings of this study also suggest that infant food acceptance or rejection directly affected the adequacy of iron-fortified cereal consumption. Infant feeding guidelines published for mothers in the "BABY'S FIRST FOODS" information sheet (B.C. Ministry of health, 1996) recommend feeding solids 1-2 times per day, starting with 1 teaspoon of iron-fortified cereal and increasing to 4 tablespoons per day from 4 to 6 months of age. From 6 to 9 months, mothers are instructed to feed their infant solid foods 3 – 4 times per day and more specifically, to feed 4 to 8 tablespoons of infant cereal daily as well as introducing other iron containing

foods such as meat, fish, and poultry. The results of this study show that there are several critical issues with regards to the practical application of current infant feeding recommendations by mothers. First, the most frequent solid food rejected by the infants was iron-fortified cereal. Further, all of the mothers in this study used a 'mixing' strategy to increase or maintain food acceptance (mixing to alter taste/texture) or get solid food eaten (mixing disliked foods with preferred foods). Third, the number of mothers among these more highly educated and motivated study participants who achieved the recommended feeding of 4 tablespoons of cereal per day by 6 months of age was low (4/12). Lastly, it took 3 months for many of the mothers (6/12) to reach routine feedings of  $\frac{1}{4}$  cup of cereal per day from the reported initial age of cereal introduction. Clearly, it is reasonable to conclude that the intake of iron from iron-fortified infant cereal differed among the infants in this study.

This study found that the mothers used numerous and diverse infant feeding strategies. The transcript data suggest that the infant's dietary intake may have differed depending on the strategy that the mother used. The solid food feeding strategies used by the mothers are represented by the theme – ways of feeding. No literature on infant feeding that we know of has described solid food feeding strategies. This finding adds to the body of knowledge on infant feeding and increases the understanding of the link between the feeding behaviors, infant food acceptance, and the success of the solid food feeding process with regards to nutritional adequacy.

The range of infant feeding strategies identified by this research can be simplistically described as strategies that possibly promote (positive), are ineffective (neutral), or could be considered as discouraging (negative) solid food acceptance. The mothers discussed in detail how they prepared and fed their infant solid foods. The mothers used several feeding strategies that appeared to be in response to infant food preferences; these strategies appeared to be responses (changes) in the mother's feeding behavior to decrease the infant's rejection of the food. These strategies included switching (types of food and/or brands of cereals), mixing (to alter taste or textures of cereals and other solid foods), sneaking or camouflaging food (mixing preferred foods with disliked foods to get the food eaten) and possibly *holding back* specific accepted foods in order to achieve acceptance of a disliked food. The mothers also appeared to be changing 'when in the day' they offered the food, labeled as *adjusting* feeding management, to improve food acceptance. These strategies of changing when the infant was fed included adjusting the frequency of feeds,

the order in which foods were fed, adjusting feeding routines and possibly *holding back* liquids (e.g., breast-feeding) to increase hunger.

The transcripts for this study also give evidence that how the mother interpreted her infant's food cues may have determined the feeding strategies that were used. The strategies that may have been used in response to the mother's interpretation of infant readiness for food were *offering* the same foods repeatedly whether the infant liked or disliked the food, *waiting* for the infant to become interested, and withholding food because of perceived allergy risk, choking risk, and texture difficulties (immaturity/unready). Further, the strategy *positioning* the infant horizontally (e.g. lying on back) to promote swallowing may reflect a strategy to deal with the infant's developmental readiness (e.g., infant was not ready). The feeding strategies that seemed most likely to have had a negative effect on the feeding dynamic/relationship were *prying/stuffing/ forcing* the infant to eat, *positioning* (restraining infant in car seat), *sneaking/camouflaging* or *hiding* (disliked foods mixed with liked foods) and *distracting* (using toys to alter dynamics to get food eaten). While possibly positive strategies may have included *socializing* (family meals), *modeling or mimicking* how to eat, *engaging* (giving the infant some degree of control in feeding by allowing them to hold the spoon, and *playing* (food play – exploring).

The classification of solid food feeding strategies in this study suggests patterns of how solid foods were fed to the infants by the different mothers in this study. Commercial infant cereal is fortified with iron and is the only appreciable source of complementary food iron fed to most infants under 7 – 9 months of age. Sullivan and Birch (1994) investigated repeated exposure of the same or similar foods on vegetable acceptance and found that all the infants (n=36) in their study increased their vegetable intake after repeated exposure. Since breast-fed infants had a greater vegetable intake than formula fed infants, the authors suggested that breast-feeding might facilitate solid food acceptance. Birch et al. (1998) found that the number of feedings needed to increase the intake of a similar compared to a novel food differed. Infants of 4 – 7 months accepted similar foods easily after exposure, whereas they did not accept different foods (e.g., vegetable compared to fruit) easily. Further, Mennella and Beauchamp (1997) reported that both cereal acceptance and the quantity of cereal consumed by breast-fed infants was influenced by the preparation method. The infants clearly preferred cereal prepared with a liquid that they liked (mother's milk compared to water), consumed it at a faster rate, and preferred the mixture made with the mothers milk when it was offered to them a ½ hour later. The transcripts from this study show that all

of the mothers used a cereal 'mixing' strategy to increase solid food acceptance. This suggests that the mothers modified how they prepared their infant's food to achieve acceptance and/or to comply with infant food preferences. Thus, it seems likely, that in the natural feeding context infant food acceptance and preferences are closely intertwined with the mother's feeding strategy (how the food is prepared).

The mothers in this study described 3 'mixing' methods, which can all be described as "preparation of a complex meal". The 3 methods were commercially pre-mixed cereal combinations (e.g. cereal with fruit), homemade mixtures using a combination of commercial infant cereal with fruit, vegetables, or yogurt, or feeding other solid foods at the same time as cereal but 'on the side'. Although the mothers used different preparation strategies to alter the food taste and/or texture and thus increase acceptance, these 3 mixing methods might influence cereal acceptance and hence consumption differently. Further, 'mixing' as a strategy to gain acceptance raises the question of potential differences in iron absorption secondary to the type of food combined with the cereal. The form of iron in infant cereal is non-heme iron, which has a wide range of absorption of 5 – 20%, depending on factors enhancing or inhibiting iron absorption in the diet (Hallberg, 1989), and the iron status of the individual. The major factors enhancing the absorption of non-heme iron include ascorbic acid, meat and fish, and organic acids (citric, lactic, malic, and tartaric acids). The major factors that inhibit non-heme iron absorption include; phytates (found in high fiber cereals), iron-binding polyphenols found in tea and coffee, vegetables and fruits, some proteins (egg albumin, and legume protein), and some inorganic elements (calcium) (Fairweather-Tait, 1989). Thus, depending on the food combination, iron absorption from cereal or breast milk may be enhanced or inhibited. For example, in the context of mixed food combinations, the phytates in the cereal may influence human milk iron absorption if cereals are fed in close proximity to breast-feeding. Another example is the polyphenols in vegetables and fruits or the calcium in yogurt that may decrease the absorption of iron from infant cereal. Recently, Engelmann et al., (1988) found that non-heme iron absorption by infants was increased to 15% from 9.9% when meat was added to a vegetable mixture. This suggests that iron absorption from infant diets of low or intermediate iron bioavailability could be improved by changes in the preparation method to increase the bioavailability of the iron present.

The transcript results from this study also show that the progression of the feeding process reflected a mother's 'learning' on how to feed her infant. The results suggest that the mother's knowledge, skills and feeding capability were important determinants of the ability to modify feeding strategies in response to perceived infant food cues. For several mothers, the 'initial' feeding behaviors appeared to be 'force' feeding, despite physical signs from the infant that they did not want food. The feeding strategies prying/stuffing/forcing, distracting, sneaking or camouflaging food, and pushing or holding back food might cause difficulties in feeding and possibly reflect gaps in the mother's knowledge, skills and thus capability. Satter (1990) noted that effective feeding includes behaviors that are supportive and promote positive feeding dynamics. The food refusal discussed by some mothers in this study could be explained by several factors such as inappropriate timing, inappropriate expectations about the quantity of food an infant should eat, misinterpreted food preferences cues, and limited opportunities for the infant to explore the food offered. The infant cues described, such as spitting food out or retching could indicate a lack of infant developmental readiness (gag and swallow reflex not fully mature), or alternately an inappropriate feeding method (i.e., pushing the spoon too far back in the infant's mouth). "Turning down food, spitting it out, not opening mouth, turning head" etc., are behaviors that could also indicate an infant's preference for sweet rather than bitter flavors (Mennella and Beauchamp, 1998). Thus, the interpretation of food refusal involves both the mother's interpretation of the various food cues, the mother's feeding skill and knowledge of infant development and behavior, as well as the feeding relationship. The outcome in the progression of feeding is dependent on how the mother adapts and what she learns from the infant's response to her actions. Infant feeding guidelines (CPS, 1998; B.C. Ministry of Health, 1996) have not addressed issues of infant food acceptance and refusal, or the complex aspect of 'how' to feed infants solid foods. The findings of this research show that mothers recognize concepts from the infant feeding guidelines such as general readiness, food preferences, hunger or satiety cues, and they know when to introduce first foods (cereals). However, in the case of food refusal, it seems likely that mothers may not have the knowledge or skills to respond appropriately.

Five themes were identified as critical to solid food feeding during the transition period and were defined as *the feeding process*, *perceiving infant food needs*, *ways of feeding*, *gaining expertise* and *tailoring the transition process*. These themes are interconnected. Within the context of the infant feeding

process, many factors influence 'how' a mother feeds her infant. The key factors that determine infant solid food feeding, besides infant food acceptance, are the mother's perceptions, feeding strategies and her expertise. This study identified a core theme – *tailoring the transition process* that connects the other 4 themes together and best describes the mother's major feeding task during the transition period. Two models were developed to describe the process through which the mother is *tailoring* her feeding strategies. The concept 'tailoring' is central to understanding the infant's dietary progression (acceptance of an increasing amount and range of semi-solid foods) from the exclusively liquid diet to a modified adult diet, and understanding dietary iron adequacy. To emphasize this, the core theme can be further described along a dimension of 'tailoring' or not 'tailoring' the transition process. The interview transcripts clearly show that some of the mothers in this study readily adapted and used multiple strategies and were thus tailoring their feeding practices. Others, however, used a limited number of strategies. The feeding strategies differed in their effectiveness. Repeated food 'offering' and 'waiting' for the infant to become interested can be considered as 'static' or not 'tailored' in that they appeared to not promote solid food acceptance (i.e., cereal) or the pace of food transition as successfully as other strategies. The food 'switching' and 'mixing' strategies can be considered to be more 'dynamic' in that the mother 'tailored' her feeding strategy according to the infant's response to the food that was offered. The switching and mixing strategies appeared to be more successful in promoting the acceptance of solid food and the transition pace. The mothers who were 'tailoring' their solid food feeding strategies appeared to be deliberately searching for 'ways' to increase food acceptance.

Although this study found that '*tailoring the transition process*' was the core theme, the mother's infant feeding knowledge, skills and capability are also central to understanding the infant's dietary progression. The mother's personal growth was labeled 'gaining expertise'. The experience of being a 'first time' mother and needing infant solid food feeding information and support (including 'reassurance') was described in detail in the transcripts. Green and Kreuter (1991) state that learning involves three processes: direct experience, indirect or vicarious experience from the observation of others (modeling), and understanding complex information to enable the anticipation of consequences of one's own actions and capabilities. Green and Kreuter (1991) also noted that the last process is central to the individual's sense of confidence in new situations or circumstances. Further, these authors state that the perception of 'self-efficacy' or capacity for success based on experience influences emotional reactions with regards

to anxiety and coping ability (Green and Kreuter, 1991). The mothers in this study described their experiences moving along a 'learning curve' with the relatively new 'circumstance' of solid food feeding. The mothers expressed various levels of frustration with unsuccessful initial attempts at solid food feeding, or when the feeding situation did not go as they had expected. Although most mothers identified and used numerous resources for information on infant feeding, they clearly articulated gaps in the resources available for their situation and information needs. The resources that were used included the professional sector (health nurses, nutritionists, doctors, community groups, parent groups and the nutrition hotline), professional guidelines and charts, the popular press, pamphlets prepared by baby food companies for products and for food packaging, and the mother's social network (family, friends and mothers' groups). This study found that mothers had the most difficulty with learning 'how' to feed their infant solid foods, not when or what food to start with.

The transcripts clearly identify that the experience of being a 'first time mom' produced feelings of uncertainty in many mothers, and this may have influenced feeding confidence. Some mothers stated that they even felt scared about feeding their infant. It is possible that mothers who did not have knowledge or experiences of 'how' to feed their infant solid food and who had feeding challenges, such as food rejection or concerns about slow infant weight gain, were expressing feelings that involved perceptions of self-efficacy and their capabilities. Some mothers described having to go with their '*own gut feeling*' and what they thought was right or '*best for their baby*' with regards to feeding solid foods. These mothers also described learning to feed their infant as a 'trial and error' process. This suggests that in learning to feed their infant, mothers might progress through a 'reflective' learning process that might benefit from peer or professional support that would reinforce positive solid food feeding practices or alternately, redirect negative practices. Since learning takes place through direct experience, as well as by observing others (Green and Kreuter, 1991) it makes sense that the mothers in this study found that 'experienced' mothers were most helpful and that they felt reassured through interaction with other mothers at the community group settings. Infant feeding guidelines (CPS, 1998; B.C. Ministry of Health, 1996) address 'when' to start feeding solid foods and 'what first foods' should be fed (i.e., iron-fortified infant cereal). The findings from this study clearly suggest that mothers may need additional resources that focus explicitly on issues around promoting infant food acceptance and decreasing food refusal – the complex aspect of 'how' to feed infants solid foods, and issues around being a 'first time' mother moving

through a 'reflective' learning process. This approach, which focuses on factors that are related to the mother, the infant and the environment (i.e., resources) would prepare the mother better for the task of 'tailoring the transition process'.

## 5.2 The conceptual models of infant solid food feeding

The 3-dimensional conceptual model (Figure 10) and the causal-consequence model of infant solid food feeding (Figure 15) were developed to illustrate the determinants of the solid food feeding practices during the transition period of the mothers in this study using the themes discovered in the interview data. A conceptual model in qualitative exploratory research is important for integrating findings. Through integration of concepts and categories, the analysis progresses from being solely descriptive to being conceptual and theoretical, which is the purpose of the grounded theory method (Glaser and Strauss, 1967; Glaser, 1978; Strauss and Corbin, 1990). Conceptual models facilitate the discovery of relationships among concepts and categories identified from within the context and are developed from the analysis process itself. Consequently, the solid food feeding models developed in this study are 'grounded' both conceptually to the interview data and developed from the data.

These conceptual models add to present knowledge because they illustrate the complex interaction between the mother, infant, food and the factors in the solid food feeding context that determined solid food feeding practices. Thus, the models provide a framework of the infant behaviors, the mothers' practices, and the determinants within the mothers' 'proximal' environments that influence the ability to feed the recommended amounts of complementary solid foods during the transition period. The framework that provides structure to the models is derived from the causal-consequence model (Glaser, 1978). Thus, the feeding process can be described according to the context, conditions (general, causal and intervening), the core category and the consequences (Strauss and Corbin, 1990). Inappropriate 'tailoring' is illustrated as a consequence that impacts on solid food acceptance and consumption patterns (iron-fortified infant cereal) at specific ages.

The consequences of inadequate dietary iron intake have been studied extensively through research identifying the prevalence of iron deficiency anemia and iron deficiency in infants. Less

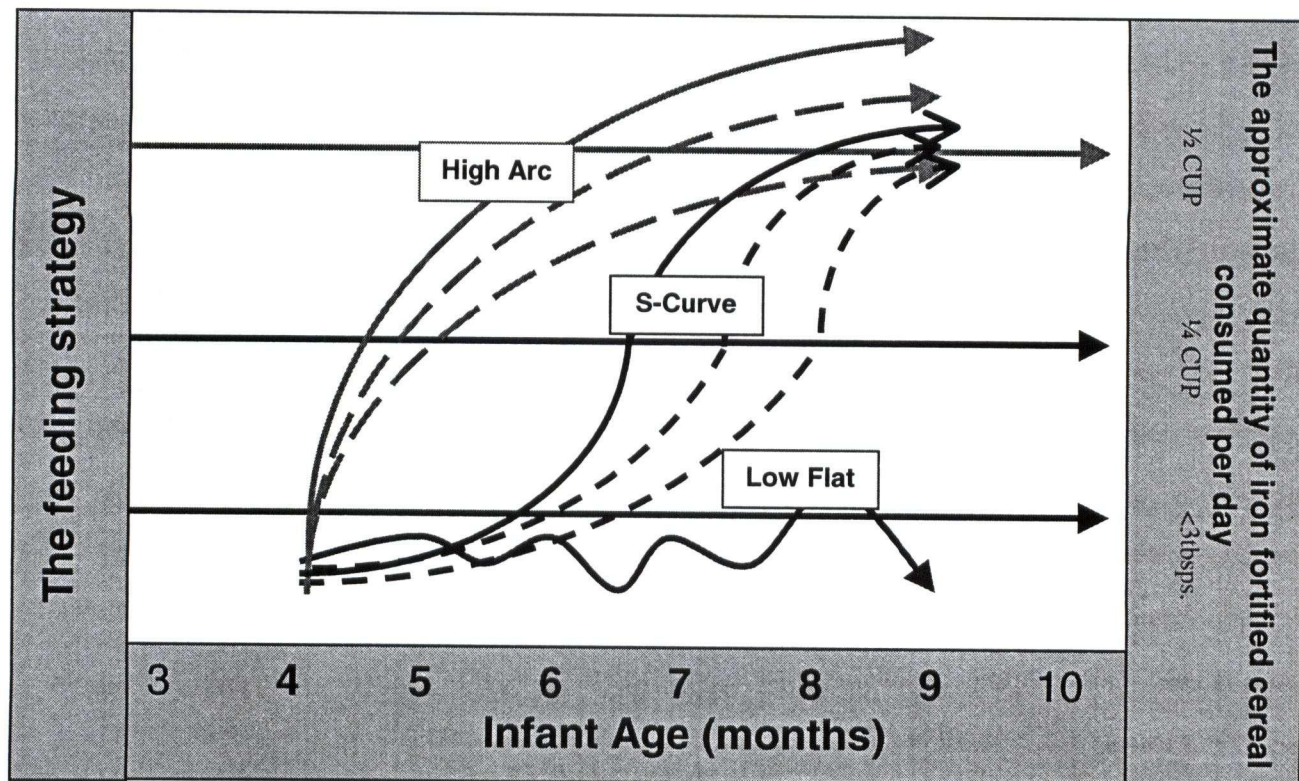
research has focused on determinants of solid food feeding practices. Two conceptual models related to infant feeding that provide a framework on the determinants of infant feeding behaviors (Lutter CK, 2000), and conceptualizing nutrition problems and causes of child undernutrition (ACC/SCN, 2000) have recently been published. Similar to the findings of this study, the underlying causes of infant feeding behaviors and inadequate dietary intake described in these models are maternal choices and caring practices. At a more distant level, these models identify the 'intermediate determinants' to maternal choices – information (inadequate or inappropriate), attitudes (discriminatory), support (physical and social) and human resources (quantity and quality). The purpose of these models was to identify and better understand what causes nutrition problems and what options are modifiable. As found in this research, conditions within the solid food feeding context (i.e., information, support) impact on mother's feeding behaviors, and these need to be fully understood in order to develop effective education interventions that enable mothers to feed their infants effectively to prevent iron deficiency anemia and iron depletion.

### **5.3 The causal-consequence model of infant solid food feeding**

The causal-consequence model of infant solid food feeding (adapted from Glaser, 1978) links the plausible relationships between the 5 themes identified in this research to dietary adequacy. The solid food feeding process in Figure 15 illustrates how the various conditions within the feeding context influence the mother's 'tailoring' practices and how these practices could influence solid food acceptance and consumption patterns (i.e., iron fortified cereal) and thus dietary adequacy. Only a few (3/12) of the mothers in this study achieved the recommended feeding of 4 tablespoons of cereal per day by 6 months of age, despite the high education level of the study participants. For half of the mothers (6/12), the interview data suggested that it took 3 months before they achieved routine feeding of ¼ cup of cereal per day. Cereal consumption had not increased above 3 tablespoons of dry cereal per day in 2 infants by 7 months of age. This suggests that mothers might benefit from a better understanding of 'how' to feed cereals during the transition period. Walter et al (1993) found that the liquid feeding practices influenced cereal consumption. Infants fed formula consumed almost 30g of cereal per day within 3 weeks of introduction, whereas it took the breast-fed infants 2 – 3 ½ months to reach intakes of 20 –

25gm of cereal per day. This suggests that mothers who breast-feed might have more difficulty with the transition process than mothers who feed formula. Walter et al (1993) also showed that the consumption of iron-fortified cereal significantly influenced the iron status of both breast-fed infants and infants fed low iron formula. These authors reported the '*cumulative*' percentage of infants excluded from this study based on hemoglobin concentrations below 105 g/L. As would be expected, the group of infants fed iron-fortified formula had the lowest percent of infants excluded. Breast-fed infants who were fed iron-fortified cereal were clearly at an advantage with 11% IDA at 8 and 15 months, compared to similar infants not fed a fortified product, with 15% and 27% IDA at both 8 and 15 months, respectively. The study by Innis et al, in 1993 in Vancouver similarly found about 15% IDA among 9 month old breast-fed infants. A slow rate of increase in cereal consumption to target levels may be an important determinant of iron status, and this may be explained, in part, by 'how' the mother is 'tailoring' her feeding strategies and thus achieving acceptance.

Figure 17 was developed to illustrate variations among the infants' iron-fortified cereal consumption patterns between 4 to 9 months of age. Standardized tools (e.g., 3-day food records) were not used to collect the dietary data since the focus of the research was exploratory (i.e., the research questions identified how the mothers fed their infants over time and why they made the choices that they did). Less emphasis was placed on quantifying the foods that were fed to infants. However, detailed data on dietary intake were collected from the face – to – face interviews and this data is illustrated in a graphic format to provide information on dietary intake patterns overtime. These consumption patterns were labeled as '*high arc*' curve, '*S-curve*', or a '*low flat*' curve (Figure 17). Approximate quantities of iron-fortified cereal mothers' fed to their infants' was extrapolated from the mothers' retrospective descriptions and questionnaire responses. The figure aids in identifying, theoretically, how different patterns of iron-fortified cereal intake might contribute to dietary iron adequacy from cereals. Clearly, more systematic recordings of quantities of cereals and other solid foods fed to infants from 4 – 9 months are needed to identify if, or to what degree these 3 consumption patterns reflect patterns that identify an infant's risk for dietary iron inadequacy.



**Figure 17.** The plausible variations in infants' iron-fortified cereal consumption patterns from 4 to 9 months of age. The approximate quantity of iron-fortified cereal mothers' fed to their infants' was extrapolated from the mothers' retrospective descriptions of food intake and questionnaire responses. The 3 patterns are based on in-depth interviews with a sample of 12 mothers. The figure aids in describing, theoretically, how cereal consumption patterns such as the 'low flat curve' or the first part of the 'S-curve' could influence dietary iron inadequacy in comparison to the 'high arc curve' consumption pattern.

In addition to the infant's personal characteristics (i.e., temperament), factors related to the mother appear to determine food acceptance to some degree. This study found variability in the number and types of feeding strategies used by mothers. The available data suggest that the mothers' solid food feeding behaviors might influence dietary iron adequacy in 3 ways, as suggested by the 3 curves illustrated in Figure 17. The infant solid food feeding strategies identified in this study that might have determined the *high arc curve* include appropriate mixing strategies that focus on the infant's food taste and texture preferences and switching brands and types of cereal to identify the ones the infant liked. Other strategies include adjusting the feeding management or adjusting feeding routines so that solid foods are fed during the day when the infant is most likely to be hungry, feeding the infant during family meal times and socializing around food in order to promote positive feeding dynamics. These strategies fit the *S-curve* pattern as well, but the mother may have taken longer to learn 'how' and 'what' to feed her infant. For example, infant food preference cues may have been misinterpreted (delaying the introduction of cereals) or learning how to manage daily feeding routines may have taken longer. In addition, if the mother used mixing strategies that the infant disliked, progress on getting the infant to accept what was offered may have been delayed. The last curve, the *low flat curve*, suggests that the infant had not accepted the cereals that were offered. The mothers in this case might have repeatedly offered the same cereal that the infant disliked, rather than switching to another type or brand, or mixing with other foods to alter the taste or texture according to the infants' preferences. The strategies that did not promote iron-fortified infant cereal consumption included repeatedly offering disliked food and waiting for cereal acceptance without tailoring the feeding strategy to meet the infants' food preferences. Other strategies that did not promote cereal acceptance included switching to fruits, vegetables and snack foods that the infant then accepted, or using strategies that might cause negative feeding dynamics (distracting, sneaking or camouflaging foods, stuffing or forcing food into the mouth).

In summary, behavioral focused education interventions that are developed with an emphasis on the types of strategies that promote iron-fortified cereal acceptance quickly are lacking. Interventions that focus on modifying mothers solid food feeding practices would improve infant dietary iron intake which is clearly important to the prevention of iron deficiency anemia and iron depletion. Further,

an interventions that focuses on 'how' to feed an infant could have additional benefits to the mother such as providing an increased sense of self-efficacy and confidence feeding solid foods during a complex transition process.

#### **5.4. Study limitations**

Transferability is the term used, instead of external validity, in qualitative research, to describe the degree to which the research findings can be applied in other settings or other groups of people. To maximize transferability of results, researchers state how, under what conditions, and from whom data were collected, thus allowing the reader to assess the degree to which the findings might apply to other contexts or age groups (Lincoln Y.S. and Guba E.G. 1986). 'Thick', detailed descriptions of the interview data and the participant characteristics have been provided throughout the thesis document. This allows the reader to judge the transferability of the present study findings to other situations or populations. This study used a qualitative research approach to carefully study a small number of participants. The sample is not representative of other populations (e.g. with different ethnic backgrounds, socio-economic status, or lifestyles) since the sample was small and was not selected randomly.

The sample was selected from 3 locations in Vancouver, rather than a single site, to facilitate participation of mothers from different locations. However, the mothers were relatively homogeneous, they were all of Caucasian background, were all highly educated and most were first time mothers. The study findings therefore, are limited to the perspectives of these participants and are difficult to compare to other groups of mothers. Most of the participants were introduced to the research student through a public health nurse. The nurse may have selected mothers because of her previous experience with the mother's infant feeding practices and concerns. In this way, mothers may have been selected who had more or fewer difficulties feeding solid foods to their infants.

The primary method of data collection was in – depth interviews. The research student had prior training in interviewing techniques and understood the importance of 'listening' to the mothers' stories, not directing them. In this way, through experience and awareness, the potential of 'leading' participant responses was decreased. The interviews also followed a semi – structured interview guide. The interviews started with broad, open-ended questions that focused the interview onto the general topic.

This allowed the participants to describe or identify infant solid food feeding issues that were important to them. However, the general topic focused on infant solid food feeding and thus this emphasis was evident from the data in the transcripts on food, feeding, and nutrition and less emphasis on environmental issues that may impact mothers' feeding choices. Thus, regardless of the procedures in place to decrease leading responses, the research focus itself and the graduate student's nutrition background potentially biased the transcript data towards these issues. Further, the graduate student has young children and thus has extensive expertise in infant feeding from feeding her own infants. These personal experiences aided in establishing rapport with the participants quickly as well as aided data interpretation. However, personal biases from the researcher's preconceived 'ideas' about 'feeding' may have influenced the data interpretations (i.e., difficulties with cereal acceptance).

It is important to acknowledge personal values and assumptions that might bias interpretations but also bring a unique view to the data collection and analysis. Personal experiences feeding children solid foods and breast-feeding beyond 9 months of age enhanced the researcher's awareness, knowledge and sensitivity to many of the challenges, decisions and issues encountered by the mothers in this study during the transition process. However, due to these previous experiences certain biases may have influenced data interpretation. Personal biases such as the researcher's values that are centered around the importance of nutrition to infant health and achievement and the critical role of the mother or primary caregiver in the infant feeding process may have shape the way that the data were viewed and understood. The researcher acknowledges that women's experiences and their 'voice' represents 'expert' knowledge of the intricacies of day to day tacit knowledge and hence assumed that the solid food feeding process during the transition period would be complex. Thus, qualitative research methods were chosen to study this complexity. The researcher assumed that the feeding practices among mothers would differ because feeding practices would be closely linked to each mother's unique personal and environmental context. The researcher's role as the primary data collection and analysis instrument is thus, to understand how these experiences might bias the data interpretations.

The credibility of the research interpretations was enhanced through the following procedures. A reflexive journal was kept throughout the study that included a detailed dialogue about the meanings of the data that were being analyzed. In – depth interviews were completed with 12 mothers. The in – depth

interviews, the analysis procedures and prolonged, intensive contact with the field of study facilitated the development of the conceptual density of the findings of this study. A potential limitation of the study was that the findings are dependent on the participants discussing their actual beliefs and practices and not what they may perceive that the researcher wants to hear. The participants in this study may have chosen, or not, to include details on the difficulties they encountered, practices or behaviors that may be considered inappropriate or their personal feelings (i.e., negative) about health professionals' practices. However, the mothers seemed very comfortable sharing their experiences feeding their infants and openly reflected on the practices that did not work as well as others that did. The participants appeared to be comfortable with the research student, and this may have been due to the fact that they all knew that the research student had children and were interested in her feeding experiences as well. Although the mothers freely discussed how they fed their infants, they appeared less open about their feelings about the role of the 'experts' (i.e., health care professionals), in the context of the solid food feeding process. This was possibly due to their perceptions about the confidentiality of the data.

A detailed description of how the analysis evolved, with the coding procedures, gives insight into the quality (dependability) of data management organization and analysis procedures. A series of documentation procedures were followed (LC, IISS, MS<sub>a/b</sub>, CCSS and integrative displays) to aid in the data organization, the analysis procedures and the data interpretations. The systematic data collection, transcription and analysis procedures used in this study add to the quality of analysis achieved (i.e. within and across case analysis) (Rodgers and Cowles, 1993). The interpretive analysis process was iterative in that it involved the writing of summaries and then returning to the original data source to verify the evolving concepts, categories and themes within the original context. However, this is the research student's first major research project and thus the data management and data analysis may reflect this lack of experience. This is a limitation since, in qualitative research, the data analysis tool is the researcher. Strauss and Corbin (1990) state that "theoretical sensitivity refers to the attribute of having insight, the ability to give meaning to data, the capacity to understand, and capability to separate the pertinent from that which isn't. It is theoretical sensitivity that allows one to develop a theory that is grounded, conceptually dense, and well integrated". These authors suggest 4 sources that promote 'theoretical sensitivity'; the literature, professional experience, personal experience and the ability to balance between creativity and science. The interpretation of the data is also limited by the

graduate student's breadth of knowledge in the field of qualitative data analysis methods and perspectives. The data interpretations would be different if a feminist perspective was used in the approach to data analysis. Alternately, a discourse analysis would have identified different, yet important, themes within the transcripts. This study used grounded theory data analysis procedures in order to identify 'process' within the data; however, it is acknowledged that other perspectives may have been valuable for understanding factors that determine mother's solid food feeding choices.

A further limitation of this study was that the participants were not given the opportunity to provide feedback on the data interpretations. Future research needs to address this issue. The interpretations of the transcript data were, therefore, not verified with the participants. Further, the interview data collection was completed before the analysis was started. However, this may not be as important in this study as in a larger study where 'theoretical' sampling of participants for subsequent interviews are based on the findings of the previous interviews. Although this study used 2 methods of data collection (in-depth semi-structured interview and questionnaire) to obtain information, the questionnaire was completed by only 9 of the 12 participants. Some questions in the questionnaire had two meanings and thus, the formatting of the questions requires revisions. Some data was missed in the spreadsheet format due to the complexity of the answer format (i.e., frequency of feeding cereals) and thus revisions to simplify the format are needed.

External checks were completed during the analysis of data by asking professional peers (Supervisory Committee) to read drafts of study reports. This aided in 'balancing' viewpoints on concepts, categories, and the relationships that were identified. The feedback was used to reconstruct interpretations. However, the committee consisted of women, data interpretation feedback may have differed if the committee had been composed of men and women. A further limitation of this study was that the findings were not presented to the health professionals and mothers at the recruitment sites. This process would have aided in sharing the findings with this group and verifying the interpretations and their relevance to the mothers in these groups.

In order to keep the analysis broad to identify contextual factors or influences on the solid food feeding process, negative cases of situations, events, or experiences were identified throughout the analysis process. For example, 14 feeding strategies were identified, rather than just a few, suggesting an

intense analysis of the data to identify the most variations possible. However, qualitative data analysis is recognized as a demanding cognitive task, thus the research students level of 'fatigue' must be acknowledged as influencing the analysis outcome.

The confirmability criteria aims to evaluate the research product, the data, the findings, interpretations, and recommendations. The data obtained from the mothers in this study was very 'rich' and the study findings reflect this. The results of this study can be judged in light of the numerous procedures followed to promote the best data management, data analysis, and interpretive integration possible. However, the recommendations emphasize the need to validate the themes and their plausible relationships in future studies with larger sample sizes of mothers with varied feeding practices and experiences (breast and bottle-feeding, more than one child) and backgrounds (ethnic, socio-economic, and lifestyle). Although this is only a small study of mother's infant feeding behaviors, the purpose was to investigate behaviors in-depth in a natural setting. This research has raised some important questions regarding dietary iron adequacy and the prevention of iron deficiency anemia and iron depletion in a natural setting. This study has also provided a conceptual framework of solid food feeding during the transition process that could be used to guide future research and practice.

## **5.5 Conclusions.**

Solid food feeding is complex and involves interactions at many levels. The mother's solid food feeding practices are determined, in part, by the infant's feeding responses, the mother's perceptions of infant food needs and the mother's knowledge and skills. Practices need to be appropriate to meet the infant's evolving nutritional requirements, especially iron needs, during the transition period (4 to 9 months). It is known that by 9 months of age infants who are not bottle-fed with iron-fortified formula are at high risk for iron deficiency anemia and low iron stores. Dietary iron from complementary foods is essential to prevent iron deficiency anemia and iron depletion by 9 – 12 months of age, however, the content and bioavailability of iron in solid foods offered during the transition period is low. Therefore, it is critical that mothers learn 'how' to feed solid foods appropriately, if the infant's iron stores are to be maintained during this nutritionally 'vulnerable' period.

The first objective of this study was to identify mothers' solid food feeding practices, focusing on what foods are fed, the quantity fed, the duration over which foods are fed, specifically iron-fortified infant cereals, cereal preparation methods, and the patterns of intake of cereals during the transition period when infants are between 4 to 9 months of age. All of the mothers in this study started the feeding process and offered iron-fortified infant cereals to their infants as recommended in the infant feeding guidelines. However, the quantity and patterns of cereal intake varied among the infants. Variations were also found in the cereal preparation methods and the number and type of feeding strategies that mothers used to feed their infants solid foods. The differences in infant cereal consumption patterns identified from the transcript data were further explored by graphing the data over time. Three cereal consumption patterns (*high curve*, *S-curve* or *low flat curve*) were extrapolated from this data. Future research investigating differences in cereal consumption patterns might increase our understanding of the impact of the solid food feeding process on infant iron status during the transition period. This in turn might reflect better what actually occurs during the period when the exclusive liquid diet is being gradually replaced by semi-solid foods. Possibly, tracking of consumption patterns over time could aid in identifying mothers who would benefit from guidance on strategies to promote infant acceptance of iron-fortified infant cereals.

The second objective of this study was to identify why mothers feed their infants solid foods in the way that they do. The most important aspect of this research is the discovery of 5 themes that were identified as central to the solid food feeding process. These themes occur at 3 main levels – the mother, the infant, and the environment. A 3 – dimensional conceptual model of infant solid food feeding was developed to illustrate these themes. The causal-consequence model was used to build a second conceptual model. The second model links dietary iron adequacy to the plausible relationships that were identified and represented in the 5 themes. These models help identify and better understand what factors might lead to problems in dietary iron adequacy and thus provides a framework to aid in targeting solid food feeding practices that could be modified to increase dietary iron adequacy.

The third objective of this study was to explore the link between the solid food feeding practices used by the study participants and current solid food feeding recommendations put forth by expert groups. This study found that mothers appear to follow the recommendation of when and what to start feeding their infants. The difficulties that mothers had feeding their infant solid foods appeared to revolve around

'how' to feed solid foods. Further, the mothers described learning how to feed their infants through 'trial and error'.

The present research has explored how mothers feed their infants and what influences the way that they feed solid foods. This information is essential to developing effective multi-level education strategies that are aimed at improving complementary solid food feeding practices and hence, the iron intake of infants at risk. The solid food feeding models that have been developed from this research can be used to guide broader research on the determinants of solid food feeding practices. The models provide a framework of the infant behaviors, the mothers' practices, and determinants within the mothers' 'proximal' environments that influence the ability to feed solid foods, and thus, are useful for informing health care professionals working with mothers during the solid food feeding process.

## Chapter VI

### 6.1. Future directions for research

1. Future studies should continue to explore the themes, models and framework identified and developed in the present study. Research using focus groups is needed to verify the present findings in a larger more heterogeneous study sample.
2. Future studies with a larger sample of mothers could be undertaken to examine solid food feeding strategies that could potentially promote the consumption of iron-fortified cereal in increased quantities, promote a faster rate of cereal acceptance and promote maximal potential for high iron absorption (such as the preparation method).
3. An education intervention could be designed that would promote mothers' understanding of how to feed solid foods during the transition period, that would promote strategies that increase the consumption of dietary iron from iron-fortified infant cereals and that monitors infant iron status to determine the efficacy of the education intervention.
4. Future studies could use the models developed from the findings in the present study to guide broader research such as identifying the importance of the mother's self-efficacy to solid food feeding outcomes.

## 6.2. Future directions for practice

1. The findings from this study suggest that the solid food feeding process is complex and factors within the mother's proximate environment influence this process. Future directions for practice could thus be to develop nutrition education tools that address the gaps in the information provided to mothers by current infant feeding resources (i.e., providing more detail on practical infant feeding issues revolving around how to feed solid foods and addressing mothers concerns).
2. In recognition that learning takes place in many contexts, it would be beneficial for future practice to explore innovative ways of facilitating dialogue and addressing mother's solid food feeding concerns and factors that determine solid food feeding success during the transition period. This may be accomplished through either utilizing the public health settings that the mothers frequently attend and/or internet technology (i.e., mother chat forums with expertise provided by nutrition experts). In this way, through a more focused approach suggested by the conceptual framework developed in the present study, health professionals working with mothers may benefit from a 'roadmap' of issues that may be important to the mother in her natural setting.

## References

- Abrams SA, Wen J, Stuff JE: Absorption of calcium, zinc, and iron from breast milk by five to seven month old infants. *Pediatr Res* 1997; 41: 384-390
- ACC/SCN : Fourth Report on the World Nutrition Situation. Geneva: ACC/SCN in collaboration with IFPRI (adapted from UNICEF (1998)). The State of the World's Children 1998. Oxford: Oxford University Press 2000.
- Akre J: Infant feeding. The physiologic basis. *Bull WHO* 1989; 67(supp): 1-108
- Annells M: Grounded Theory Method: philosophical perspectives, paradigm of inquiry, and postmodernism. *Qualitative Health Research* 1996; 6(3): 379-393
- B.C. Ministry of Health. Baby's First Foods. NUT031 03/96
- Beard JL, Connor JR, Jones BC: Iron in the brain. *Nutrition Reviews* 1993; 51(6): 157-170.
- Beaudry M, Aucoin-Larade L: Who breast feeds in New Brunswick, when & why?. *Can J Public Health* 1989; 80: 166-72
- Bergerman JE, Misskey ED, Thompson DA: An overview of breastfeeding practices in three Saskatchewan health regions. *J Can Diet Assoc* 1979; 40(3): 236-40
- Birch LL, Gunder L, Grimme-Thomas K, Laing D: Infants' consumption of a new food enhances acceptance of similar foods. *Appetite* 1998; 30: 283-295
- Bothwell TH, Baynes RD, MacFarlane BJ, MacPhail AP: Iron requirements and food iron absorption. *J Int Med* 1989; 22(6): 357-65
- Bothwell TH, Charlton RW, Cook JD, Finch CA: Iron Metabolism in Man. Blackwell Scientific Publications, Oxford, 1979.
- Bynes RD: Iron Deficiency. In Iron Metabolism in Health and Disease. Brock JH, Halliday JW, Pippard MF, Powell LW. WB Saunders, London, UK 1994
- Calvo EB, Galindo AC, Aspres NB: Iron status in exclusively breast-fed infants. *Pediatrics* 1992; 90: 375-379
- Calvo EB, Gnazzo N: Prevalence of iron deficiency in children aged 9-24 months from a large urban area of Argentina. *Am J Clin Nutr* 1990; 52: 534-40
- Cameron M, Hofvander Y: Manual on feeding infants and young children, 3<sup>rd</sup> ed. Oxford: Oxford Medical Publications, 1990
- Canadian Paediatric Society, Nutrition Committee. Meeting the iron needs of infants and young children: An Update. *Can Med Assoc J* 1991; 144(11): 1451-1454
- Canadian Paediatric Society, Dietitians of Canada, Health Canada. Nutrition for Healthy Term Infants: Minister of Public Works and Government Services. Ottawa. Canada. 1998
- Chan-Yip A, Grey-Donald K: Prevalence of iron deficiency among Chinese children aged 6-36 months in Montreal. *Can Med Assoc J* 1987; 136: 373-378

- Charlton RW, Bothwell TH: Iron absorption. *Annu Rev Med* 1983; 34: 55-68.
- Chenitz CW, Swanson JM: From Practice to Grounded Theory: qualitative research in nursing. CA. Addison-Wesley. 1986
- Clark LL, Beal VA: Age at introduction of solid foods to infants in Manitoba. *J Can Diet Assoc* 1981; 42(1): 72-78
- Cohen RJ, Rivera L.L, Canahuati J, Brown KH, Dewey KG: Delaying the introduction of complementary food until 6 months does not affect appetite or mother's report of food acceptance of breast-fed infants from 6 to 12 months in a low income, Honduran population. *J. Nutr.* 1995; 125: 2787-2792
- Cohen RJ, Brown KH, Canahuati J, Rivera LL, Dewey KG: Effects of age of introduction of complementary foods on infant breast milk intake, total energy intake, and growth: a randomized interventions study in Honduras. *Lancet* 1994; 343: 288-93
- Cook JD, Bothwell, TH: Availability of iron from infant food. In: Nutrition in Infancy and Childhood, ed. A. Stekel. Raven Press, New York, 1984: 119-143
- Creswell JW: Research Design: Qualitative & Quantitative Approaches. Sage: CA 1994
- Dallman PR: Changing iron needs from birth through adolescence. In Nutritional Anemias (Fomon, S.J. and Zlotkin, S. eds.). Nestle Nutrition Workshop Series. Raven Press, NY 1992:30:29-38
- Dallman PR: Review of iron metabolism. In Filer L.J. Dietary Iron: Birth to Two Years. Raven Press Ltd., NY 1989; 63-70
- Dallman PR: Iron deficiency in infants: three topics of current interest (1995). In J.G.Bindels, A.C. Goedhart and HKA Visser (ed). In Recent Developments in Infant Nutrition, 272-77. Kluwer Academic Publishers, Great Britain, 1996
- Dallman PR: Iron deficiency in the weanling: a nutritional problem on the way to resolution. *Acta Paediatr Scand* 1986; 323: 59-67
- Dallman PR, Siimes MA, Stekel A: Iron deficiency in infancy and childhood. *Am J Clin Nutr* 1980; 33: 86-118
- Davidsson L., Kastenmayer P, Yuen M, Lonnerdal B, Hurrell RF: Influence of lactoferrin on iron absorption from human milk in infants. *Pediatr Res* 1994; 35: 117-124
- Denzin Nk, Lincoln YS: Handbook of Qualitative Research. Sage: CA, 1994
- Dewey KG, Cohen RJ, Rivera LL, Brown KH: Effects of age of introduction of complementary foods on iron status of breast-fed infants in Honduras. *Am J Clin Nutr* 1998; 67: 878-84
- Eisner EW (1991): The enlightened eye: qualitative inquiry and the enhancement of educational practice. New York: Macmillan. In Creswell JW. Research Design: Qualitative & Quantitative Approaches. Sage: CA, 1994;163
- Engelmann M, Davidsson L, Sandstrom B, Walchzyk T, Hurrell RF, Michaelsen KF: The influence of meat on non-heme iron absorption in infants. *Pediatr Res* 1998; 43: 768-773

- ESPGAN Committee on Nutrition. Guidelines on infant nutrition: *Acta Paediatr Scand* 1981(supp): 287
- Fairweather-Tait SJ: Iron in food and its availability. *Acta Paediatr Scand* 1989; Suppl 36: 12-21
- Fairweather-Tait SJ, Fox T, Wharf G, Eagles J: The bioavailability of iron in different weaning foods and the enhancing effect of a fruit drink containing ascorbic acid. *Pediatr Res* 1995; 37(4): 389-394
- Filer LJ: Dietary Iron: Birth to Two Years. Raven Press Ltd., New York 1989
- FOA/WHO Joint Expert Consultation Report. Requirements of vitamin A, iron, folate, and vitamin B12. Food and Nutrition Series 23. FAO, Rome 1988
- Fomon S.J. and Zlotkin S: Nutritional Anemias. Nestle Nutrition Workshop Series Vol. 30. Raven Press Ltd. New York 1992
- Fomon SJ: Infant Nutrition (2<sup>nd</sup> ed.). W.B. Saunders, Philadelphia: 1974: 309
- Forman MR: Review of research on the factors associated with choice and duration of infant feeding in less-developed countries. *Pediatrics* 1984; 74(4 pt2): 667-94
- Fox TE, Eagles J, Fairweather-Tait SJ: Bioavailability of iron as a fortificant in infant foods. *Am J Clin Nutr* 1998; 67: 664-668
- Fuchs GJ, Farris RP, DeWier M, Hutchinson SW, Warriar R, Doucet H, Suskind RM: Iron status and intake of older infants fed formula versus cow milk with cereal. *Am J Clin Nutr* 1993; 58: 343-348
- Gesell A, Ilg FL: Feeding behavior of infants. JB Lippincott, Philadelphia: 1937
- Glaser B, Strauss A: The Discovery of Grounded Theory. Aldine Publishing CO, Chicago 1967
- Glaser BG: Theoretical Sensitivity: Advances in the Methodology of Grounded Theory. The Sociology Press, Mill Valley, CA, 1978
- Gorden (1975) In Chenitz CW., Swanson JM: From practice to grounded theory: qualitative research in nursing. Addison-Wesley, CA 1986:74
- Grand RJ, Watkins JB, Torti FM: Development of the human gastrointestinal tract. A review. *Gastroenterology* 1976; 70: 790-810
- Green LW, Kreuter MW: Health promotion planning – An educational and environmental approach. Mayfield Publishing Company. Mountain View, CA, 1991
- Greene-Finestone L, Feldman W, Heick H, Luke B: Infant feeding practices and socio-demographic factors in Ottawa-Carleton. *Can J of Public Health* 1989; 80: 173-176
- Gupta SBA, Venkateswaran R, Gorenflo DW, Eyler AE: Childhood iron deficiency anemia, maternal knowledge, and maternal feeding practices in a high-risk population. *Prev Med* 1999; 29: 152-156
- Hallberg L. Search for nutritional confounding factors in the relationship between iron deficiency and brain function. *Am J Clin Nutr* 1989; 50: 598-606

- Hallberg L, Rossander L., Brune M, Glerup A: Bioavailability in man of iron in human milk and cow's milk in relation to their calcium contents. *Pediatr Res* 1992; 31: 524-527
- Hallberg L: Bioavailability of dietary iron in man. *Annu Rev Nutr* 1981; 1: 123-147
- Health and Welfare Canada. Feeding babies – A counseling guide on practical solutions to common infant feeding questions. Ministry of Supply and Services, Canada 1986
- Health and Welfare Canada. Nutrition Recommendations: The report of the scientific review committee. Ministry of National Health and Welfare. Canadian Government Publishing Center Supply and Services Ottawa, Canada 1990
- Heinig MJ, Nommsen LA, Peerson JM, Lonnerdal B, Dewey KG: Intake and growth of breast-fed and formula-fed infants in relation to the timing of introduction of complementary foods: the DARLING study. *Acta Paediatr* 1993; 82: 999-1006
- Hendricks KM, Badruddin SH: Weaning recommendations: the scientific basis. *Nutrition Reviews* 1992; 50(5): 125-133
- Henly SJ, Anderson CM, Avery MD, Hills-Bonczyk SG, Potter S, Duckett LJ: Anemia and insufficient milk in first-time mothers. *Birth* 1995; 22(2): 87-92
- Hercberg S, Galan P: Nutritional Anemias. *Baillieres Clinical Haematology* 1992; 5(1): 143-168
- Hertrampf E, Cayazzo M, Pizarro F, Stekel A.: Bioavailability of iron in soy-based formula and its effect on iron nutriture in infancy. *Pediatrics* 1986; 78: 640-645
- Hutchinson SA: Grounded Theory: The Method. In Munhall PL, Boyd CO: *Nursing Research: a qualitative perspective*. National League for Nursing Press, New York 1993: 180-212
- Idjradinata P, Elliot E: Reversal of developmental delays in iron-deficient anaemic infants treated with iron. *The Lancet* 1993; 341: 1-4
- Ingram TTS: Clinical significance of the infantile feeding reflexes. *Dev Med Child Neurol* 1962; 4: 159-69.
- Innis SM, Nelson CM, Wadsowrth LD, MacLaren IA, Lwanga D. Incidence of iron-deficiency anaemia and depleted iron stores among nine month old infants in Vancouver, Canada. *Can J of Public Health* 1997; 88(2): 80-84
- Katcher AL, Lonese MG: Breastfeeding by employed mothers: A reasonable accomodation in the workplace. *Pediatrics* 1985; 73: 644-47
- Kearrey MH, Cronenwett L: Breastfeeding and employment. *JOGNN* 1991; 20(6): 471-480
- Kim SK, Cheong WS, Jun YH, Choi JW, Son BK: Red blood cell indices and iron status according to feeding practices in infants and young children. *Acta Paediatr* 1996; 85: 139-44
- Lehmann F, Gray-Donald K, Mongeon M, Di Tommaso S: Iron deficiency anemia in 1-year-old children of disadvantaged families in Montreal. *Can Med Assoc J* 1992; 146(9): 1571-77
- Life Sciences Research Office Rockville Pike, Bethesda, Maryland. Assessment of nutrient requirements for infant formulas. Center for Food Safety and Applied Nutrition Food and Drug Administration. Department of Health and Human Services Washington, DC. 1998

- Lincoln YS: Emerging criteria for quality in qualitative and interpretive research. *Qualitative Inquiry*, 1995; 1(3): 275-289
- Lincoln YS, Guba EG (1985): *Naturalistic inquiry*. Beverly Hills, Sage CA. In Creswell, JW. *Research design: qualitative & quantitative approaches*. Sage CA. 1994:162
- Lonerdal B, Cederblad A, Davidsson L, Sandstrom B: The effect of individual components of soy formula and cows' milk formula on zinc bioavailability. *Am J Clin Nutr* 1984; 40: 1064-70
- Lozoff B et al: Iron-deficiency anemia and infant development: Effects of extended oral iron therapy. *Journal of Pediatrics* 1996; 129: 382-389
- Lozoff B et al: Long-term Developmental Outcomes of Infants with Iron Deficiency. *New England Journal of Medicine* 1991; 325: 687-694
- Lutter CK : Breastfeeding promotion: Is its effectiveness supported by scientific evidence and global changes in breast feeding behaviors? In Short and long term effects of breastfeeding on infant health, ed. Koletzo B, Hernell O, Michaelsen K. Plenum Press, NY 2000 (in press)
- Lynch SR: Interaction of iron with other nutrients. *Nutrition Reviews* 1997; 55(4): 102-110
- MacLean H, Millar W: *Breastfeeding in Canada: A review and update*. Ottawa: Ministry of Supply and Services Canada. 1998
- MacLean HM: *Women's experience of breastfeeding*. Toronto: University of Toronto Press, 1990
- McMillan JA, Oski FA, Lourie G, Tomarelli RM, Landaw SA: Iron absorption from human milk, simulated human milk, and proprietary formulas. *Pediatrics* 1977; 60-: 896-900.
- McMillan JA, Landaw SA, Oski FA: Iron sufficiency in breast-fed infants and the availability of iron from human milk. *Pediatrics* 1976; 58: 686-691
- McNally E, Hendricks S, Horowitz I: A look at breast-feeding trends in Canada (1963-1982). *Can J Public Health* 1985; 76: 101-7
- Mead Johnson Canada: *Infant Nutrition for the 90's*. 1992; 2(2): 1-8
- Mennella JA, Beauchamp GK: Early flavor experiences: Research Update. *Nutr. Rev* 1998; 56(7): 205-211
- Mennella Ja, Beauchamp GK: Mother's milk enhances the acceptance of cereal during weaning *Pediatr Res* 1997; 41: 188-92
- Merriam SB: *Case study research in education: A qualitative approach*. Jossey-Bass, San Francisco 1988
- Moffatt MEK. Current status of nutritional deficiencies in Canadian Aboriginal people. *Can. J. Physiol. Pharmacol.* 1995; 73: 754-758
- Monsen ER, Hallberg L, Layrisse M, Hegsted DM, Cook JD, Mertz W, Firnch CA: Estimation of available dietary iron. *Am J Clin Nutr* 1978; 31: 134-41
- Morse JM, Bottorff JL, Boman J: Patterns of breastfeeding and work: the Canadian experience. *Canadian Journal of Public Health* 1989; 80: 182-88

Munhall PL, Boyd CO: Nursing Research: A Qualitative Perspective. National League for Nursing Press, New York 1993.

Nielsen GA, Thomsen BL, Michalsen KF: Influence of breastfeeding and complementary food on growth between 5 and 10 months. *Acta Paediatr* 1998; 87: 911-917

O'Brien MF, Sterken E, Shears E: Breastfeeding: protection, promotion and support – forward to the breastfeeding statement of the breastfeeding committee for Canada. *J Can Diet Assoc* 1998; 59(1): 10

Oski FA, Landaw SA: Inhibition of iron absorption from human milk by baby food. *Am J Dis Child* 1980; 134: 459-60

Oski FA: The causes of iron deficiency in infancy. In Filer L.J. Dietary Iron: Birth to Two Years. Raven Press Ltd., New York 1989: 63-70

Piccianno MF, Guthrie HA: Copper, iron, and zinc contents of mature human milk. *Am J Clin Nutr* 1976; 29: 242-254

Pizarro F, Yip R, Dallman PR, Olivares M, Hertrampf E, Walter T: Iron status with different infant feeding regimens: relevance to screening and prevention of iron deficiency. *J Pediatr* 1991; 118: 687-92

Pollitt E: Iron deficiency and cognitive function. *Annu Rev Nutr* 1993; 13: 521-537

Pridham KF: Feeding behavior of 6 to 12 month old infants: assessment and sources of parental information. *J Pediatr* 1990; 117: S174-80

Promoting breastfeeding: a role for the dietitian/nutritionist. Official position of the Canadian Dietetic Association. *J of Can Diet Assoc* 1989; 50(4): 211-14

Rios E, Hinter RE, Cook JD, Smith N J, Finch CA: The absorption of iron as supplements in infant cereal and infant formulas. *Pediatr* 1975; 55: 686-693

Rodgers BL, Cowles KV: The qualitative research audit trail: A complex collection of documentation. *Research in Nursing and Health* 1993; 16: 219-226

Rossander-Hulthen L, Hallberg L: Dietary factors influencing iron absorption – an overview. Iron Nutrition in Health and Disease. John Libbey and Company Ltd., 1996 105-115

Rosseau EH, Lescop JN, Fontaine S et al: Influence of cultural and environmental factors on breast-feeding. *CMAJ* 1982; 127: 701-4

Saarinen UM, Siimes MA, Dalman PR: Iron absorption in infants: high bioavailability of breast milk iron as indicated by the extrinsic tag method of iron absorption and by the concentration of serum ferritin. *J. Pediatr* 1977; 91: 36-39

Satter E. The feeding relationship: problems and interventions. *J Pediatr* 1990; 117: S181-9

Sawchuk P, Rauliuk M, Kotaska A, Townsend S, Wilson E, Starr M: Infant nutrition program: iron-deficiency anemia in a First Nations community. *96 Curcumpolar Health* 1996; 189-193

Scammon RE, Doyle LO: Observations on the capacity of the stomach in the first ten days of postnatal life. *Am J Dis Child* 1990; 516-38

- Schulz-Lell G, Buss R, Oldigs HD, Dorner K, Schaub J: Iron balances in infant nutrition. *Acta Paediatr. Scand* 1987; 76: 585-591
- Schwartz C, Evers S: Infant feeding practices in low-income communities in Ontario. *J Can Diet Assoc* 1998; 59 (1): 30-34
- Siimes MA, Salmenpera L, Perheentupa J: Exclusive breast-feeding for 9 months: risk of iron deficiency. *J Pediatr* 1984; 104: 196-99
- Siimes MA, Vuori E, Kuitunen P: Breast milk iron – a declining concentration during the course of lactation. *Acta Paediatr. Scand* 1979; 68: 29-31
- Smith N J, Rios E: Iron metabolism and iron deficiency in infancy and childhood. In *Advances in Pediatrics*, ed. I. Schulman. Year Book Medical Publishers, Inc., Chicago 1974:21:239-280
- Stekel A: Iron requirements in infancy and childhood. In *Iron Nutrition in Infancy and Childhood* (Stekel A., ed). Nestle Nutrition Workshop Series, Raven Press NY. Vol. 4.1984:1-6
- Stephen LJ, Innis SM: Complementary feeding practices: understanding the complexity of the milk to solid food transition process of mother and infant. *Can J of Diet Prac and Res.* 1999; Suppl.59:122 (abstr.).
- Stephenson DM, Meeks Gardner JM, Walker S, Ashworth A: Weaning-food viscosity and energy density: their effects on ad libitum consumption and energy intakes in Jamaican children. *Am J Clin Nutr* 1994; 60: 465-9
- Stewart PJ, Steckle J: Breastfeeding among Canadian Indians On-Reserve and women in the Yukon and N.W.T. *Can J Public Health* 1987; 78: 255-61
- Strauss A., Corbin J : Basics of qualitative research: Grounded theory procedures and techniques. Newbery Park, Sage, CA 1990
- Streubert HJ, Carpenter DR: Qualitative research in nursing advancing the humanistic imperative. J.B. Lippincott Company Philadelphia. 1995
- Sullivan SA , Birch LL: Infant dietary experience and acceptance of solid foods. *Pediatrics* 1994; 93: 271-277
- Tanaka PA, Yeung DL, Anderson GH: Infant feeding practices: 1984-85 versus 1977-78. *Can Med Assoc J* 1987; 136: 940-44
- Underwood BA: Weaning practices in deprived environments: the weaning dilemma. *Pediatrics* 1985; 75(1 pt 2): 194-8
- Vancouver Health Department, West Main Unit: Position on infant feeding for the first year of life. November 1993
- Walter T, Dallman PR, Pizarro F, Velozo L, Pena G, Bartholomey SJ, Hertrampf E, Olivares M, Letelier A, Arredondo M: Effectiveness of iron-fortified infant cereal in prevention of iron deficiency anemia. *Pediatrics* 1993; 91: 976-982
- Walter T et al: Iron deficiency anemia: adverse effects on infant psychomotor development. *Pediatrics* 1989; 84: 7-17

- Whalen EA, Caulfield LA, Harris SB: Prevalence of anemia in First Nations children of northwestern Ontario. *Canadian Family Physician* 1997; 43: 659-664
- Wharton B: Weaning and child health. *Ann Rev Nutr* 1989; 9: 377-94
- Whitehead RG: Infant physiology, nutritional requirements, and lactational adequacy. *Am J Clin Nutr* 1985a; 41(2 supp): 447-58
- Whitehead RG: The human weaning process. *Pediatrics* 1985b; 75(1 pr 2): 189-93
- WHO International code of marketing of breastmilk substitutes. World Health Assembly: Geneva, Switzerland, 1981
- WHO/ UNICEF. Protecting, promoting and supporting breast-feeding: the special role of maternity services. Geneva, Switzerland: World Health Organization/ UNICEF, 1989
- Williams PL, Innis SM, Vogel AMP, Stephen LJ: Factors influencing infant feeding practices of mothers in Vancouver. *Can J of Public Health* 1999; 90(2): 114-119
- Williams PL, Innis SM, Vogel AMP: Breastfeeding and weaning practices in Vancouver. *Can J Public Health* 1996: 231-36
- Willows ND, Morel J, Gray-Donald K: Prevalence of anemia among James Bay Cree infants of northern Quebec. *Can Med Assoc J* 2000; 162(3): 323-326
- World Health Organization. The quantity and quality of breast milk. Report of the WHO collaborative study on breastfeeding. Geneva. 1985
- World Health Organization. Weaning from breast milk to family food. Geneva. 1988
- Yeung DL: Infant nutrition: a study of feeding practices and growth from birth to 18 months. Ottawa, Ont: The Canadian Public Health Association 1983.
- Yeung DL, Pennell MD, Leung M, Hall J, Anderson GH: Iron intake of infants: the importance of infant cereals. *CMA Journal*. 1981; 125: 999-1002
- Zlotkin S: Iron needs. *Can J of Paediatrics* 1993; (supp): 32-38
- Zlotkin SH, Ste-Marie M, Kopelman H, Jones A, Adam J: The prevalence of iron depletion and iron-deficiency anaemia in a randomly selected group of infants from four Canadian cities. *Nutrition Research* 1996; 16(5): 729-733



## 4-6 MONTHS

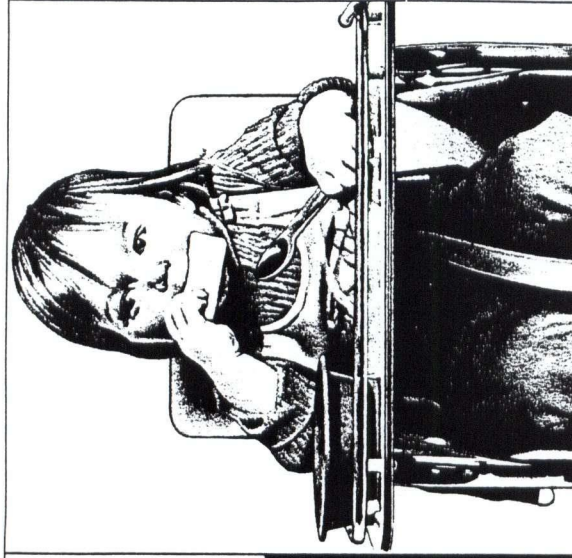
- Breastmilk on demand, or formula - 1000 to 1250 mL (32 to 40 oz.) daily.
- FEED SOLIDS 1-2 TIMES PER DAY**
- Begin with iron-fortified, single grain, commercial infant cereal mixed with breastmilk, water or formula. Start with 5 mL (1 tsp.) and increase to 60 mL (4 tbsp.) daily.
- After a month or so, offer well-mashed vegetables and fruit such as: cooked sweet potato, squash, potato, peach, banana, pear and applesauce (canned without sugar). Start with 5 mL (1 tsp.) and increase to 60 mL (4 tbsp.) daily. \*
- Breastmilk is the best food for the first 4-6 months. When your baby is taking solids it is still important to continue breastfeeding. Commercial formula is the next best choice after breastmilk.

**\* Note:** If fruit and vegetables need to be pureed for your baby to eat them, then your baby is not ready for these foods.



## 6-9 MONTHS

- Breastmilk on demand, or formula - 750 to 1000 mL (24 to 32 oz.) daily.
- FEED SOLIDS 3-4 TIMES PER DAY**
- Infant cereal - 60 to 125 mL (4 to 8 tbsp.) daily.
- Vegetables and fruit (mashed) - 60 to 125 mL (4 to 8 tbsp.) daily and unsweetened juice offered in a cup - up to 60 mL (1/4 cup) daily.
- Try adding meat, fish, poultry (cooked and ground); dried beans, lentils, egg yolk (cooked and mashed); tofu, cottage cheese or plain yogurt. Start with 5 mL (1 tsp.) and increase to 100 mL (6 tbsp.) daily.
- Later try finger foods: pieces of peeled fruit (peach, pear, orange, banana, kiwi, plum, melon), soft cooked vegetables (carrot, broccoli, cauliflower, potato), toast, squares of bread, crackers, cooked pasta, "oat rings" cereal, pieces of soft cheese.
- AVOID small pieces that may cause choking such as: nuts, seeds, raw peas, raw carrot, corn, popcorn. Slice wieners and grapes lengthwise.
- Babies can enjoy mashed foods and finger foods before teeth appear.
- At first, your baby may do more playing with food than eating. Food is fun!



## 9-12 MONTHS

- Breastmilk on demand, or formula - 625 to 950 mL (20 to 30 oz.) daily. Your baby will take less milk as he or she eats more solids.
- FEED SOLIDS 5-6 TIMES PER DAY**
- Infant cereal - 60 to 125 mL (4 to 8 tbsp.) daily.
- Vegetables and fruit (small soft pieces) 125 to 250 mL (1/2 to 1 cup) daily and unsweetened juice offered in a cup - up to 125 mL (1/2 cup) daily.
- Cooked meat, fish, poultry, dried beans (ground or chopped), lentils, egg yolk; tofu, cottage cheese or plain yogurt - 75 to 125 mL (1/3 to 1/2 cup) daily.
- Finger foods.
- Offer whole egg towards the end of the first year.
- Whole milk can be given occasionally once your baby is eating regular meals and a variety of solid foods.
- By 1 year, your baby will be eating table foods and enjoying family meal time.
- Learning to eat takes time and patience. Expect some mess and relax.

## Recruitment Checklist

### Determinants of Weaning Practices Among Breast-feeding and Formula-feeding Mothers

Participant Code: ☐☐☐☐

Mother's name \_\_\_\_\_ Phone \_\_\_\_\_

Infant's name \_\_\_\_\_

Birth date: \_\_\_\_\_

Age: \_\_\_\_\_

Gestation (wks) \_\_\_\_\_

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Does participant meet the following criteria?

- ☐ Caucasian mother who is breast-feeding or formula-feeding.
- ☐ Infant is 4-12 months of age.
- ☐ Mother is living in Vancouver, B.C.
- ☐ Infant is born > 37 weeks gestation
- ☐ Infant has no known history of unusual feeding behavior (allergies, recurrent infections, etc.).
- ☐ Mother has sufficient English (verbal and written) to complete interview and questionnaires.

Yes ☐ No ☐ Initials \_\_\_\_\_

---

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COMMENTS:

## Determinants of Weaning Practices Among Breast-feeding and Formula-feeding Mothers

**Your participation is greatly appreciated.** Information obtained from the in-depth interviews and this infant weaning practices survey will further our understanding of the weaning process and factors that influence mother's decisions at this time. Your participation is greatly appreciated but please remember, **participation is voluntary**, and you do not have to answer any question(s) you do not wish to.

Participant Code: ☐ ☐ ☐ ☐

Interview Date: ☐ ☐ ☐ ☐ ☐ ☐

### INFANT INFORMATION:

Birth Date: \_\_\_\_\_  
 Gestation Age: \_\_\_\_\_  
 Sex: \_\_\_\_\_  
 Birth Weight: \_\_\_\_\_ Length: \_\_\_\_\_  
 Siblings (# & ages) \_\_\_\_\_

### COMMENTS:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Please give an appropriate response. The questions in this section focus on your liquid feeding practices.

- A1. Was your baby ever breast-fed?  
 Yes ☐ No ☐ - go to A4
- A2. Are you breast-feeding your baby now?  
 Yes ☐ No ☐
- \*If no, when did you stop?  
 \_\_\_\_\_ month(s)
- A3. Was breast-feeding replaced or supplemented with infant formula (e.g. greater than 8 oz [240 ml] per week)?  
 Yes ☐ No ☐ - go to A6
- \*If yes, at what age \_\_\_\_\_
- A4. Was breast-feeding or formula feeding supplemented or replaced with cow, goat, or soy milk (e.g. greater than 8 oz [240 ml] per week)?  
 Yes ☐ No ☐
- A6. How much (oz/ml) milk, per day, does your baby currently drink?
1. Breast-milk  
 - number of feeds per day \_\_\_\_\_  
 - minutes per feed \_\_\_\_\_
  2. Formula \_\_\_\_\_  
 Type \_\_\_\_\_ Brand \_\_\_\_\_
  3. Cows' milk \_\_\_\_\_ (type) \_\_\_\_\_
  4. Other milk \_\_\_\_\_ (type) \_\_\_\_\_

Please CHECK ☒ appropriate boxes indicating TYPES, BRANDS, and AMOUNTS of liquids baby drinks.

NEVER USED	IN HOSPITAL	WHAT DOES YOUR BABY DRINK?	BRANDS You Use	AMOUNTS Baby Eats
<input type="checkbox"/>	<input type="checkbox"/>	Breast-Milk:	1. Number of feeds/day 2. Minutes/feed	
<input type="checkbox"/>	<input type="checkbox"/>	Infant Formula:		
<input type="checkbox"/>	<input type="checkbox"/>	a. Regular (low iron) .....	1. 2. 3. 4. 5. 6.	
<input type="checkbox"/>	<input type="checkbox"/>	b. Formula with iron (fortified) ..		
<input type="checkbox"/>	<input type="checkbox"/>	c. Soy-based formula .....		
<input type="checkbox"/>	<input type="checkbox"/>	Cows' Milk:		
<input type="checkbox"/>	<input type="checkbox"/>	a. Whole milk .....		
<input type="checkbox"/>	<input type="checkbox"/>	b. 2% .....		
<input type="checkbox"/>	<input type="checkbox"/>	c. 1% or d. Skim .....		
<input type="checkbox"/>	<input type="checkbox"/>	Other:		
<input type="checkbox"/>	<input type="checkbox"/>	a. Soy Milk (not formula) .....		
<input type="checkbox"/>	<input type="checkbox"/>	b. Goats Milk .....		
<input type="checkbox"/>	<input type="checkbox"/>	c. Juice (dilution ____ ) .....		

Participant Code: ☐ ☐ ☐ ☐ ☐

✓ WHICH MONTHS HAS BABY BEEN DRINKING ITEMS FROM LIST?												
1	2	3	4	5	6	7	8	9	10	11	12	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Please give an appropriate response. The questions in this section focus on your infant/toddler cereal feeding practices.

B1. Does your child eat cereal?  
 Yes ☐  
 No ☐ - go to D6

For the following 5 questions (B2-B6)  
 put a number in each space provided  
 that best reflects your practices.

1-always, 2-almost always, 3-sometimes,  
 4-almost never, 5-never

B2. When you first started using  
 infant cereal, what did you use to  
 prepare it, and what do you use  
 now?

FIRST STARTED	USING NOW
_____ Water .....	_____
_____ Breast-milk .....	_____
_____ Formula .....	_____
_____ Cow's milk .....	_____
_____ Fruit juice .....	_____
_____ Other .....	_____

B3. Does your baby eat all the cereal  
 you prepare? ☐

B4. Do you prepare the same  
 quantity of cereal each time you  
 feed your baby? ☐

B5. Do you save uneaten cereal to  
 use later? (e.g., if baby doesn't  
 want it at the time it was  
 prepared) ☐

B6. Who prepares your baby's food?  
 Mother \_\_\_\_\_ Father \_\_\_\_\_  
 Grandmother \_\_\_\_\_ Daycare \_\_\_\_\_  
 Nanny/baby sitter \_\_\_\_\_ Other \_\_\_\_\_

For the following 5 questions (B7-B11)  
put a number in each space provided  
that best reflects your practices.

1-always, 2-almost always, 3-sometimes,  
4-almost never, 5-never

- B7. What do you do if your baby is still hungry after you feed cereal you have prepared?  
 \_\_\_ Not applicable  
 \_\_\_ (e.g., baby not hungry anymore)  
 \_\_\_ Prepare more  
 \_\_\_ Feed milk (bottle or breast)  
 \_\_\_ Offer other solid foods  
 \_\_\_ (e.g., banana or crackers etc.)  
 \_\_\_ Other, specify \_\_\_\_\_
- B8. What is your cereal feeding pattern?  
 \_\_\_ I feed cereal to my baby between milk feeds.  
 \_\_\_ I feed cereal to my baby after I feed milk (breast or bottle).  
 \_\_\_ I feed cereal to my baby before I feed milk (breast or bottle).  
 \_\_\_ I feed cereal to my baby at breakfast.  
 \_\_\_ I feed cereal to my baby at bedtime.
- B9. How often in a day do you feed cereal?  
 \_\_\_ Once  
 \_\_\_ Twice  
 \_\_\_ Three times  
 \_\_\_ Four or more times
- B10. What days of the week do you feed cereal?  
 \_\_\_ Everyday  
 \_\_\_ Week days  
 \_\_\_ Weekends  
 \_\_\_ Other, explain \_\_\_\_\_
- B11. When in the day do you feed cereal?  
 \_\_\_ Family meal times  
 \_\_\_ Mornings only  
 \_\_\_ Evenings only  
 \_\_\_ Between family meals  
 \_\_\_ Other, explain \_\_\_\_\_
- B12. What do you think influences how much cereal your baby eats?

Please CHECK ✓ appropriate boxes indicating TYPES, BRANDS, and AMOUNTS of cereals baby eats, (and preparation methods).

Participant Code: ☐ ☐ ☐ ☐ ☐

NEVER EATEN		WHAT IS BABY EATING NOW?	WHAT CEREAL(S) DOES YOUR BABY EAT?	BRANDS You Use	AMOUNTS Baby Eats
<input type="checkbox"/>	<input type="checkbox"/>		What do you use to mix the dry cereal with?	1. Breast milk 2. Infant Formula 3. Cow's milk 4. Juice 5. Water 6. Other	
<input type="checkbox"/>	<input type="checkbox"/>		Infant Cereal:	1. Heinz 2. Gerber 3. Milupa 4. Pablum 5. Other	
<input type="checkbox"/>	<input type="checkbox"/>		Toddler Cereal:	1. Heinz 2. Gerber 3. Milupa 4. Pablum 5. Other	
<input type="checkbox"/>	<input type="checkbox"/>		Other:	1. 2. 3.	

✓ WHICH MONTHS HAS BABY BEEN EATING FOODS ON LIST?												
1	2	3	4	5	6	7	8	9	10	11	12	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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Please give an appropriate response. The questions in this section focus on your current infant/toddler cereal purchasing practices.

- C1. Where do you usually buy your commercial baby cereals?  
(Check all that apply)
- ☐ Grocery Store  
☐ Bulk food/Warehouse Store  
☐ Drug Store  
☐ Convenience Store  
☐ Health Food Store (eg. Capers)  
☐ Other, specify \_\_\_\_\_
- C2. Do you purchase infant cereals/foods as part of your routine grocery shopping trip?  
 Yes ☐ No ☐
- C3. Do you make specific trips to specific stores to purchase infant cereals/foods for your baby?  
 Yes ☐ No ☐
- C4. Why do you purchase your baby cereal where you do? (Check all that apply)
- ☐ Good selection  
☐ No reason  
☐ Better prices  
☐ Convenient  
☐ Other, specify \_\_\_\_\_
- C5. How much cereal do you purchase at one time? (Check all that apply)
- ☐ Several boxes, same type  
☐ Several boxes, different type  
☐ 1 box  
☐ A large supply  
☐ Other, specify \_\_\_\_\_
- C6. Who in the household usually purchases the baby cereal?  
 \_\_\_\_\_
- C7. What do you think influences how you choose the brand and type of cereal you buy?  
 \_\_\_\_\_

Please give an appropriate response. The questions in this section focus on your perception of your baby's acceptance of commercial baby cereals.

- D1. Does your baby ever refuse to eat commercial baby cereal?  
Yes ☐ No ☐
- D2. Does your baby prefer specific textures?  
Yes ☐ No ☐
- D3. Does your baby like a variety of cereals?  
Yes ☐ No ☐
- D4. Does your baby like different methods of preparing cereals?  
Yes ☐ No ☐
- D5. Does your baby eat baby cereal if he/she has other choices?  
Yes ☐ No ☐
- For the following 2 questions, put a number in each space provided.
- |  |
|--|
| 1-Excellent, 2-Very Good, 3-Good, 4-Fair, 5-Poor |
|--|
- D6. In general, how nutritious do you feel your baby's diet is? \_\_\_\_\_
- D7. How would you describe your baby's appetite? \_\_\_\_\_
- D8. Do you have any concerns about your baby's food intake?  
Yes ☐ No ☐

Please give an appropriate response. The questions in this section focus on information you may have received or obtained yourself during your baby's first year.

E1. Did you receive information on introducing solid foods to your baby?

Yes ☐ No ☐ - go to E3.

E1a. Describe what information you received.

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E1b. When did you receive information? 

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E1c. Where were you given information? 

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E1d. Did the information you received influence your feeding practices?

Yes ☐ No ☐

E2. Did you seek information yourself on introducing solid foods to your baby?

Yes ☐ No ☐ - go to E3.

E2a. Describe what information you sought.

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E2b. When did you seek information? 

---

E2c. Where did you seek information? 

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E2d. Did the information you obtained influence your feeding practices?

Yes ☐ No ☐

E1e. What information from above did you find most helpful (if any)?

Sources: 

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 Why: 

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E2e. What information from above did you find most helpful (if any)?

Sources: 

---

 Why: 

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E1f. Was the information you received adequate for your needs?

Yes ☐ No ☐

E2f. Was the information you obtained adequate for your needs?

Yes ☐ No ☐

E3. What information would you have liked? (if any)

Please give an appropriate response. The questions in this section focus on other solid food feeding practices.

F1. Has your baby been introduced to the following foods (Put yes or no in space).

☐ Fruits ☐ Egg ☐ Cheese(s)  
☐ Vegetables ☐ Yogurt(s) ☐ Meat(s)

F2. If you have NOT given your baby foods from the above list, comment in the following chart when you intend to introduce these foods (if you do).

FOODS FROM LIST	AGE OF INTENDED INTRODUCTION

Please CHECK ✓ appropriate boxes indicating TYPES, BRANDS, and AMOUNTS of foods baby eats.

Participant Code: ☐☐☐☐☐☐

WHAT IS BABY EATING NOW?		WHAT FOODS DOES YOUR BABY EAT?	BRANDS You Use	AMOUNTS Baby Eats	✓ WHICH MONTHS HAS BABY BEEN EATING FOODS ON LIST?											
NEVER EATEN					1	2	3	4	5	6	7	8	9	10	11	12
<input type="checkbox"/>	<input type="checkbox"/>	Fruits:			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Vegetables:			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Commercial Meat Products:	1. Strained Junior 3. Junior 4. Toddler 4. _____ 5. _____ 6. _____ 7. _____ 8. _____		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	a. Beef; b. beef combinations . .			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	c. Pork; d. pork combinations . .			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	e. Chicken; f. combinations of . .			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Homemade Baby Foods:			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	a. Beef, specify . . . . .			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	b. Pork, specify . . . . .			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	c. Chicken, specify . . . . .			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	Other:			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	a. Fish; b. Congee . . . . .			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	c. Egg (Whole/Yolk/White) . .			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	d. Yogurt; e. Cheese . . . . .			<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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**THANK-YOU**  
**For Your Participation**

**Please help me improve my survey.  
You are the experts on feeding your baby.**

1. Did I miss any questions you think are important?

2. Were any questions confusing or poorly written?

3. Was the format easy to follow?

4. Is there anything I could improve?

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**Determinants of Weaning Practices Among Breast-feeding and Formula-feeding Mothers in Vancouver.**

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**PARTICIPANT CODE**

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**INTERVIEW**

Day

--	--

Month

--	--

Year

--	--

**BABY'S BIRTH DATE**

Day

--	--

Month

--	--

Year

--	--

**BABY'S SEX** \_\_\_\_\_**BABY'S GESTATION AGE** \_\_\_\_\_**BABY'S BIRTH WEIGHT/LENGTH/HEAD CIRC.**

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*Information obtained from the demographic and infant feeding practices questionnaire will assist us in targeting infant nutrition programs more effectively. Although we greatly appreciated your participation, participation is voluntary and you do not have to answer any question(s) you do not wish.*

**SECTION A - FAMILY BACKGROUND INFORMATION**

Please Check the Appropriate Response

1. I am the baby's:

☐ Mother☐ Nanny☐ Father☐ Other (specify) \_\_\_\_\_☐ Relative

2. What is your age?

	Baby's mother	Baby's father
< 20 years	<input type="checkbox"/>	<input type="checkbox"/>
20-24 years	<input type="checkbox"/>	<input type="checkbox"/>
25-29 years	<input type="checkbox"/>	<input type="checkbox"/>
30-34 years	<input type="checkbox"/>	<input type="checkbox"/>
35+ years	<input type="checkbox"/>	<input type="checkbox"/>

3. What is your present living status?  
(You may check more than one)☐ Living alone☐ Living with family or relatives☐ Living with spouse/partner☐ Living with friends

4. What is your marital status?  
(check only one)

- ☐ Legally married/common-law  
☐ Separated but still legally married  
☐ Divorced  
☐ Widowed  
☐ Never married (single)

5. How many children, in total live in the household?

6. Please check the highest level of schooling that you have completed.

	Mother		Father	
	Some	Completed	Some	Completed
Secondary (high) school?		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Community college, technical or vocational training		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
University		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Graduate degree		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other training? (specify)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<hr/>		<hr/>	

7. What is your usual occupation?

Mother 

---

Father 

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8. If you are on maternity leave, how long do you have? \_\_\_\_\_
9. How old will your baby be when you go back to work? \_\_\_\_\_

10. Which of the following describes your family income per year?

- ☐ Less than \$10,000
- ☐ \$10,000 - \$19,999
- ☐ \$20,000 - \$29,999
- ☐ \$30,000 - \$39,999
- ☐ \$40,000 - \$49,999
- ☐ \$50,000 - \$59,999
- ☐ \$60,000 - \$69,999
- ☐ \$70,000 - over

11. Were you born in Canada?

- Mother ☐ Yes
- ☐ No (please state country of birth) \_\_\_\_\_
- Father ☐ Yes
- ☐ No (please state country of birth) \_\_\_\_\_

12. How many years have you lived in Canada?

Mother \_\_\_\_\_ yrs

Father \_\_\_\_\_ yrs

13. What language is spoken most often at home?

- i) English ☐
- ii) French ☐
- ii) Other ☐ specify \_\_\_\_\_

14. Canadians belong to many ethnic or cultural groups. To which ethnic or cultural group(s) do you belong (please consider your usual social/cultural practices)? Mark or specify more than one, if applicable. Please answer for mother and father of the child as applicable.

	Child's Mother	Child's Father
<b>British,</b> specify country	<input type="checkbox"/> _____	<input type="checkbox"/> _____
<b>French,</b> specify	<input type="checkbox"/> _____	<input type="checkbox"/> _____
<b>European,</b> specify country	<input type="checkbox"/> _____	<input type="checkbox"/> _____
<b>First Nations,</b> specify	<input type="checkbox"/> _____	<input type="checkbox"/> _____
<b>Asian,</b> specify country	<input type="checkbox"/> _____	<input type="checkbox"/> _____
<b>Latin American,</b> specify country	<input type="checkbox"/> _____	<input type="checkbox"/> _____
<b>Arab,</b> specify country	<input type="checkbox"/> _____	<input type="checkbox"/> _____
<b>Canadian,</b> specify	<input type="checkbox"/> _____	<input type="checkbox"/> _____
<b>Other,</b> specify	<input type="checkbox"/> _____	<input type="checkbox"/> _____

15. Are you: (Mark or specify more than one, if applicable)

	Child's Mother	Child's Father
Chinese	<input type="checkbox"/>	<input type="checkbox"/>
South Asian (East Indian, Punjabi, Sri Lankan, Pakistani, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
South East Asian (Filipino, Indonesian, Laotian, Vietnamese, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
White/Caucasian (European, etc.)	<input type="checkbox"/>	<input type="checkbox"/>
Other - Please specify,	<input type="checkbox"/>	<input type="checkbox"/>

16. Canadians often have food related practices and beliefs about food which are associated with a particular ethnic or cultural background(s). Which ethnic or cultural background(s) do you associate **your usual food related practices** with?

*For example: Western/North American, British, Vietnamese, Chinese, Mediterranean, Hindu, Moslem, Sikh, etc.*

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17. Do you **exclude** any of foods from your family diet?

Mother ☐ No                      Father ☐ No  
☐ Yes, specify below                      ☐ Yes, specify below

<input type="checkbox"/> Beef	<input type="checkbox"/> Vegetables
<input type="checkbox"/> Pork	<input type="checkbox"/> Fruit
<input type="checkbox"/> Poultry	<input type="checkbox"/> Breads/Cereals
<input type="checkbox"/> Fish	<input type="checkbox"/> Pasta
<input type="checkbox"/> Eggs	<input type="checkbox"/> Rice
<input type="checkbox"/> Dairy products	<input type="checkbox"/> Beans, peas or lentils
<input type="checkbox"/> Nuts, seeds or peanut butter	

Comments \_\_\_\_\_

## 18. Does your family have any particular diet practices for medical, religious, or other reasons?

Yes ☐ (please describe below)  
 No ☐

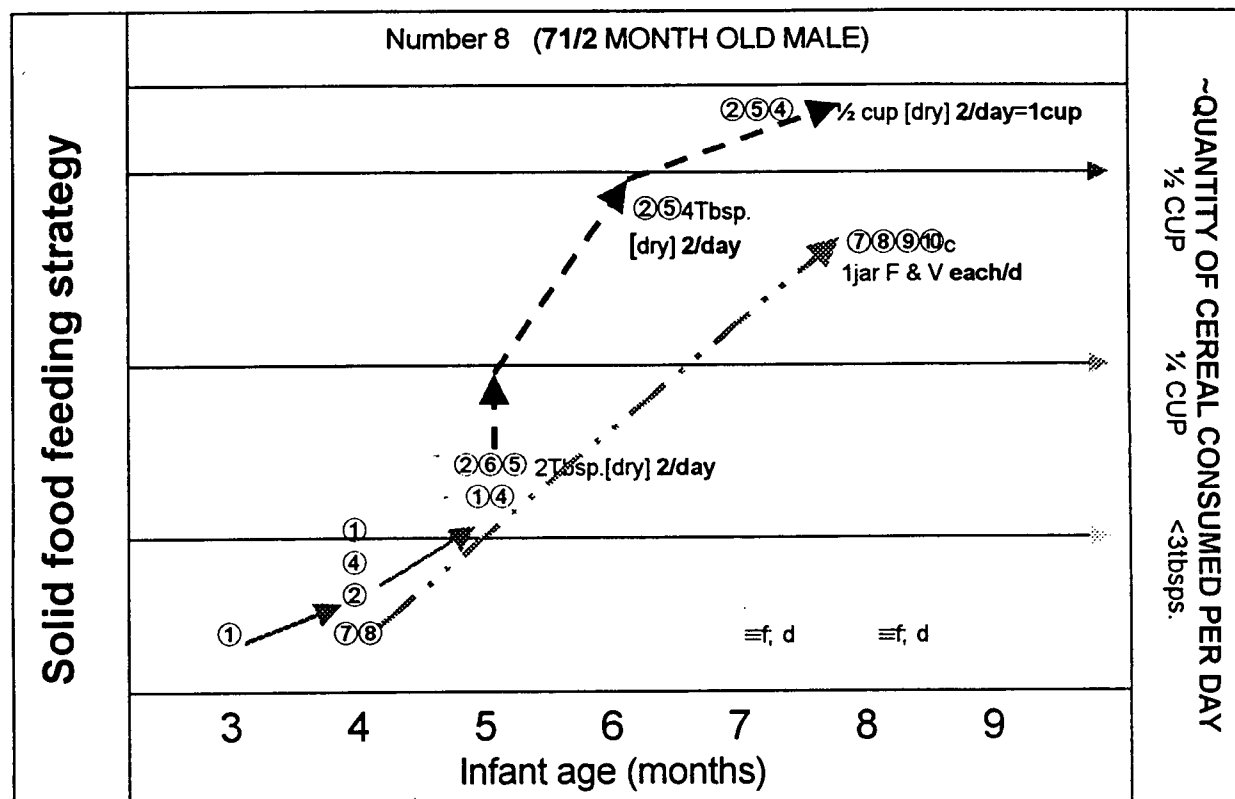
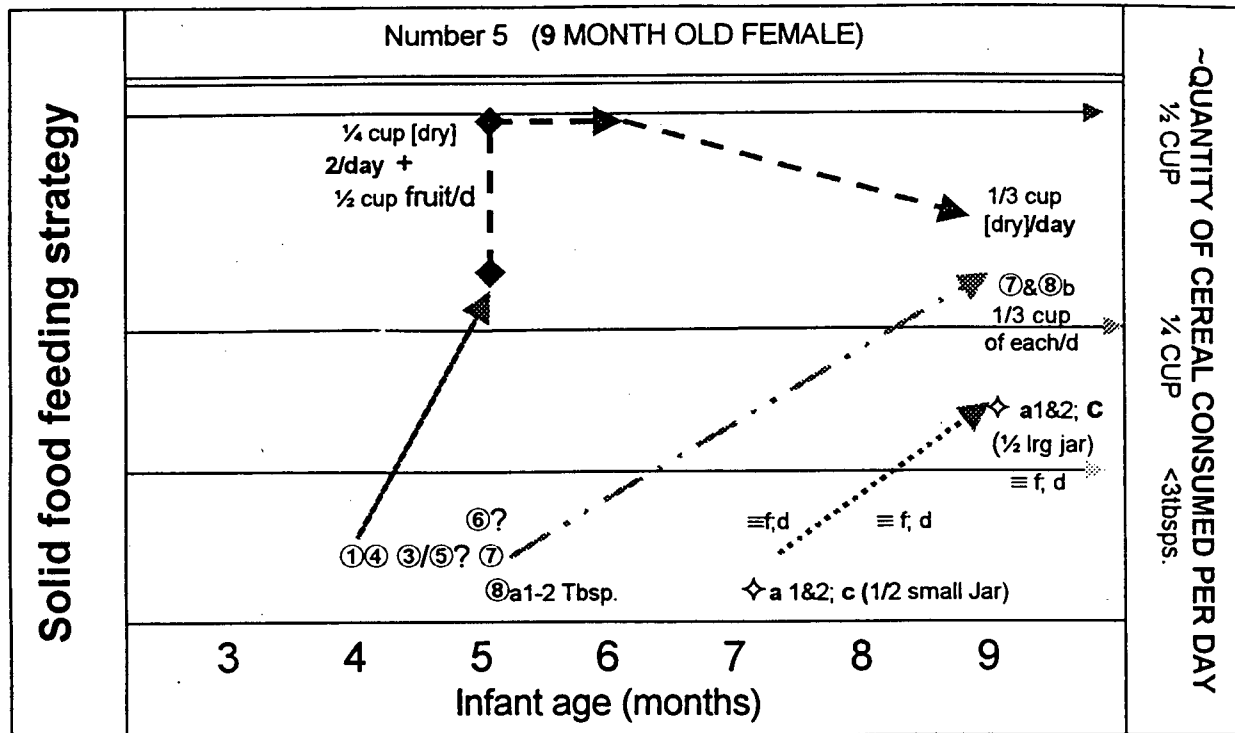
Comments \_\_\_\_\_

## 19. Does your baby go to play group, babysitter's home, day care centre or nursery school once a week or more?

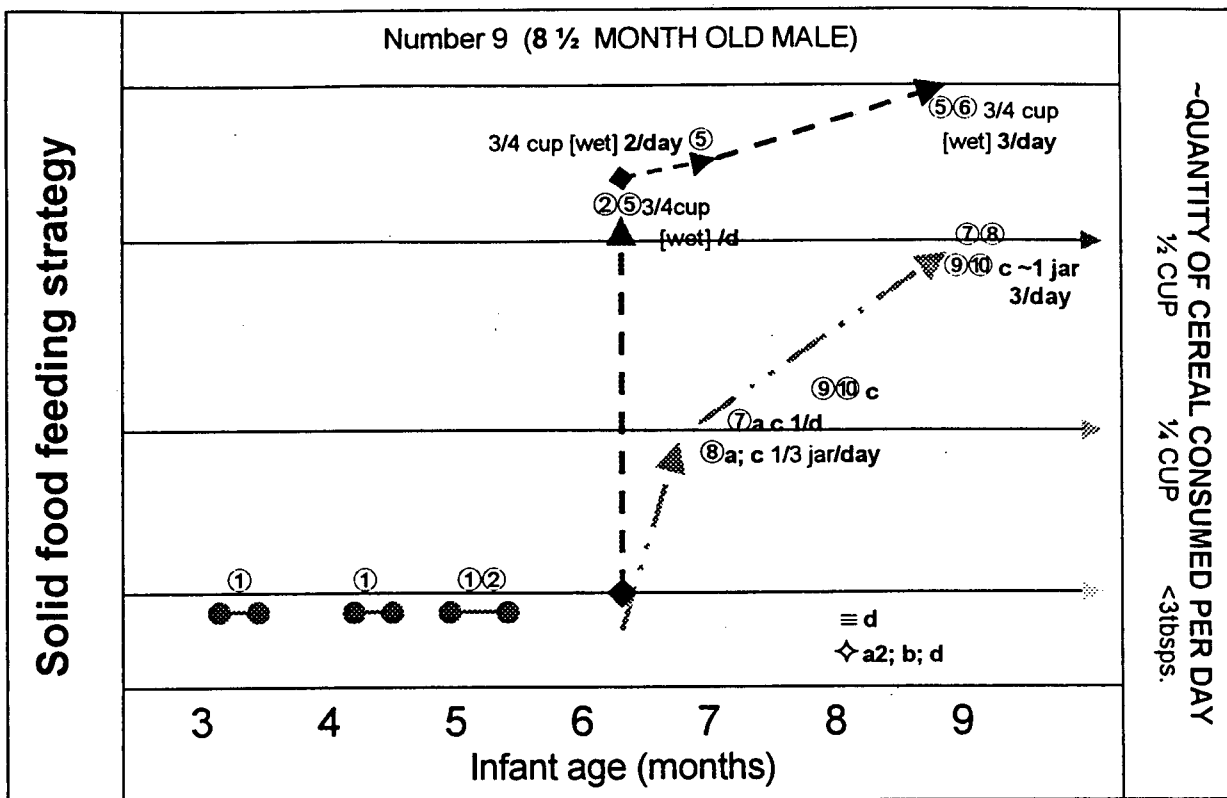
Yes ☐ if yes, specify \_\_\_\_ days per week  
 No ☐ \_\_\_\_ hours per day  
 \_\_\_\_ number of children who attend with your child

*Thank you for your time and cooperation  
 in completing this questionnaire.*

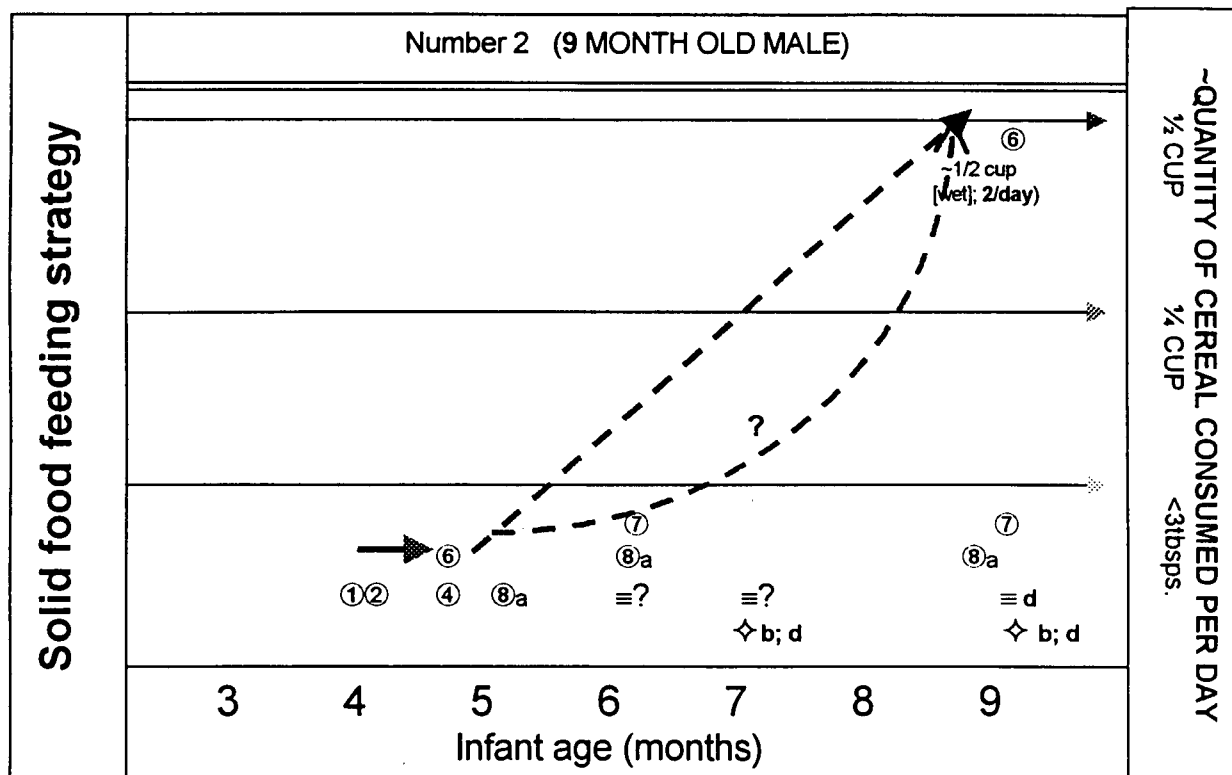
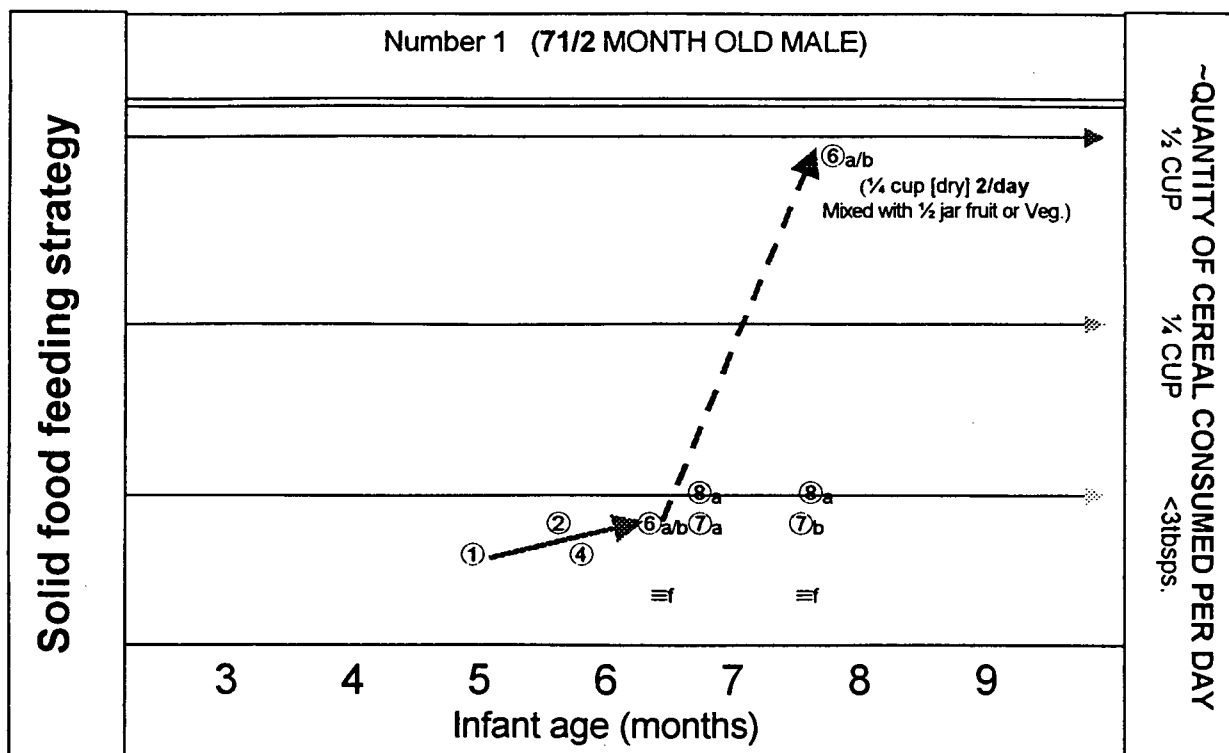
## High cereal consumption pattern



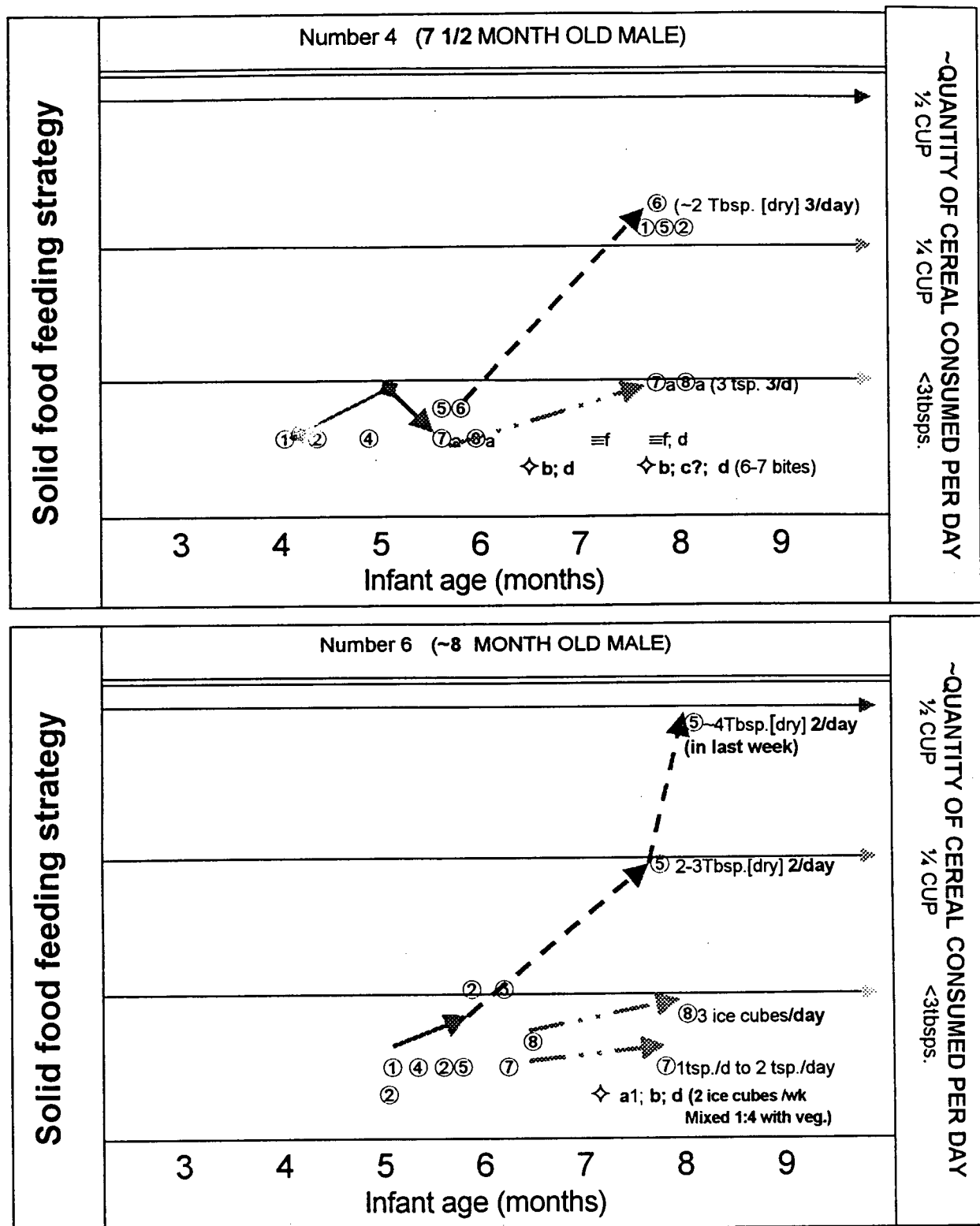
## High cereal consumption pattern

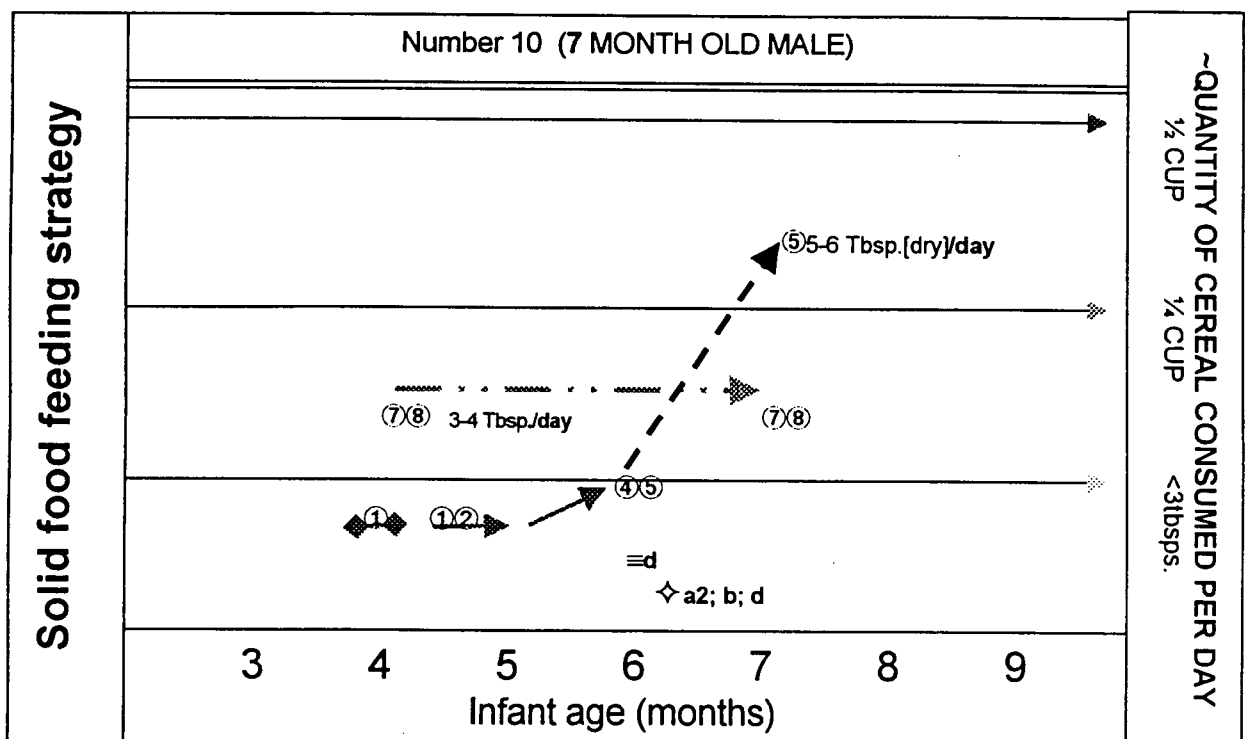
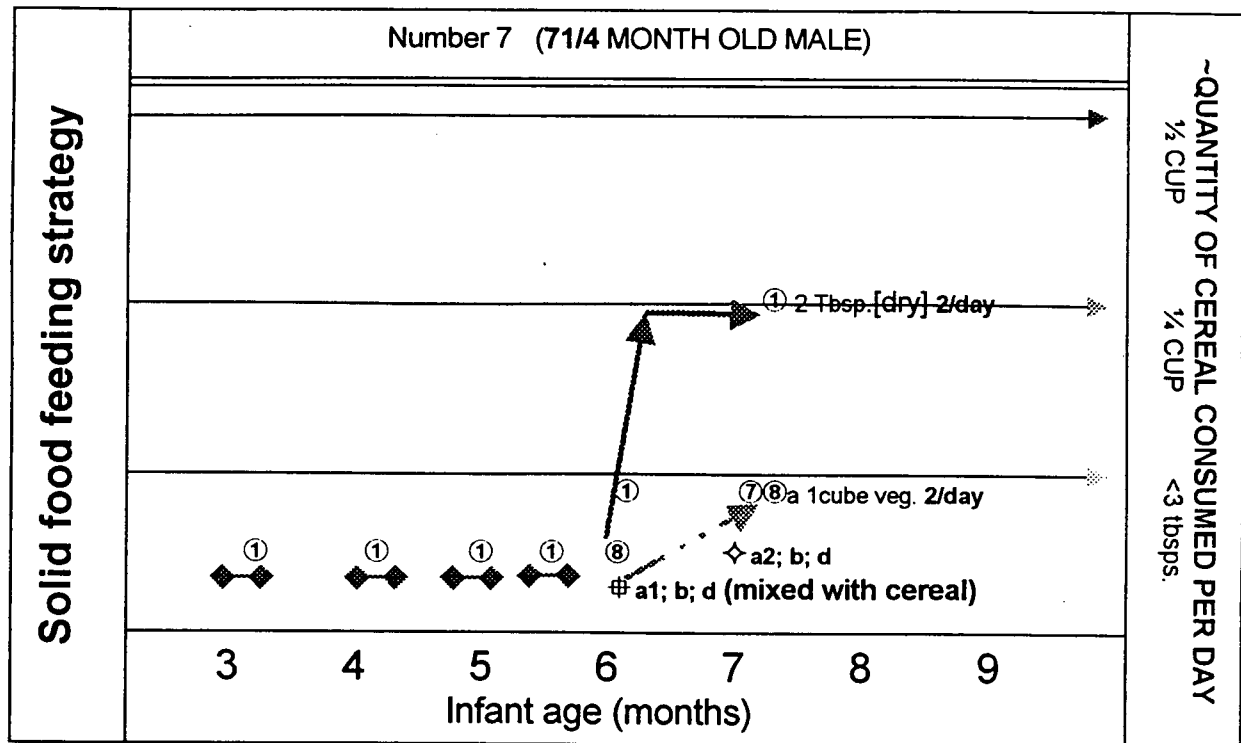


## Medium cereal consumption pattern

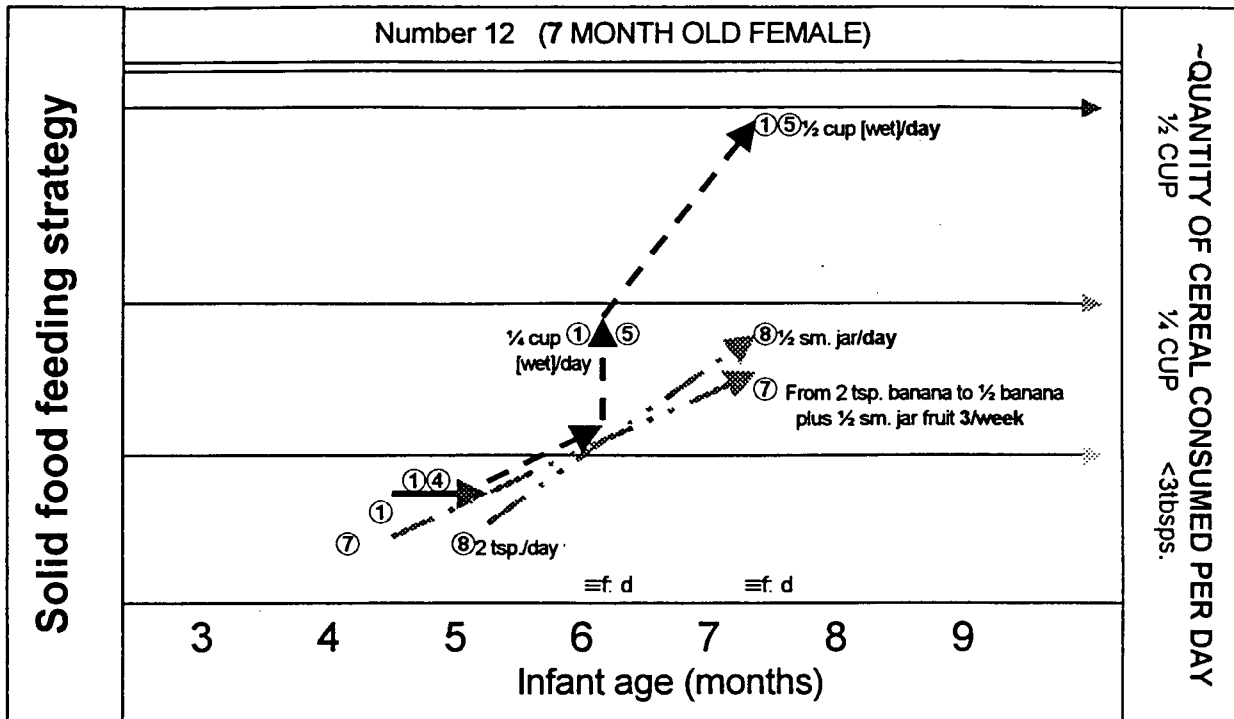


## Medium cereal consumption pattern

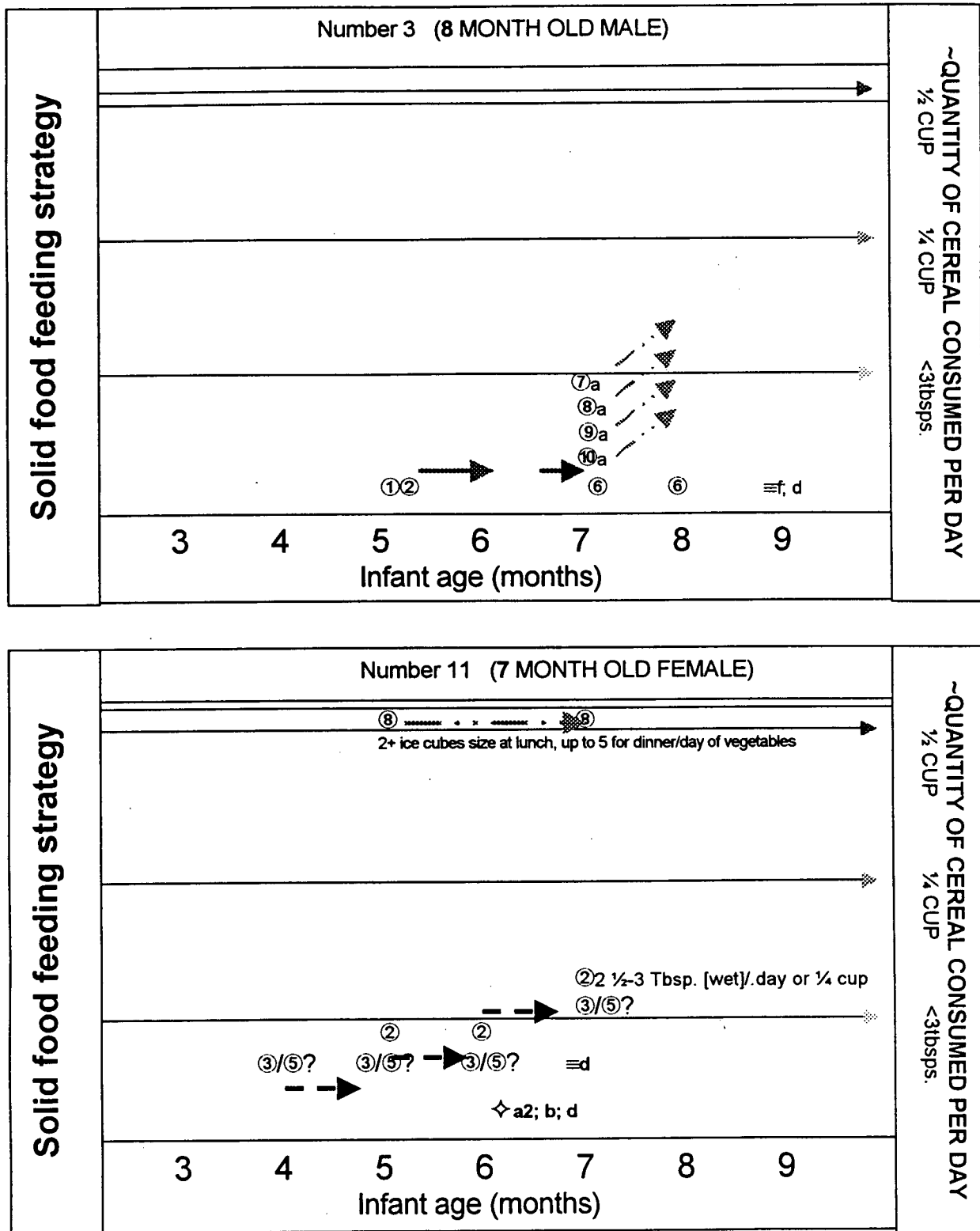




### Medium cereal consumption pattern



## Low cereal consumption pattern



### The feeding strategies/techniques

that mothers appeared to use in order to promote solid food acceptance.

*"The actual feeding process itself is going quite well. We feed (baby) when we eat. And we pull his high chair right up with us...and between when we are cutting our own food and feeding ourselves he's eating, you know; we are dealing with him. Yeah, and I think that's also...made it easier...for him to eat. Like before, when you're just sitting there and you are just spooning it into his mouth, he's kind of like, what's this all about. Whereas...we'll stop and we will say, "**see (baby), you chew**" and talking to him, and **he is watching** what you are doing....I have found that, umm you know, there may have been times where maybe if I am giving him lunch and I am not really having my lunch he doesn't eat as much and so I'll grab an apple and I'll **start eating** a apple and he'll eat more and he will continue eating so. Yeah, and also he'll, umm I start just feeding him and he'll kind of, he'll stop and he'll start fussing and if I give him a spoon so that he holds onto a spoon he'll eat...more. **He'll start eating again**...so I'll hold onto the dish and he'll whack his spoon into the dish...and I will give him the lid (Tuppaware containers) and so he likes either chewing on the lid or he likes putting the lid on the dish. He'll put it on and watch it fall off and put it back on again and in between I am still (she gives cues as if feeding)...And it's distracting...but the **distracters are related to the food**. The spoon and the lid for the dish... Yeah yeah and the spoon, he will chew on the spoon as well. ...And then, you know, in between, then I am putting my spoon in his mouth and he is getting the food that way and I think it helps because he is teething as well, so it helps that he's got something to chew on, for his **teething**. But really the way he plays with the spoon in the bowl, he's like, it's more like he's got some **control** over what's happening to him. You really can see that...And I **let him play** with the food with his fingers and I let him touch the food but my husband doesn't. My husband is much cleaner. You can tell who has fed him. And then at the end of it, I give umm a facecloth, a wet facecloth and I put it in front of him and he always grabs it and starts chewing on it. So he kind of partly wipes his own face, **because that was a real bit of a battle at first** to try and wipe his face and **then I realized**...he kind of plays with it for a while and then I go back and tidy up (6-706-778)".*

### Summary of individual solid food feeding strategies between the mothers.

0001 MED	<p><b>0001</b> 1-Initially 'give in' and BF 2-Trying to stuff in his mouth 3-Switched to oat 4-Mixed with fruit and later Vegetables. 5-Limited the Breastfeeding <b>Outcome:</b></p>	0007 MED	<p><b>0007</b> 1-Tried cereal at 3 mo. Stopped. Fed on a regular basis at 6 mo. (Sporadic versus Routine Feeding) 2-Coordinate 'feeding' (good mood/ sit still, space between meals) 3-too difficult...so give a bottle... get him focused on eating.. wants to play 4-Strapping into car seat/high chair to feed bottle 5-Food distracters (toys) <b>Outcome: "worried". No weight gain in ~2 months</b></p>
0002 MED	<p><b>0002</b> 2-1.'Give in' and breastfeed 2-Initially pry with spoon (1169) 3-Switched to barley &amp; oat which he loved 4-Now he has his food toys <b>Outcome:</b></p>	0008 HIGH	<p><b>0008</b> 1-Make Pablum thick and lumpy 2-Routine Feeding 3 meal/day (more content) 3-Not introducing Finger foods (Fear of Choking) <b>Outcome:</b></p>
0003 LOW	<p><b>0003</b> 3-1.Offering one food/ time 2.Mixing with fruit/vegetable after 6 mo. 3-Switched to Earth's Best @ 7mo. <b>Outcome:</b></p>	0009 HIGH	<p><b>0009</b> 1-Mixing cereal + formula quite dry, feed vegetables on the side 2-Feed when baby is hungry. No set schedule flexible (4:30-7pm) 3-If he likes something we go with it 4-At first he spit it out (cottage cheese)...Just kept putting it back in 5-Follow his lead. LS-Mother responds <b>Outcome:</b></p>
0004 MED	<p><b>0004</b> 4-1.Switching types and brands (✓ Milupa) 2-Mixing with juice then Juice + fruit 3-'Giving in' (sweeter foods) 4-Give Vegetable. &amp;/or Combination first 8tsp. ...fed up... then give cereal mixture 5-Now feeding when we eat = Socializing "family meals" <b>Outcome:</b></p>	0010 MED	<p><b>0010</b> 1-Switching types (Milupa Mixed) 2-Make Home Made Food 3-Figure out if hungry or just doesn't like what we are giving 4-Being more creative...Hiding dislikes with likes "sneaking" 5-Eating with infant = eating together when baby eats. Routine family Meals (relaxing) 6-Play with food <b>Outcome:</b></p>
0005 HIGH	<p><b>0005</b> 5-1-No morning bottle. Cereal fed first 2-Mixing meats in a lot of vegetables 3-Buying a combination meat or make own (switching) 4-Adding butter/cheese to potatoes <b>Outcome:</b></p>	0011 LOW	<p><b>0011</b> 1-Mixing cereal with formula 2-Feed cereal before bottle in the morning and then hold back bottle if infant doesn't eat enough cereal <b>Outcome:</b></p>
0006 MED	<p><b>0006</b> 6-1-Fed cereals and vegetables on back for first month 2-Hold back on fruit (tart/rash) 3-Mashed/pureed/really have to mix it ( meat) with vegetables 1:4 ratio (homemade)=thinned 4-Use of distracters (toys) related to the food 5-Family meals 6-Parent(s) eating when feeding LS-Role Modeling-Mimicking 7-Giving control (spoon/lids etc) LS-Engaging infant in eating process. <b>Outcome:</b></p>	0012 MED	<p><b>0012</b> 1-Switching brands/types of cereal <b>*Outcome: "fight it" up until a month ago/not interested between 4 1/2 and 6 months. "worried" No weight gain for ~2 months</b></p>

Low/Medium/High indicates the infant's level of cereal intake identified from the transition graphs