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Iron Content in the Diets of Rural Honduran Women and Children

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Executive Summary

1. Introduction

According to FAO/WHO, over a third of the population in developing countries is anemic. Young children and women, especially pregnant women, are most affected. Iron deficiency, the major cause of nutritional anemia, is the most prevalent micronutrient deficiency in the world. Iron deficiency is associated with reduced work capacity in adults; increased maternal mortality and low birth weight in pregnant women; and reduced learning capacity, impaired attentiveness and irritability in children.

Among the main causes of iron deficiency anemia are inadequate intake, poor availability of absorbable iron from the diet and excessive losses. There is a large variation in the availability of dietary iron based on the source from which it is derived and on the presence of other factors in the diet which may enhance or inhibit iron absorption and utilization.

This study investigates the level of iron intake and bioavailability for women and children in rural western Honduras in various age, socio-economic and nutritional categories.

2. Source of Data and Methodology

The data used in these analyses were obtained as part of a comparative study on costs and effectiveness of alternative food and nutrition programs in Honduras, conducted by the Latin American and Caribbean Health and Nutrition Sustainability (LACHNS) project. The study sampled a group of households participating in Mother-Child Health programs in the rural western part of the country.

Data were collected from 1418 households on household characteristics, expenditure, dietary intake, and anthropometry. Dietary data were collected at the household level on three non-consecutive days based on a recall of the past 24 hours. In addition, in each household, the proportion of food consumed by one mother and two of her children (up to the age of 9 years, and at least one of whom was below 5 years) was also noted. Data collection was completed between July and December 1994.

The WorldFood Dietary Assessment Program (Version 2), developed by the University of California, Berkeley, was used for analyzing iron content of the diets consumed by women and children in the sample. The computations for iron were done for each meal in order to include the effects of enhancers and inhibitors in the diet on iron availability.

A diet from which the availability of iron is 5 percent is considered a low bio-availability diet, and is characterized as a simple, monotonous diet containing cereals (maize, beans, whole wheat flour, sorghum, etc.), roots and tubers and negligible quantities of animal foods and ascorbic acid rich foods. The phytate levels in this diet are very high. The corn based Honduran diet largely falls into this category (unless significant amounts of enhancers are consumed). Coffee consumption in

Honduran diet also lowers availability of iron. Each cup of coffee consumed with the meal can reduce the availability by 20 percent to a maximum of 60 percent.

In order to estimate the population at risk of having inadequate intake of iron, the WorldFood2 program uses an approach based on a comparison of the distribution of nutrient intake with that of nutrient requirement. The WorldFood2 program uses iron requirements defined at two levels: basal requirement and requirement to prevent anemia. Basal requirement of iron is defined as the amount of dietary iron required to maintain a normal supply of iron to tissues and preserve all clinically detectable functions. The requirement to prevent anemia is defined as the level of dietary iron intake needed to prevent a fall in hemoglobin to levels below the cut-off points proposed by WHO as suggesting the presence of anemia.

3. Results

3.1. Iron in Diets of Honduran Children

3.1.1. Dietary iron

Male children tend to consume slightly higher amounts of gross total iron in their diets. There is no statistical difference between the amount of enhancers and inhibitors in the diets of male and female children. The average amount of iron available to male children is significantly higher compared to the female children, though the difference in absolute values is rather small. There is however, no significant difference in the estimates of probabilities of having inadequate intake between boys and girls because boys tend to be heavier and have higher iron needs when calculated on the basis of per kg body weight during the pre-puberty years. The absolute differences in iron intake between the two groups are rather small and may not necessarily be suggestive of gender discrimination in child rearing. It is, however, crucial to stress the importance of iron in the diets of young girls, given that the intakes by young Honduran women are poor.

The total amount of iron consumed in the diet increases with age. Coffee is introduced in the diet soon after birth. The inhibiting role of coffee in iron absorption becomes more important as children get older and increase their coffee consumption. By six years of age children on average consume about one cup of coffee per day. Breast feeding is common among children under 18 months of age with close to 90 percent of children under 12 months of age and almost 75 percent of 12 - 18 month olds being breast fed. The high levels of ascorbic acid in the diets of children under 18 months of age is attributable to their breast feeding status. Owing to the high level of availability of iron from breast milk (50 percent), the percent of iron available from the diet is highest for younger children most of whom are breast fed. Children between 3 - 12 months of age absorb about 8.45 percent of the iron in their diet. As they get older, and start eating the low bio-availability Honduran diet and start increasing their coffee consumption, the average percent of iron absorbed goes down to 4.75 percent by the time they are in the 6 - 12 year age group.

The probability of having an inadequate intake is highest for the youngest children in the sample and goes down with increasing age. Fifty-seven percent of the children in the age group 3 months - 1 year; 23 percent of the 1-2 year olds and 11 percent of the 2-6 year olds are likely to have inadequate intakes at levels to prevent clinical signs of anemia.

3.1.2. Iron in diets of breast fed children

On average, breast milk provides between 0.13 to 0.16 mg of dietary iron to children who are breast fed depending on their age. Breast fed children seem to do poorly in terms of the average total gross iron intake from their diets. Though all children are fed very small amounts of animal foods, children who are not breast fed obtain almost two to three times as much iron and protein from animal sources. In the 12-18 month age group the non-breast fed group consumed twice as much coffee as the breast fed group. The average intake of ascorbic acid and percent of dietary iron available is significantly higher in the breast fed group in both age categories. The probability of having an inadequate intake of iron is high in all the categories. For the younger children the probability of having an inadequate intake is significantly higher in breast fed children. In the older age group, there are no significant differences in the probability of having an inadequate intake between the two categories.

3.1.3. Dietary iron and socio-economic indicators

The total amount of iron in the diet of children is not significantly different across expenditure quartiles. However, the amount of available iron as well as the percent of dietary iron available is significantly higher among the higher expenditure groups. This is because of the better quality of the diet of children from richer households as measured by animal foods and foods rich in ascorbic acid in the diet. One would expect that if the bio-availability of iron was higher, the probability of inadequate intake among children would be lower. The findings show, however, that there is no significant difference between the probabilities of inadequate intake across the four expenditure quartiles. The reason for these findings is that children from richer households tend to have better nutritional status and weigh more. They, therefore, have higher total requirements for iron based on per unit body weight compared to children from lower income households who have lower body weights and therefore lower total requirements.

3.1.4. Dietary iron and nutritional indicators

While total iron intake among stunted children was somewhat higher, the quality of diet as measured by consumption of meat, fish and poultry and foods rich in ascorbic acid was significantly better among children who were not stunted. The stunted category consumed significantly higher levels of coffee compared to the non-stunted category. The slightly higher amount of total iron consumed by the stunted category is off-set by the presence of inhibitors in higher quantities and enhancers in lower quantities in their diet. There is no significant difference in the total iron available in the diets of stunted and non-stunted children. The probability of having inadequate intake to prevent deficiency was significantly higher among non-stunted children. Since the stunted children weigh significantly less than non-stunted children, their

requirements, when estimated based on per unit body weight, are lower and hence their intakes appear adequate when compared to their requirements.

In general, for children, caloric adequacy seems to be a reasonable predictor of iron status of the diet with 48 percent of the children with caloric adequacy below 65 percent having diets which are almost certainly likely to be inadequate and slightly over 50 percent with caloric adequacy above 120 percent having diets which are almost certainly adequate in iron. The percent of children having diets that are almost certainly inadequate in iron falls from 48 percent to 0.63 percent as the caloric adequacy level increases from 65 percent to greater than 120 percent.

3.2. Iron in the Diets of Honduran Women

3.2.1. Dietary iron

The average total iron in the diet of women over 16 years of age is about 25 mg. Like their children, women in the rural western part of Honduras consume very small amounts of animal foods in their diets. The average ascorbic content of the diet for different physiological categories is 20 mg or slightly less. The women in the sample on average consume slightly over one and a half cups of coffee per day. After taking into account the bio-availability of iron and the role of enhancers and inhibitors in the diet, less than 5 percent of dietary iron is available for absorption.

At basal level (no clinical signs of iron deficiency) the mean probability of having an inadequate intake is in the range of .48 to 1.00. Almost all of the pregnant women in the sample, one fifth of the lactating women and a third of non-pregnant non-lactating women are at risk of developing anemia. While the total amount of iron in the diets of women is not very low, the poor bio-availability of iron from a corn based diet coupled with low levels of enhancers viz. ascorbic acid and animal (meat, fish and poultry) foods and an average consumption of over one and a half cups of coffee per day limits the availability of iron.

3.2.2. Dietary iron and socio-economic status

As the households get richer, the iron content of their diet goes up slightly, the quality of their diets improve, and so does the availability of iron. Women from richer households tend to consume significantly higher amounts of animal foods and have a significantly higher intake of ascorbic acid. The mean probability of inadequate intakes is slightly lower among women from higher income households. Household headship affects the women the same way as it does their children, with women from female headed households faring poorly compared to those coming from male headed households (without, however, controlling for the economic status of the household).

3.2.3. Dietary iron and caloric adequacy

As the level of caloric adequacy for women goes up, the total amount of iron in the diet, the amount of ascorbic acid as well as the amounts of iron and protein derived from meat, fish and protein increases. The probability of having an inadequate intake at the basal level falls from about 95 percent in the lowest caloric adequate group to 42 percent in the highest caloric adequacy group. As the diets of women become more adequate in calories, they also tend to consume more coffee. This higher intake of coffee is responsible for the lowest percent of dietary iron available in the highest caloric adequacy group which consumes the highest amount of coffee.

Is caloric adequacy a good proxy for iron status of the diet of Honduran women? While the likelihood of consuming a diet adequate in iron increases with increase in level of caloric adequacy, there are a significant number of women with over 100 percent caloric adequacy whose diets are still inadequate in iron. About 36 percent of women whose levels of caloric adequacy are over 100 percent have diets which are almost certainly inadequate in iron. And about 56 percent of them have diets which are likely to be inadequate in dietary iron.

3.3. Dietary Iron Compared To Requirements For Women and Children

Based on the requirements laid out by the FAO/WHO joint consultation group, children under one year of age and pregnant women are most at risk of having inadequate intakes followed by 1-2 year olds and 6-12 year olds. Children in the age group 2-6 years, non-pregnant and non-lactating women and lactating women appear to have median intakes which are more or less in line with the recommendations of the expert committee.

3.4. Sources of Iron in the Diet of Honduran Children and Women

Maize, red beans and corn meal are the most important contributors of iron in the diets of Honduran women and children. While foods like dried fish, corn-soy blend (CSB), liver, spinach and shell fish provide a significant amount of iron to those consuming them, they are actually eaten by less than 1-2 percent of the sample. Other foods of animal origin such as fish, chicken, beef, and pork, which have iron whose bio-availability is higher and also help to improve the bio-availability of non-heme iron in the diet, are consumed by a larger proportion of the population.

4. Conclusions

The dietary iron status of this non-representative sample of Honduran women and children in the rural west of the country is very poor. Almost 40 percent of all children under 6 years of age have iron intakes inadequate to prevent clinical signs of iron deficiency. Among the children, the worst off are those between 3-12 months of age with 71 percent having inadequate diets; 47 percent of 1-2 year olds also have inadequate diets. As the children get older the percent having inadequate intakes falls. All of the pregnant women, 50 percent of lactating women and 62 percent of non-pregnant and non-lactating women in the sample are at risk of having inadequate dietary intakes to prevent any clinical signs of iron deficiency.

Most of the dietary iron in the diets of Hondurans is derived from corn and corn based products. Due to the high phytate content the absorption of iron from corn in very poor. Foods of animal origin, which have heme iron and which also improve the availability of iron from non-heme sources are consumed in very small amounts especially by younger children. Ascorbic acid which is another enhancer for absorption of iron from non-heme sources and is derived from fresh fruits and vegetables is also consumed in very inadequate amounts. Greens which are rich in both iron and ascorbic acid are consumed by less than 2 percent of women and children in the sample.

Coffee, a very popular drink in Honduras for all age groups, inhibits iron absorption in all age categories. The inhibiting role of coffee becomes important as early as 1-2 years of age by which time children on average are consuming about half a cup of coffee per day. Iron absorption is lowered by about 8 percent because of coffee in this age group. By the time children are 6 years and over, coffee lowers the iron absorption by 13 percent. Women lower their iron absorption by 17 percent by drinking an average of one and a half cups of coffee per day.

The consumption of ascorbic acid and foods of animal origin is associated with socio-economic status. As the households get richer women and children eat more foods rich in ascorbic acid and foods of animal origin. Coffee consumption is not affected by the expenditure level of the household.

About 90 percent of children under one and 75 percent of those between 12-18 months breast feed. Half of the iron in breast milk is absorbable compared to 5-15 percent of the non-heme iron. However, the absolute amount of iron in breast milk is very low. In the sample, children who were breast fed had lower iron intakes. Those below one year of age and breast feeding were significantly more likely to have inadequate intakes of iron to prevent signs of deficiency compared to those who were not breast fed. In this sample, breast fed children are not given as much other food as the non-breast fed group, including foods of animal origin. This is not to say that the practice of breast feeding is detrimental to iron status of children. In spite of having lower gross intake, breast fed children one year and older were as likely to have an inadequate intake as their non-breast fed counterparts. In addition there are definite advantages of breast feeding. In addition to having a highly bio-available form of iron, breast milk also tends to keep the coffee consumption lower among 1-2 years olds. An effort should be made to introduce iron rich foods, both of plant and animal origin, in the diets of all children after 4-6 months of age along with foods rich in ascorbic acid.

There is a strong association between caloric adequacy and iron intake both in women and children. However, in the case of women, about 56 percent of those with level of caloric adequacy at 100 percent or more have diets which are likely to be inadequate in iron. Only 13 percent of children with caloric adequacy of 100 percent or more have iron inadequate iron intakes. Therefore, caloric adequacy should not be taken as an indicator of overall adequacy of the diet, especially among women.

5. Recommendations

5.1. Children

Encourage mothers to exclusively breast feed for the first few months as additional dietary iron from supplemental foods is not absorbed by the children and may in fact interfere with the absorption of iron from breast milk. Start supplementing the diets of all children at 4-6 months with iron rich foods. Along with corn and bean based foods, introduce foods of animal origin as well as foods rich in ascorbic acid. Use of low cost foods such as greens, soybeans, and cheaper meats and fish should be encouraged. Discourage coffee consumption by all children of all ages.

5.2. Women

Since the iron requirements of pregnant women are very high, diets alone will not be able meet their needs. Therapeutic doses of iron supplements would be necessary to bridge the gap between intakes and increased requirements during pregnancy.

As in the case of children, use of low cost foods such as greens, soybeans, and cheaper meats and fish by women should be encouraged to increase iron intake. Fresh fruits and vegetables consumption should also be increased so that bio-availability of iron from the primarily corn based diet can be improved. Coffee consumption should be limited to meals where no iron rich foods are consumed. Since most of the iron in the Honduran diet is coming from corn which is consumed at all the meals, women should be advised not to drink coffee within an hour of consuming any meal.

5.3. Fortification

Since the traditional Honduran diet does not include significant quantities of iron rich foods, and given the high cost of some of the iron rich foods with high bio-availability, increasing dietary intake of iron by modifying existing diets may not be easy to achieve. As an alternative, fortifying staple foods such as corn or a corn product with iron may be a good way to enhance the dietary intake of iron. Corn could be a suitable medium for this population since it is consumed by a large fraction of the vulnerable population and is introduced early in the diets of small children.

1. Introduction

According to FAO/WHO, over a third of the population in developing countries is anemic. Young children and women, especially pregnant women are most affected. The number of children and women affected by anemia in Latin America is estimated to be 26 percent and 17 percent respectively (FAO, 1988). Iron deficiency, the major cause of nutritional anemia, is the most prevalent micronutrient deficiency in the world. Iron deficiency is associated with reduced work capacity in adults; increased maternal mortality and low birth weight in pregnant women; and reduced learning capacity, impaired attentiveness and irritability in children.

Among the main causes of iron deficiency anemia are inadequate intake, poor availability of absorbable iron from the diet and excessive losses. There is a large variation in the availability of dietary iron based on the source from which it is derived and on the presence of other factors in the diet which may enhance or inhibit iron absorption and utilization. Ascorbic acid and animal protein (derived from meat, fish and poultry) enhance iron absorption from a mixed diet. Coffee and tea and foods rich in phytates and calcium are among the major inhibitors of iron absorption.

The results of the Nutrition Collaborative Research Support Program (NCRSP) show that among Mexican toddlers (18 - 30 months), the prevalence of iron intakes likely to be inadequate to prevent anemia is 43 percent (Murphy, Beaton and Calloway, 1992). Absorption of iron from corn has been found to be low in Mexican diet (Martinez-Torres et. al., 1987, Rosado et.al., 1992). The Honduran diet, which is similar to the Mexican diet in terms of its dependence on corn, is in fact less diverse than Mexican diet. Over 50 percent of the calories in the diets of people in the rural west of Honduras are derived from corn products (Rogers, Swindale and Ohri-Vachaspati, 1996). Diets with such high dependence on grain are very high in phytates. The bio-availability of iron from such diets is no more than 5 percent (FAO, 1988). Consumption of coffee, which is also very prevalent in all age and income groups in Honduras, is expected to be another major inhibitor of the availability of iron. Earlier studies have shown that the Honduran diet is inadequate in calories and Vitamin A (Rogers, Swindale and Ohri-Vachaspati, 1996; Sanghvi et.al., 1995). This study investigates the level of iron intake by women and children in Honduras in various age, socio-economic and nutritional categories.

2. Source of Data

The data used in these analyses were obtained as part of a comparative study on costs and effectiveness of alternative food and nutrition programs in Honduras conducted by the Latin American and Caribbean Health and Nutrition Sustainability project. Details of the survey design and sampling procedure can be found in Magnani (1993). The sampling procedure was designed for a cross-sectional comparison of MCH programs in the rural western part of the country. A list of all government and community-based health centers in the region was drawn up and organized into four categories of food and nutrition programs. From each of these categories, 20 centers were randomly selected. A list of program participants was drawn up for each of the randomly selected samples. The participants were then grouped by community. Communities were selected randomly followed by random selection of households within the community. A

fixed number of individuals were selected per health center, which were selected from each community in proportion to the total number of beneficiaries per community. Since the aim of the study was to investigate the cost effectiveness of alternate food and nutrition programs, the sample was selected based on participation in one of the food and nutrition programs, and is therefore not representative of the population. The same number of households were selected from each of the health centers offering different food and nutrition programs, even though the proportions of the population benefiting from the different programs were not the same (Sanghvi et.al. 1995). While the results of the present study will give a good overall picture of the iron status of women and children in rural western Honduras, it should be noted that they will not be representative of the general population in the region.

3. Methodology

From the selected sample, data were collected from 1418 households on household characteristics, expenditure, dietary intake, and anthropometry. Dietary data were collected at the household level on three non-consecutive days based on a recall of the past 24 hours. In addition, in each household, the proportion of food consumed by one mother and two of her children (up to the age of 9 years, and at least one of whom was below 5 years) was also noted. Data collection was completed between July and December 1994. Details of the data collection procedure can be found in Sanghvi et.al. 1995.

Using the household level dietary data, quantities of individual food items consumed by reference women and children were computed on the basis of the fraction of quantities of each dish consumed by them. For dishes that were listed in the data without specifying a list of ingredients (about 20 percent), the quantities of ingredients (recipes) were imputed from the dishes prepared by the household at another time or day, or from average recipes for the cluster or domain. It was important to list individual items consumed at each meal as the iron bio-availability analysis took into account the effect of different types of foods (enhancers and inhibitors) eaten at a single meal.

3.1. Iron from breast milk

Information was available on whether a child in the study was breast fed or not. From this information, the lactation status of the mother was imputed. In order to compute the nutrient contribution of breast milk to the diets of breast feeding children, average quantities of breast milk produced by mothers of rural low income Guatemalan children at different ages (of children), obtained from the WHO collaborative study on breast feeding (WHO, 1985), were used. The nutrient content of the milk was obtained from the same source and from the report of a joint WHO/IAEA collaborative study on minor and trace elements in breast milk (WHO, 1989). Nutrient contribution of breast milk was computed for children who were breast fed up to 18 months of age, based on the average length of breast feeding in Honduras. Availability of iron from breast milk is computed at the level of 50 percent (FAO, 1988).

3.2. Bio-availability of iron

The WorldFood Dietary Assessment Program (Version 2), developed by the University of California, Berkeley, was used for analyzing iron content of the diets consumed by women and children in the sample. The computations for iron were done for each meal in order to include the effects of enhancers and inhibitors in the diet on iron availability.

To compute available iron the algorithm used by WorldFood2 program was adopted. The program uses the algorithm developed by Monsen et. al. in 1978 and is based on the availability ranges in FAO/WHO 1988 report on iron. The algorithm is described in detail in Murphy, Beaton and Calloway, 1992. In brief, dietary iron is divided into two components, heme iron (from meat, fish and poultry) and non-heme iron. Forty percent of the iron present in meat, fish and poultry is considered to be heme iron; 25 percent of the heme iron is available to the body. The availability from non-heme iron varies from 5 percent to 15 percent in individuals with no iron stores but with normal iron transport, depending upon the extent of enhancing and inhibiting factors present in the same meal (FAO/WHO, 1988). A diet from which the availability of iron is 5 percent is considered a low bio-availability diet, and is characterized as a simple, monotonous diet containing cereals (maize, beans, whole wheat flour, sorghum, etc.), roots and tubers and negligible quantities of animal foods and ascorbic acid rich foods. The phytate levels in this diet are very high. The corn based Honduran diet falls into this category, unless significant amounts of enhancers are consumed. A diet from which the availability is 10 percent is an intermediate bio-availability diet which consists of mainly cereals (high in phytates) but has somewhat higher levels of foods such as foods of animal origin and those containing ascorbic acid that enhance iron absorption. And finally a diet from which the availability of non-heme iron is 15 percent is considered a high bio-availability diet and is characterized as a diversified diet containing generous amounts of meat, poultry and fish and foods containing high amounts of ascorbic acid.

The following table is used for the WorldFood non-heme iron availability computations:

Estimated percent availability of non-heme iron (at basal requirement level)*

Ascorbic Acid mg / 1000 kcal	Meat, fish, and poultry protein g / 1000 kcal		
	< 9	9 - 27	> 27
< 35	5%	10%	15%
35 - 105	10%	15%	15%
> 105	15%	15%	15%

* From WorldFood Dietary Assessment Program, Version 2 Documentation for Additional Calculations.

Coffee consumption in Honduran diet also lowers availability of iron. Each cup of coffee consumed with the meal can reduce the availability by 20 percent to a maximum of 60 percent.

3.3. Probability of Inadequate Intake

In order to estimate the population at risk of having inadequate intake of iron, the WorldFood2 program uses the approach developed by National Academy of Sciences (NAS, 1986). This approach is based on a comparison of the distribution of nutrient intake with that of nutrient requirement. The probability of observed intake being below the individuals (unknown) requirement is computed assuming that the requirements are normally distributed (which is assumed in all cases except for menstruating women). An intake close to the mean would have about 50 percent probability of inadequacy, while intakes well above the mean would have a lower and those below the mean would have a higher probability of inadequacy. For menstruating girls and women, the program computes the probability of deficiency based on iron requirements being distributed log-linearly (Murphy, Beaton and Calloway, 1992).

3.4. Dietary requirements for iron

FAO/WHO, 1988 has defined iron requirement at two levels viz. basal requirement and requirement to prevent anemia. Basal requirement of iron is defined as the amount of dietary iron required to maintain a normal supply of iron to tissues and preserve all clinically detectable functions. It is assumed that the iron stores in the body are negligible. At this level of requirement, availability of iron is from 5 percent - 15 percent depending upon the type of diet as described above.

The requirement to prevent anemia is defined as the level of dietary iron intake needed to prevent a fall in hemoglobin to levels below the cut-off points proposed by WHO as suggesting the presence of anemia. The levels of some of the other clinically detectable indicators of iron deficiency (transferrin saturation, erythrocyte protoporphyrin) are likely to be lower than the normal range. While the requirements of absorbed iron are same as at the basal level, the efficiency of absorption from the diet in this case is 50 percent higher (7.5 percent - 22 percent).

The WorldFood2 program uses these two levels of requirements to compute the probability of deficiency or the probability of inadequate intake for each individual. If the diet represents habitual intake, then a probability of deficiency of less than 5 percent indicates that a diet is almost certainly adequate, while a probability of deficiency of over 95 percent indicates that a diet is almost certainly inadequate. A probability of less than 25 percent indicates a diet is likely to be adequate, while one with a probability of over 75 percent is likely to be inadequate (WorldFood2, 1996).

4. Results

4.1. Iron in Diets of Honduran Children

4.1.1. Dietary iron

Tables 1 and 2 show the dietary intake of iron, that of its enhancers and inhibitors as well as the probabilities of having inadequate intake of iron at the two levels of requirement among children in the various age and gender categories. Male children tend to consume slightly higher amounts of gross total iron in their diets. There is no statistical difference between the amount of enhancers and inhibitors in the diets of male and female children. The average amount of iron available to male children is significantly higher compared to the female children, though the difference in absolute values is rather small. There is however, no significant difference in the estimates of probabilities of having inadequate intake between boys and girls because boys tend to be heavier and have higher iron needs when calculated on the basis of per kg body weight during the pre-puberty years. The absolute differences in iron intake between the two groups are rather small and may not necessarily be suggestive of gender discrimination in child rearing. It is, however, crucial to stress the importance of iron in the diets of young girls, given that the intakes by young Honduran women are poor.

The total amount of iron consumed in the diet increases with age. There appears to be minimal consumption of foods of animal origin by children in the sample, therefore, the amount of iron and protein derived from meat, fish and protein is very small and does not change very much with increasing age. Coffee is introduced in the diet soon after birth. The inhibiting role of coffee in iron absorption becomes more important as children get older and increase their coffee consumption. By six years of age children on average consume about one cup of coffee per day. Table 2 shows that the consumption of ascorbic acid goes down with increasing age. Breast feeding is prevalent among children under 18 months of age with close to 90 percent of children under 12 months of age and almost 75 percent of 12 - 18 months old being breast fed. The high ascorbic acid in the diets of children under 18 months is attributable to their breast feeding status (see tables 4a and 4b). Since contribution of breast milk to nutrition was included in the computations up to 18 months of age, there is a sudden drop in ascorbic acid intake after that age. There is a possibility that the amount of ascorbic acid in breast milk might be slightly overestimated because, unlike for other nutrients for which values were obtained from low income Guatemalan women, in the case of ascorbic acid the amounts were obtained from a sample of Swedish women, as no data were available from the Guatemalan sample. Ascorbic acid in the diets (excluding breast milk) might have been under estimated in this analysis as we did not have the quantities of all ascorbic acid rich foods in the diets. However, only a very small fraction of the population consumes these fresh fruits and vegetables in the rural western region of Honduras (Rogers, Swindale, Ohri-Vachaspati, 1996) from which data for the present analysis were drawn. Given the extremely low intake of ascorbic acid by the non breast feeding group, any possible additional intake of ascorbic acid (from the missing data on quantities of ascorbic acid rich foods) are unlikely to bring the overall intake of ascorbic acid to a level (>35 mg/1000cal) where it might affect the availability of iron intake.

Table 1. Dietary Iron Status of Children in Rural Honduras, by Gender

Gender	Total Iron in Diet * (mg) Mean (SD)	Total Meat, Fish, Poultry Iron (mg) Mean (SD)	Total Ascorbic Acid (mg) Mean (SD)	Total Meat Fish Poultry Protein (g) Mean (SD)	Total Amount of Coffee (ml) Mean (SD)	Available Iron Based on Enhancers in Diet * (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet * (mg) Mean (SD)	Percent of Dietary Iron Available (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level (%) & Mean (SD)	Mean Probability of Inadeq Intake at Level to Preventing Anemia (%)& Mean (SD)
Male (n = 1316)	14.03 (7.96)	0.08 (0.35)	18.18 (20.97)	1.33 (3.90)	180.87 (167.14)	0.77 (0.42)	0.68 (0.36)	5.35 (2.81)	0.39 (0.35)	0.20 (0.29)
Female (n = 1200)	13.11 (7.38)	0.07 (0.34)	18.71 (20.77)	1.25 (3.52)	176.79 (159.46)	0.72 (0.40)	0.64 (0.34)	5.31 (1.95)	0.39 (0.34)	0.21 (0.29)

*Difference between groups significant at $p < .05$.

& Based on a smaller sample which had body weights available.

Table 2. Dietary Iron Status of Children in Rural Honduras, by Age

Age categories	Total Iron in Diet * (mg) Mean (SD)	Total Meat, Fish, Poultry Iron (mg) Mean (SD)	Total Ascorbic Acid * (mg) Mean (SD)	Total Meat Fish Poultry Protein (g) Mean (SD)	Total Amount of Coffee * (ml) Mean (SD)	Available Iron Based on Enhancers in Diet * (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet * (mg) Mean (SD)	Percent of Dietary Iron Available * (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level * (%) & Mean (SD)	Mean Probability of Inadeq Intake at Level to Preventing Anemia (%)& Mean (SD)
3mths - 1yr (n=229)	5.79 (5.21)	0.03 (0.09)	36.62 (16.78)	0.52 (1.58)	60.88 (107.69)	0.37 (0.28)	0.35 (0.25)	8.45 (6.08)	0.71 (0.22)	0.57 (0.28)
1-2 yrs (n=412)	8.97 (5.25)	0.09 (0.57)	31.51 (22.30)	1.26 (3.49)	116.47 (133.24)	0.53 (0.31)	0.49 (0.29)	5.74 (1.56)	0.47 (0.35)	0.23 (0.30)
2-6 yrs (n=1326)	14.45 (6.79)	0.07 (0.28)	13.09 (18.12)	1.38 (3.94)	202.86 (161.50)	0.78 (0.37)	0.69 (0.32)	4.85 (0.97)	0.28 (0.31)	0.11 (0.22)
6-12 yrs (n=537)	18.58 (7.73)	0.10 (0.35)	13.59 (18.94)	1.44 (3.99)	220.54 (172.26)	1.00 (0.41)	0.87 (0.36)	4.75 (0.88)	NA	NA

*Difference between groups significant at $p < .05$.

& Based on a smaller sample which had body weights available.

Owing to the high level of availability of iron from breast milk (50 percent), the percent of iron available from the diet is highest for younger children, most of whom are breast fed. Children between 3 - 12 months of age absorb about 8.45 percent of the iron in their diet. As they get older, and start eating the low bio-availability Honduran diet and start increasing their coffee consumption, the average percent of iron absorbed goes down to 4.75 percent by the time they are in the 6 - 12 year age group.

The probability of having an inadequate intake (at the basal level as well as at the level of preventing anemia) is highest for the youngest children in the sample and goes down with increasing age. 57 percent of the children in the age group 3 months - 1 year, 23 percent of the 1-2 year olds year and 11 percent of the 2-6 year olds are likely to have inadequate intakes at levels to prevent clinical signs of anemia. Probability of deficiency could not be computed for children over 6 years of age because we did not have body weights on these children.

Based on the probability of deficiency analysis which computes the probability of intake being below an individual's requirements, Table 3 shows the probabilities of inadequate intake at basal requirement level. A probability of deficiency of intake of less than 5 percent indicates that only 5 percent of individuals will have requirements above this level of intake, and therefore, for most individuals, such a diet is almost certainly adequate. Similarly a probability of deficiency of over 95 percent indicates that the diet is almost certainly inadequate, as 95 percent of the cases will have their requirements above this level of intake. Younger children, those between 3 -12 months of age, seem to fair poorly with regards to having an inadequate intake. About 17 percent of them have intakes which are almost certainly inadequate and half of them have intakes which are likely to be inadequate compared to their levels of requirement. Among 1-2 year olds, while 18.7 percent are almost certainly likely to have adequate intake, about 15 percent of them are almost certainly likely to have inadequate intake. Children in the 2-6 year age category seem to be better off, about 40 percent of them have intakes which are almost likely to be adequate.

4.1.2. Iron in diets of breast fed children

Tables 4a and 4b show the differences between iron intake and probabilities of deficiency in children under 18 months of age depending upon their breast feeding status. In table 4a the data are presented at 3 month interval for children under 1 year of age. Since the sample size for non-breast feeding children was too small for statistical analysis, in table 4b the sample was pooled and the children were divided into two groups. The first category included children 3 - 12 months of age and the second one 12 - 18 months of age. Children under 3 months of age were not included in this analysis, as there is minimal absorption from dietary sources at this age and the iron is mobilized from stores that the children are born with. FAO/WHO has not laid down requirements for iron for this age group. Iron stores laid down at birth are considered to be adequate for most children, however, low birth weight children have lower stores which might get depleted sooner.

Table 3. Percent of Children with Different Probabilities of Inadequate Intake at Basal Requirement Level

	Probability of Inadequate Intake = 0 (%)	Probability of Inadequate Intake < = 5 (%)	Probability of Inadequate Intake <=25 (%)	Probability of Inadequate Intake>75 (%)	Probability of Inadequate Intake >95 (%)
3mths - 1yr (n=226)	0	0	4.4	50.0	16.8
1-2 yrs (n=402)	8.5	18.7	33.8	26.6	14.9
2-6 yrs (n=1053)	22.1	39.4	55.3	10.1	5.1

Probability of deficiency of less than 5% indicates that a diet is almost certainly adequate.
Probability of deficiency of over 95% indicates that a diet is almost certainly inadequate.
Probability of deficiency of less than 25% indicates that a diet is likely to be adequate.
Probability of deficiency of over 75% indicates that a diet is likely to be inadequate.

Table 4(a). Dietary Iron Status of Children Under 1.5 Years of Age in Rural Honduras, by Breast Feeding Status

Breast Feeding Status	Total Iron in Diet (mg) Mean (SD)	Total Meat, Fish, Poultry Iron (mg) Mean (SD)	Total Ascorbic Acid (mg) Mean (SD)	Total Meat Fish Poultry Protein (g) Mean (SD)	Total Amount of Coffee (ml) Mean (SD)	Available Iron Based on Enhancers in Diet (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet (mg) Mean (SD)	Percent of Dietary Iron Available (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level (%) Mean (SD)	Mean Probability of Inadeq Intake at Level of Preventing Anemia (%) Mean (SD)
0-3 months										
Breast Fed (n = 9)	1.85 (2.20)	0.00	36.46 (0.81)	0.00	17.78 (53.33)	0.16 (0.11)	0.15 (0.10)	12.84 (8.15)	0.91 (0.13)	0.85 (0.20)
Not Breast Fed (n =0)										
3-6 months										
Breast Fed (n = 20)	3.44 (4.65)	0.00	34.73 (1.38)	0.00	61.39 (119.85)	0.25 (0.23)	0.23 (0.19)	13.70 (10.52)	0.83 (0.22)	0.75 (0.30)
Not Breast Fed (n =3)	7.14 (2.76)	0.17 (0.29)	21.01 (28.23)	4.23 (7.28)	127.17 (149.63)	0.44 (0.27)	0.40 (0.22)	5.40 (0.82)	0.63 (0.23)	0.45 (0.25)
6-9 months										
Breast Fed (n = 71)	4.46 (4.41)	0.01 (0.05)	38.18 (9.14)	0.29 (0.90)	58.00 (87.42)	0.30 (0.23)	0.29 (0.21)	9.89 (7.89)	0.76 (0.21)	0.63 (0.28)
Not Breast Fed (n =6)	6.48 (4.56)	0.02 (0.04)	7.61 (7.36)	0.45 (0.70)	82.25 (63.81)	0.35 (0.22)	0.33 (0.21)	5.20 (0.55)	0.76 (0.19)	0.62 (0.28)
9-12 months										
Breast Fed (n = 104)	6.43 (5.55)	0.03 (0.09)	44.22 (15.73)	0.56 (1.49)	65.22 (127.21)	0.42 (0.30)	0.40 (0.28)	7.45 (2.82)	0.67 (0.21)	0.51 (0.26)
Not Breast Fed (n =25)	8.46 (5.29)	0.06 (0.15)	10.90 (10.05)	0.98 (2.23)	37.51 (54.81)	0.46 (0.27)	0.45 (0.27)	5.47 (1.01)	0.60 (0.24)	0.45 (0.26)
12-18 months										
Breast Fed (n = 176)	7.32 (3.47)	0.03 (0.08)	43.09 (15.07)	0.71 (1.76)	87.38 (98.42)	0.46 (0.20)	0.44 (0.19)	6.42 (1.61)	0.48 (0.34)	0.22 (0.30)
Not Breast Fed (n =61)	9.34 (3.83)	0.07 (0.15)	11.39 (15.20)	1.65 (3.75)	131.36 (149.76)	0.53 (0.26)	0.48 (0.24)	5.16 (1.16)	0.47 (0.35)	0.19 (0.25)

* Difference within groups significant at $p < .05$.

Table 4 (b). Dietary Iron Status of Children Under 1.5 Years of Age in Rural Honduras, by Breast Feeding Status

Breast Feeding Status	Total Iron in Diet (mg) Mean (SD)	Total Meat, Fish, Poultry Iron (mg) Mean (SD)	Total Ascorbic Acid (mg) Mean (SD)	Total Meat Fish Poultry Protein (g) Mean (SD)	Total Amount of Coffee (ml) Mean (SD)	Available Iron Based on Enhancers in Diet (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet (mg) Mean (SD)	Percent of Dietary Iron Available (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level (%) Mean (SD)	Mean Probability of Inadeq Intake at Level of Preventing Anemia (%) Mean (SD)
3-12 months										
Breast Fed (n = 195)	5.41 (5.17)	0.02 (0.07)	41.05 (13.20)	0.41 (1.23)	62.20 (113.00)	0.36 (0.28)	0.34 (0.25)	9.00 (6.43)	0.72 (0.22)	0.58 (0.28)
Not Breast Fed (n =34)	8.00 (4.96)	0.06 (0.15)	11.21 (11.88)	1.17 (2.80)	53.32 (70.68)	0.44 (0.26)	0.42 (0.25)	5.42 (0.91)	0.63 (0.23)	0.47 (0.26)
Significance	*	*	*	*				*	*	*
12-18 months										
Breast Fed (n = 176)	7.32 (3.47)	0.03 (0.08)	43.09 (15.07)	0.71 (1.76)	87.38 (98.42)	0.46 (0.20)	0.44 (0.19)	6.42 (1.61)	0.48 (0.34)	0.22 (0.30)
Not Breast Fed (n =61)	9.34 (3.83)	0.07 (0.15)	11.39 (15.20)	1.65 (3.75)	131.36 (149.76)	0.53 (0.26)	0.48 (0.24)	5.16 (1.16)	0.47 (0.35)	0.19 (0.25)
Significance	*	*	*	*	*	*		*		

* Difference within groups significant at $p < .05$.

On average, breast milk provides between 0.13 to 0.16 mg of dietary iron to children who are breast fed depending on their age, which determines the average amount of breast milk secreted. Breast fed children in the 3-12 month as well 12-18 month category seem to do poorly in terms of the average total gross iron intake from their diets. Though all children are fed very small amounts of animal foods, children who are not breast fed obtain almost two to three times as much iron and protein from animal sources. In the 12-18 month age group the non-breast fed group consumed twice as much coffee as the breast fed group. The average intake of ascorbic acid and percent of dietary iron available are significantly higher in the breast fed group in both the age categories. The probability of having an inadequate intake of iron is high in all the categories. For the younger children the probability of having an inadequate intake is significantly higher in breast fed children. In the older age group, there are no significant differences in the probability of having an inadequate intake between the two categories.

It should be noted that the amount of ascorbic acid in breast milk was not taken into account while computing the bio-availability of non-heme iron because the actual quantities of breast milk consumed at each meal were not available. The higher ascorbic acid content of breast milk might improve the availability of non-heme iron in the foods consumed close to the time of breast feeding but is difficult to estimate.

4.1.3. Dietary iron and socio-economic indicators

Table 5 presents the iron status of children by household expenditure quartiles. The total amount of iron in the diet is not significantly different across the expenditure quartiles. However, the amount of available iron as well as the percent of dietary iron available is significantly higher among the higher expenditure groups. This is because of the better quality of the diet of children from richer households, as measured by animal foods and foods rich in ascorbic acid in the diet. One would expect that if the bio-availability of iron was higher, the probability of inadequate intake among children would be lower. The findings presented in Table 5 show, however, that there is in fact no significant difference between the probabilities of inadequate intake across the four expenditure quartiles. The reason for these findings is that children from richer households tend to have a better nutritional status and weigh more. They, therefore, have higher total requirements for iron based on per unit body weight compared to children from lower income households who have lower body weights and therefore lower total requirements. Since intakes are compared with requirements (based on body weight) to compute the probability of inadequate consumption, it appears that children from lower income households with lower requirements (who have significantly lower intakes and lower body weights), do just as well as children from higher income households with higher requirements.

Using household headship as a marker of socio-economic condition of the household, Table 6 indicates that households headed by males are better off in terms of their iron intake and are less likely to have children with inadequate intakes. There is no difference in the quality of diet as represented by inclusion of foods of animal origin, but there is a higher total amount of gross iron consumed by children from male headed households.

Table 5. Dietary Iron Status of Children in Rural Honduras, by Household Expenditure Quartile

Expenditure Categories	Total Iron in Diet (mg) Mean (SD)	Total Meat, Fish, Poultry Iron* (mg) Mean (SD)	Total Ascorbic Acid * (mg) Mean (SD)	Total Meat Fish Poultry Protein* (g) Mean (SD)	Total Amount of Coffee (ml) Mean (SD)	Available Iron Based on Enhancers in Diet * (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet* (mg) Mean (SD)	Percent of Dietary Iron Available * (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level (%)& Mean (SD)	Mean Probability of Inadeq Intake at Level of Preventing Anemia (%)& Mean (SD)
Expenditure Quartile 1 (n = 661)	13.27 (7.36)	0.03 (0.11)	17.13 (20.80)	0.74 (2.36)	186.24 (180.38)	0.72 (0.39)	0.63 (0.34)	5.05 (1.39)	0.38 (0.36)	0.18 (0.28)
Expenditure Quartile 2 (n = 644)	13.53 (7.35)	0.06 (0.34)	16.30 (18.66)	1.01 (3.38)	188.13 (163.89)	0.73 (0.39)	0.65 (0.34)	5.23 (2.90)	0.40 (0.35)	0.21 (0.29)
Expenditure Quartile 3 (n = 628)	13.92 (8.29)	0.08 (0.30)	18.74 (20.56)	1.49 (4.32)	170.93 (149.37)	0.77 (0.44)	0.68 (0.38)	5.49 (2.82)	0.38 (0.35)	0.22 (0.31)
Expenditure Quartile 4 (n = 552)	14.05 (8.69)	0.15 (0.54)	22.32 (23.33)	2.14 (4.66)	169.46 (159.38)	0.80 (0.47)	0.70 (0.40)	5.55 (2.09)	0.40 (0.34)	0.21 (0.30)

*Difference between groups significant at $p < .05$.

& Based on a smaller sample which had body weights available.

Table 6. Dietary Iron Status of Children in Rural Honduras, by Household Headship

Household Head	Mean Expend* Mean (SD)	Total Iron in Diet * (mg) Mean (SD)	Total Meat, Fish, Poultry Iron (mg) Mean (SD)	Total Ascorbic Acid (mg) Mean (SD)	Total Meat Fish Poultry Protein (g) Mean (SD)	Total Amount of Coffee * (ml) Mean (SD)	Available Iron Based on Enhancers in Diet * (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet * (mg) Mean (SD)	Percent of Dietary Iron Available (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level *& (%) Mean (SD)	Mean Probability of Inadeq Intake at Level of Preventing Anemia *& (%) Mean (SD)
Male Headed Household (n = 2189)	1401.70 (1279.32)	13.83 (7.93)	0.08 (0.37)	18.42 (20.69)	1.31 (3.80)	181.88 (165.35)	0.76 (0.42)	0.67 (0.36)	5.32 (2.30)	0.38 (0.34)	0.20 (0.29)
Female Headed Household (n = 307)	1237.90 (765.97)	12.51 (7.62)	0.07 (0.19)	18.80 (22.39)	1.30 (3.51)	159.46 (153.19)	0.69 (0.42)	0.62 (0.38)	5.34 (2.91)	0.45 (0.36)	0.26 (0.32)

* Difference within groups significant at $p < .05$.
& Based on a smaller sample which had body weights available.

4.1.4. Dietary iron and nutritional indicators

The dietary iron status of children was also compared with their anthropometric measurements (Table 7). While the total iron intake among stunted children was somewhat higher, the quality of diet as measured by consumption of meat, fish and poultry and foods rich in ascorbic acid was significantly better among children who were not stunted. The stunted category consumed significantly higher levels of coffee compared to the non-stunted category. The slightly higher amount of total iron consumed by the stunted category is off-set by the presence of inhibitors in higher quantities and enhancers in lower quantities in their diet. There is no significant difference in the total iron available in the diets of stunted and non-stunted children. The probability of having inadequate intake to prevent deficiency was significantly higher among non-stunted children. The reason for this is the same as we saw when comparisons were made across expenditure quartiles. The algorithm for computing the probability takes into account the requirements per unit body weight. Since the stunted children weigh significantly less than non-stunted children, their requirements, when estimated based on per unit body weight, are lower and hence their intakes appear adequate when compared to their requirements.

Comparing the dietary iron status with levels of caloric adequacy for children yields the mostly expected outcome (Table 8). At higher levels of caloric adequacy children not only consume more total iron but also consume more from the meat, fish and poultry group. Almost half of the breast fed children have a caloric adequacy level of < 65 percent. Because of the large number of breast fed children in the lowest caloric adequacy level, the percent of available iron ends up being higher for this category. In general, for children, caloric adequacy seems to be a reasonable predictor of iron status of the diet (Table 9) with 47.9 percent of the children with caloric adequacy below 65 percent having diets which are almost certainly likely to be inadequate and slightly over 50 percent with caloric adequacy above 120 percent having diets which are almost certainly adequate in iron. The percent of children having diets that are almost certainly inadequate in iron falls from 47.9 percent to 0.63 percent as the caloric adequacy level increases from 65 percent to greater than 120 percent.

4.2. Iron in the Diets of Honduran Women

4.2.1. Dietary iron

The average total iron in the diet of women over 16 years of age is about 25 mg (Table 10). Like their children, women in the rural western part of Honduras consume very small amounts of animal foods in their diets. The average ascorbic content of the diet for different physiological categories is 20 mg or slightly less. As mentioned earlier we have incomplete information on quantities consumed for some of the foods rich in ascorbic acid. However, these foods are consumed by a small fragment of the population, and in very small amounts. It is, therefore, extremely unlikely that these missing data would have contributed sufficient amounts of ascorbic acid to affect the level of bio-availability of iron in the diets. The women in the sample on average consume slightly over one and a half cups of coffee per day.

Table 7. Dietary Iron Status of Children in Rural Honduras, by Nutritional Status

Nutritional Status	Total Iron in Diet * (mg) Mean (SD)	Total Meat, Fish, Poultry Iron * (mg) Mean (SD)	Total Ascorbic Acid * (mg) Mean (SD)	Total Meat Fish Poultry Protein* (g) Mean (SD)	Total Amount of Coffee * (ml) Mean (SD)	Available Iron Based on Enhancers in Diet (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet (mg) Mean (SD)	Percent of Dietary Iron Available * (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level * (%) Mean (SD)	Mean Probability of Inadeq Intake at Level of Preventing Anemia * (%) Mean (SD)
No Stunting (n = 786)	11.09 (6.89)	0.10 (0.48)	22.98 (22.17)	1.44 (3.76)	145.68 (154.12)	0.63 (0.38)	0.57 (0.33)	6.05 (3.84)	0.45 (0.35)	0.26 (0.32)
Stunted (n = 643)	12.04 (6.79)	0.06 (0.24)	18.65 (20.22)	1.01 (3.34)	179.56 (162.71)	0.66 (0.36)	0.58 (0.32)	5.16 (1.45)	0.33 (0.33)	0.16 (0.26)

*Difference between groups significant at $p < .05$.

Table 8. Dietary Iron Status of Children in Rural Honduras, by Child's Level of Caloric adequacy

Level of Caloric adequacy	Total Iron in Diet * (mg) Mean (SD)	Total Meat, Fish, Poultry Iron* (mg) Mean (SD)	Total Ascorbic Acid * (mg) Mean (SD)	Total Meat Fish Poultry Protein* (g) Mean (SD)	Total Amount of Coffee* (ml) Mean (SD)	Available Iron Based on Enhancers in Diet * (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet * (mg) Mean (SD)	Percent of Dietary Iron Available * (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level *& (%) Mean (SD)	Mean Probability of Inadeq Intake at Level of Preventing Anemia *& (%) Mean (SD)
< 65% (n = 303)	5.62 (2.93)	0.02 (0.14)	15.56 (17.62)	0.44 (1.47)	104.58 (110.54)	0.32 (0.16)	0.29 (0.14)	6.69 (5.55)	0.80 (0.24)	0.59 (0.34)
65 - 80% (n = 309)	8.58 (3.37)	0.03 (0.09)	16.91 (20.24)	0.74 (2.15)	134.74 (122.55)	0.48 (0.16)	0.44 (0.15)	5.68 (2.53)	0.62 (0.28)	0.32 (0.31)
80 - 100% (n = 445)	10.53 (3.75)	0.06 (0.28)	15.02 (16.86)	0.97 (2.41)	165.51 (142.91)	0.58 (0.19)	0.52 (0.18)	5.23 (1.29)	0.43 (0.31)	0.19 (0.26)
100 -120% (n = 438)	13.12 (4.32)	0.08 (0.41)	16.75 (21.03)	1.20 (3.23)	181.32 (151.18)	0.72 (0.23)	0.64 (0.21)	5.11 (1.29)	0.31 (0.29)	0.13 (0.23)
> 120% (n = 1023)	19.20 (8.46)	0.11 (0.43)	21.96 (22.88)	1.91 (4.99)	220.14 (188.12)	1.05 (0.45)	0.91 (0.39)	4.95 (1.12)	0.19 (0.25)	0.08 (0.17)

* Difference within groups significant at $p < .05$.

& Based on a smaller sample which had body weights available.

Table 9. Levels of Iron Deficiency, by Levels of Caloric adequacy in Honduran Children

Level of Caloric adequacy	Probability of Inadequate Intake <= 5 %	Probability of Inadequate Intake <= 25 %	Probability of Inadequate Intake => 75 %	Probability of Inadequate Intake => 95 %
< 65% (n = 219)	1.4	4.6	62.6	47.9
65 - 80% (n = 212)	5.2	10.8	37.7	13.7
80 - 100% (n = 311)	16.1	33.1	21.5	2.6
100 - 120% (n = 281)	29.9	50.5	10.0	3.6
> 120% (n = 666)	51.4	67.6	3.2	0.63

Probability of deficiency of less than 5% indicates that a diet is almost certainly adequate.
Probability of deficiency of over 95% indicates that a diet is almost certainly inadequate.
Probability of deficiency of less than 25% indicates that a diet is likely to be adequate.
Probability of deficiency of over 75% indicates that a diet is likely to be inadequate.

Table 10 **Dietary Iron Status of Women in Rural Honduras, by Age and Physiological Status**

Age and Physiological Status Categories	Total Iron in Diet (mg) Mean (SD)	Total Meat, Fish, Poultry Iron # (mg) Mean (SD)	Total Ascorbic Acid (mg) Mean (SD)	Total Meat Fish Poultry Protein (g) Mean (SD)	Total Amount of Coffee (ml) Mean (SD)	Available Iron Based on Enhancers in Diet (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet (mg) Mean (SD)	Percent of Dietary Iron Available (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level * (%) Mean (SD)	Mean Probability of Inadeq Intake at Level of Preventing Anemia * (%) Mean (SD)
16 + years Non-Pregnant (n = 434)	25.17 (9.05)	0.17 (0.57)	20.60 (28.63)	2.79 (7.36)	344.69 (243.76)	1.37 (0.51)	1.13 (0.46)	4.54 (1.01)	0.62 (0.29)	0.34 (0.30)
Pregnant (n = 171)	23.68 (8.77)	0.23 (0.78)	17.02 (25.15)	2.67 (7.02)	303.71 (241.40)	1.29 (0.50)	1.09 (0.46)	4.65 (1.24)	1.00 (0.01)	0.99 (0.05)
Lactating Child<6mths (n = 258)	25.71 (9.69)	0.11 (0.28)	18.90 (24.07)	2.37 (6.42)	339.33 (290.75)	1.39 (0.53)	1.14 (0.46)	4.53 (1.04)	0.48 (0.35)	0.20 (0.27)
Lactating Child>6mths (n = 521)	25.73 (9.48)	0.10 (0.34)	17.24 (23.09)	1.95 (4.82)	332.05 (250.31)	1.37 (0.51)	1.14 (0.45)	4.49 (0.98)	0.48 (0.34)	0.21 (0.28)

*Difference within groups significant at $p < .05$.

After taking into account the bio-availability of iron and the role of enhancers and inhibitors in the diet, less than 5 percent of dietary iron is available for absorption. The corn based Honduran diet, with minimal intakes of foods from the meat, fish and poultry groups and with little fresh fruit and vegetables, typifies a low bio-availability diet where the availability is expected to be only 5 percent.

At basal level (no clinical signs of iron deficiency) the mean probability of having an inadequate intake is in the range of .48 to 1.00. Almost all of the pregnant women in the sample, one fifth of the lactating women and a third of non-pregnant non-lactating women are at risk of developing anemia. While the total amount of iron in the diets of women is not very low, the poor bio-availability of iron from a corn based diet coupled with low levels of enhancers viz. ascorbic acid and animal (meat, fish and poultry) foods and an average consumption of over one and a half cups of coffee per day limits the availability of iron.

Table 11 examines the percent of women with different probabilities of inadequate intake at basal requirements. All of the pregnant women in the sample have intakes which are almost certainly likely to be inadequate in iron. This is consistent with the FAO/WHO subcommittee report which states that the requirements during pregnancy, especially second and third trimesters, are very high and cannot be met with diet alone. We do not have information as to whether the pregnant women in our sample were taking iron supplements. More than a quarter of lactating women and about 40 percent of the non-pregnant and non-lactating women have intakes which are likely to be inadequate (probability of deficiency < 75 percent).

4.2.2. Dietary iron and socio-economic status

Table 12 presents the results of the analysis broken by household expenditure quartiles. In none of the comparisons are the expenditure quartiles 1 and 2 different from one another. The significant differences presented are either between groups 1 / 2 / 3 and 3 / 4. As the households get richer, the iron content of their diet goes up slightly and the quality of their diets improve and so does the availability of iron. Women from richer households tend to consume significantly higher amounts of animal foods and have a significantly higher intake of ascorbic acid. The mean probability of inadequate intakes is also slightly lower among women from higher income households. Household headship affects the women the same way as we saw in the case of children, with women from female headed households faring poorly compared to those coming from male headed households (Table 13).

Table 11. Percent of Women with Different Probabilities of Inadequate Intake at Basal Requirement Level

	Probability of Inadequate Intake = 0 (%)	Probability of Inadequate Intake < = 5 (%)	Probability of Inadequate Intake <=25 (%)	Probability of Inadequate Intake>75 (%)	Probability of Inadequate Intake >95 (%)
Non Pregnant and Non Lactating (n = 436)	1.8	3.4	12.8	38.8	18.1
Pregnant (n=172)	0	0	0	100	99.4
Lactating < 6 months (n=261)	5.7	16.5	32.6	26.8	15.7
Lactating > 6 months (n=523)	5.5	18.2	31.7	25.2	13.8

Probability of deficiency of less than 5% indicates that a diet is almost certainly adequate.
Probability of deficiency of over 95% indicates that a diet is almost certainly inadequate.
Probability of deficiency of less than 25% indicates that a diet is likely to be adequate.
Probability of deficiency of over 75% indicates that a diet is likely to be inadequate.

Table 12. Dietary Iron Status of Women in Rural Honduras, by Expenditure Quartiles

Expenditure Categories	Total Iron in Diet * (mg) Mean (SD)	Total Meat, Fish, Poultry Iron* (mg) Mean (SD)	Total Ascorbic Acid * (mg) Mean (SD)	Total Meat Fish Poultry Protein * (g) Mean (SD)	Total Amount of Coffee (ml) Mean (SD)	Available Iron Based on Enhancers in Diet * (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet * (mg) Mean (SD)	Percent of Dietary Iron Available * (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level * (%) Mean (SD)	Mean Probability of Inadeq Intake at Level of Preventing Anemia (%) Mean (SD)
Expenditure Quartile 1 (n = 343)	24.50 (9.31)	0.07 (0.23)	16.72 (25.28)	1.43 (4.82)	332.11 (265.51)	1.31 (0.53)	1.08 (0.47)	4.44 (1.01)	0.61 (0.35)	0.35 (0.36)
Expenditure Quartile 2 (n = 344)	24.33 (9.28)	0.11 (0.49)	15.72 (21.20)	1.64 (4.74)	332.55 (244.90)	1.29 (0.49)	1.07 (0.43)	4.48 (0.99)	0.62 (0.34)	0.36 (0.36)
Expenditure Quartile 3 (n = 344)	25.97 (9.79)	0.15 (0.56)	18.09 (25.44)	2.63 (6.87)	326.81 (227.88)	1.39 (0.53)	1.16 (0.46)	4.54 (0.96)	0.56 (0.36)	0.34 (0.37)
Expenditure Quartile 4 (n = 340)	26.22 (8.63)	0.22 (0.57)	23.93 (28.68)	3.83 (7.95)	336.02 (273.51)	1.46 (0.50)	1.21 (0.45)	4.70 (1.16)	0.55 (0.34)	0.33 (0.36)

* Difference within group significant at $p < .05$.

Table 13. Dietary Iron Status of Women in Rural Honduras, by Household Headship

Head of the Household	Mean Household Expenditure Mean (SD)	Total Iron in Diet * (mg) Mean (SD)	Total Meat, Fish, Poultry Iron (mg) Mean (SD)	Total Ascorbic Acid (mg) Mean (SD)	Total Meat Fish Poultry Protein (g) Mean (SD)	Total Amount of Coffee (ml) Mean (SD)	Available Iron Based on Enhancers in Diet * (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet * (mg) Mean (SD)	Percent of Dietary Iron Available (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level * (%) Mean (SD)	Mean Probability of Inadeq Intake at Level of Preventing Anemia * (%) Mean (SD)
Male Headed Household (n = 1205)	1456.54 (1291.06)	25.57 (9.29)	0.14 (0.51)	18.57 (25.35)	2.40 (6.42)	331.71 (252.99)	1.38 (0.51)	1.14 (0.45)	4.54 (1.04)	0.58 (0.35)	0.33 (0.36)
Female Headed Household (n = 173)	1344.01 (906.24)	23.07 (9.05)	0.11 (0.29)	19.32 (26.21)	2.28 (5.40)	336.34 (264.42)	1.25 (0.51)	1.04 (0.47)	4.50 (1.02)	0.64 (0.35)	0.42 (0.38)

* Difference within groups significant at $p < .05$.

4.2.3. Dietary iron and caloric adequacy

As the level of caloric adequacy for women goes up, the total amount of iron in the diet, the amount of ascorbic acid as well as the amounts of iron and protein derived from meat, fish and protein increases (Table 14). The probability of having an inadequate intake at the basal level falls from about 95 percent in the lowest caloric adequate group to 42 percent in the highest caloric adequacy group. As the diets of women become more adequate in calories, they also tend to consume more coffee. This higher intake of coffee is responsible for the lowest percent of dietary iron available in the highest caloric adequacy group which consumes the highest amount of coffee.

In the case of children we saw that caloric adequacy was a good proxy for iron status of the diet. In the case of women, while the likelihood of consuming a diet adequate in iron increases with an increase in level of caloric adequacy, there are a significant number of women with over 100 percent caloric adequacy whose diets are still inadequate in iron (Table 15). About 36 percent of the women whose levels of caloric adequacy are over 100 percent have diets which are almost certainly inadequate in iron. And about 56 percent of them have diets which are likely to be inadequate in dietary iron.

4.3. Dietary Iron Compared To Requirements For Women and Children

Table 16 presents the median intake of total iron in the diets of Honduran women and children along with the recommended levels of intake suggested by FAO/WHO at the basal level as well as at the level of preventing anemia, for three levels of bio-availability. Given that a large percent of children in the sample are breast fed, we can assume that the diets of children under 18 months of age have medium to high bio-availability. In the case of older children and women, the bio-availability of iron from a typical Honduran diet is low (5%).

Based on the requirements laid out by the FAO/WHO joint consultation group, children under 1 years of age and pregnant women are most at risk of having inadequate intakes followed by 1-2 year olds and 6-12 year olds. Children in the age group 2-6 years, non-pregnant and non-lactating women and lactating women appear to have median intakes which are more or less in line with the recommendations of the expert committee.

4.4. Sources of Iron in the Diet of Honduran Children and Women

Tables 17 and 19 (see appendix 1) present the sources of iron in the diets of Honduran children and women. These tables has been sorted by the last column, which has the average amount of iron obtained from a particular food category averaged over consuming and non-consuming children. This amount represents the relative importance of a food as a contributor of iron in the diets of Honduran women and children. As expected the first three categories are maize, red

Table 14. Dietary Iron Status of Women in Rural Honduras, by Mother's Level of Caloric adequacy

Level of Caloric adequacy	Total Iron in Diet * (mg) Mean (SD)	Total Meat, Fish, Poultry Iron* (mg) Mean (SD)	Total Ascorbic Acid * (mg) Mean (SD)	Total Meat Fish Poultry Protein* (g) Mean (SD)	Total Amount of Coffee* (ml) Mean (SD)	Available Iron Based on Enhancers in Diet * (mg) Mean (SD)	Available Iron Based on Enhancers and Inhibitors in Diet * (mg) Mean (SD)	Percent of Dietary Iron Available * (%) Mean (SD)	Mean Probability of Inadeq Intake at Basal Req Level * (%) Mean (SD)	Mean Probability of Inadeq Intake at Level of Preventing Anemia * (%) Mean (SD)
< 65% (n = 106)	11.08 (3.46)	0.08 (0.51)	14.25 (28.12)	0.80 (2.72)	203.50 (166.24)	0.62 (0.25)	0.54 (0.22)	4.88 (1.15)	0.95 (0.09)	0.77 (0.24)
65 - 80% (n = 126)	15.85 (2.81)	0.03 (0.09)	10.69 (20.06)	0.89 (2.90)	283.17 (203.94)	0.84 (0.15)	0.71 (0.17)	4.50 (0.90)	0.87 (0.16)	0.58 (0.32)
80 - 100% (n = 227)	19.11 (3.31)	0.14 (0.54)	14.42 (19.11)	1.94 (4.42)	269.79 (217.05)	1.04 (0.20)	0.89 (0.23)	4.70 (1.20)	0.74 (0.25)	0.42 (0.34)
100 - 120% (n = 248)	23.21 (3.21)	0.11 (0.29)	16.46 (20.04)	1.97 (4.66)	336.40 (255.10)	1.26 (0.21)	1.05 (0.24)	4.52 (0.87)	0.60 (0.30)	0.33 (0.36)
> 120% (n = 685)	32.05 (7.63)	0.18 (0.55)	22.81 (28.44)	3.18 (7.84)	382.45 (273.03)	1.73 (0.44)	1.41 (0.43)	4.44 (1.02)	0.42 (0.34)	0.22 (0.32)

* Difference within groups significant at $p < .05$.

Table 15. Levels of Iron Deficiency, by Levels of Caloric adequacy in Honduran Women

Level of Caloric adequacy	Probability of Inadequate Intake <= 5 %	Probability of Inadequate Intake <= 25 %	Probability of Inadequate Intake => 75 %	Probability of Inadequate Intake => 95 %
< 65% (n = 106)	0	0	92.5	74.5
65 - 80% (n = 126)	0	0	76.2	51.6
80 - 100% (n = 227)	0	3.5	52.4	32.6
100 - 120% (n = 248)	4.0	13.7	35.1	23.0
> 120% (n = 685)	20.2	38.7	20.9	12.8

Probability of deficiency of less than 5% indicates that a diet is almost certainly adequate.
Probability of deficiency of over 95% indicates that a diet is almost certainly inadequate.
Probability of deficiency of less than 25% indicates that a diet is likely to be adequate.
Probability of deficiency of over 75% indicates that a diet is likely to be inadequate.

Table 16. Iron Intake and Requirements# for Different Age, Gender and Physiological Status Categories

Group	Median Dietary Iron (mg)	Median Requirement to Prevent Anemia (mg/day) Bio-availability *			Median Basal Requirement (mg/day) Bio-availability *		
		Low	Medium	High	Low	Medium	High
Infants 0-3mths+ (n = 9)	1.29						
3mths-1 year (n = 229)	4.64	11 (14)	5.5 (7)	3.8 (5)	17 (21)	8.5 (11)	5.5 (7)
Children 1-2 years	8.00	6.5 (8)	3.5 (4)	2.2 (3)	10 (12)	5 (6)	3.3 (4)
2-6 years (n = 1326)	13.31	7.5 (9)	3.5 (5)	2.5 (3)	11 (14)	5.5 (7)	3.7 (5)
6-12 years (n = 539)	17.53	12.5 (16)	6 (8)	4.2 (5)	19 (23)	9.5 (12)	6.3 (8)
Women Non-Pregnant non-lactating (n = 434)	24.66	17 (29)	8 (14)	5.6 (10)	25 (48)	12.5 (24)	8.3 (16)
Pregnant++ (n = 171)	22.80						
Lactating (n = 779)	24.64	14 (17)	7 (9)	4.7 (6)	21 (26)	10.5 (13)	7 (9)

Requirements are based on FAO/WHO Joint Expert Consultation report, 1988.
* Numbers in parenthesis indicate requirements including variability.
+ There is minimal absorption of dietary iron, the FAO/WHO expert consultation committee did not suggest any requirements.
++ Requirements in pregnanacy (second and third trimester) are very high and cannot be satisfied by dietary iorn alone, the FAO/WHO expert consultation committee did not suggest any requirements.

beans and corn flour, which describe a basic Honduran diet. While maize is consumed by almost all of the women (97 percent), the consumption is slightly lower among children (85 percent) owing to inclusion of children under one, many of whom may not be eating yet. Similarly red beans are consumed by a larger number of women than children. Sorghum and chicken egg and the other food categories that follow contribute a negligible amounts of iron to the diet either because of their low iron content; or very small quantities being consumed; or a very small proportion of women and children actually consuming them. While foods like dried fish, CSB, liver, spinach and shell fish provide a significant amount of iron to those consuming them, they are actually eaten by less than 1-2 percent of the sample.

Tables 18 and 20 (see appendix 1) present the same data as in Tables 17 and 19, but sorted by the average amount of iron per 100g of the food category. Most of the iron rich foods from animal origin on the top of the list such as dried fish, liver, shellfish and processed meats are consumed by a very small fraction of the population. Foods from vegetable sources which are also very high in iron, such as corn soy blend (CSB), soybean, spinach and greens, are also not consumed by very many women and children. The foods that have a moderately high iron content and are consumed in large amounts by a large fraction of the sample tend to be corn and bean based foods. Other foods of animal origin, such as fish, chicken, beef, and pork, which have iron whose bio-availability is higher and also help to improve the bio-availability of non-heme iron in the diet, are consumed by a larger fraction of the population than the foods on the top of the list.

5. Conclusions

The dietary iron status of this non-representative sample of Honduran women and children in the rural west of the country is very poor. Almost 40 percent of all children under 6 years of age have iron intakes inadequate to prevent clinical signs of iron deficiency. Among the children, the worst off are those between 3-12 months of age with 71 percent having inadequate diets, 47 percent of 1-2 year olds also have inadequate diets. As the children get older the percent having inadequate intakes falls. All of the pregnant women, 50 percent of lactating women and 62 percent of non-pregnant and non-lactating women in the sample are at risk of having inadequate dietary intakes to prevent any clinical signs of iron deficiency.

Most of the dietary iron in the diets of Hondurans is derived from corn and corn based products. Due to the high phytate content the absorption of iron from corn is very poor. Foods of animal origin, which have heme iron and which also improve the availability of iron from non-heme sources, are consumed in very small amounts especially by younger children. Ascorbic acid, which is another enhancer for absorption of iron from non-heme sources and is derived from fresh fruits and vegetables, is also consumed in very inadequate amounts. Greens which are rich in both iron and ascorbic acid are consumed by less than 2 percent of women and children in the sample.

Coffee, a very popular drink in Honduras for all age groups, inhibits iron absorption in all age categories. The inhibiting role of coffee becomes important as early as 1-2 years of age, by which time children on average are consuming about half a cup of coffee per day. Iron absorption is

lowered by about 8 percent because of coffee in this age group. By the time children are 6 years and over, coffee lowers the iron absorption by 13 percent. Women lower their iron absorption by 17 percent by drinking an average of one and a half cups of coffee per day.

The consumption of ascorbic acid and foods of animal origin is associated with socio-economic status. As the households get richer women and children eat more of the foods rich in ascorbic acid and foods of animal origin. Coffee consumption is not affected by the expenditure level of the household.

About 90 percent of children under one and 75 percent of those between 12-18 months breast feed. Half of the iron in breast milk is absorbable compared to 5-15 percent of the non-heme iron. However, the absolute amount of iron in breast milk is very low. In the sample, children who were breast fed had lower iron intakes. Those below one year of age and breast feeding were significantly more likely to have inadequate intakes of iron to prevent signs of deficiency compared to those who were not breast fed. In this sample, breast fed children are not given as much other food, including foods from animal origin, as the non-breast fed group. This is not to say that the practice of breast feeding is detrimental to iron status of children. In spite of having lower gross intake, breast fed children one year and older were as likely to have an inadequate intake as their non-breast fed counterparts. In addition there are definite advantages of breast feeding. In addition to having a highly bio-available form of iron, breast milk also tends to keep the coffee consumption lower among 1-2 years olds. An effort should be made to introduce iron rich foods, both of plant and animal origin, in the diets of all children after 4-6 months of age along with foods rich in ascorbic acid.

There is a strong association between caloric adequacy and iron intake both in women and children. However, in the case of women about 56 percent of those with level of caloric adequacy at 100 percent or more have diets which are likely to be inadequate in iron. Only 13 percent of children with caloric adequacy of 100 percent or more have iron inadequate iron intakes. Therefore, caloric adequacy should not be taken as an indicator of overall adequacy of the diet, especially among women. Iron supplementation programs should, therefore, target women at all levels of caloric adequacy.

6. Recommendations

6.1. Children

Encourage mothers to exclusively breast feed for the first few months as additional dietary iron from supplemental foods is not absorbed by the children and may in fact interfere with the absorption of iron from breast milk. Start supplementing the diets of all children at 4-6 months with iron rich foods. Special emphasis needs to be placed on introduction of such foods in the diets of breast fed children. Along with corn and bean based foods, introduce foods of animal origin as well as foods rich in ascorbic acid. Use of low cost foods such as greens, soybeans, and cheaper meats and fish should be encouraged. Discourage coffee consumption by all children of all ages.

6.2. Women

Since the iron requirements of pregnant women are very high, diets alone will not be able meet their needs. Therapeutic doses of iron supplements would be necessary to bridge the gap between intakes and increased requirements during pregnancy.

As in the case of children, use of low cost foods such as greens, soybeans, and cheaper meats and fish by women should be encouraged to increase iron intake. Fresh fruits and vegetables consumption should also be increased so that bio-availability of iron from the primarily corn based diet can be improved. Coffee consumption should be limited to meals where no iron rich foods are consumed. Since most of the iron in the Honduran diet is coming from corn which is consumed at all the meals, women should be advised not to drink coffee within an hour of consuming any meal.

6.3. Fortification

Since the traditional Honduran diet does not include significant quantities of iron rich foods, and given the high cost of some of the iron rich foods with high bio-availability, increasing dietary intake of iron by modifying existing diets may not be easy to achieve. As an alternative, fortifying staple foods such as corn or a corn product with iron may be a good way to enhance the dietary intake of iron. Corn would be a suitable medium for this population since it is consumed by a large fraction of the vulnerable population and is introduced early in the diets of small children.

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APPENDIX 1

TABLES 17 THROUGH 20

SOURCES OF IRON IN THE DIET OF HONDURAN WOMEN AND CHILDREN

Table 17. Sources of Iron in the Diets of Honduran Children (Sorted by amount of iron /day for consuming and non consuming children)

Food Categories	% of children consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming children/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming children Mean (SD)	Average amount eaten (including non consuming children) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming children Mean (SD)
Maize	85.47	3.4996	281.94 (192.91)	9.87 (6.75)	26.97 (102.15)	0.94 (3.57)
Corn flour	31.44	3.5	166.60 (124.46)	5.83 (4.36)	5.86 (38.56)	0.21 (1.35)
Red bean	78.70	2.9	63.63 (46.50)	1.85 (1.35)	5.6 (22.7)	0.16 (0.66)
Sorghum	4.18	4.1	179.56 (127.24)	7.36 (5.22)	0.84 (15.01)	0.03 (0.62)
Chicken egg	56.33	1.2	27.14 (20.54)	0.33 (0.25)	1.71 (8.37)	0.02 (0.1)
Rice	69.62	0.6046	37.62 (31.58)	0.23 (0.19)	2.93 (13.39)	0.02 (0.08)
CSB	0.74	18	37.04 (35.33)	6.67 (6.36)	0.03 (1.46)	0.01 (0.26)
Other cheese	2.62	6.8568	41.95 (24.69)	2.80 (1.72)	0.12 (2.63)	0.01 (0.18)
Black bean	12.90	2.9	33.10 (24.95)	0.96 (0.72)	0.48 (4.96)	0.01 (0.14)
Chicken	12.19	1.0847	48.45 (48.63)	0.53 (0.53)	0.66 (7.99)	0.01 (0.09)
Cassava	5.67	0.8	135.24 (172.55)	1.08 (1.38)	0.86 (17.41)	0.01 (0.14)

Table 17 cont. Sources of Iron in the Diets of Honduran Children (Sorted by amount of iron /day for consuming and non consuming children)

Food Categories	% of children consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming children/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming children Mean (SD)	Average amount eaten (including non consuming children) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming children Mean (SD)
Plantain	5.39	0.792	155.71 (134.97)	1.52 (1.33)	0.94 (15.95)	0.01 (0.16)
Tomato	35.52	0.5	42.79 (46.93)	0.21 (0.23)	1.7 (12.54)	0.01 (0.06)
Liquid milk	39.28	0.1	228.74 (231.77)	0.23 (0.23)	10.05 (67.51)	0.01 (0.07)
Dried Fish	0.32	18.4	54.21 (30.28)	9.76 (5.45)	0.02 (1.16)	0 (0.21)
Soy bean	0.60	6.4	13.03 (13.45)	0.84 (0.86)	0.01 (0.48)	0 (0.03)
Oatmeal	1.21	6	7.78 (6.54)	0.47 (0.39)	0.01 (0.37)	0 (0.02)
Liver	0.07	5	49.48 (17.49)	2.48 (0.87)	0 (0.45)	0 (0.02)
Spinach and greens	1.52	4.3423	26.46 (55.95)	1.06 (2.24)	0.05 (2.53)	0 (0.1)
Other egg	0.28	3.9	13.97 (9.10)	0.55 (0.36)	0 (0.29)	0 (0.01)
Carrot	1.52	0.6	12.96 (15.22)	0.08 (0.09)	0.02 (0.82)	0 (0)
Corn flakes	0.07	3.5	4.77 (0.52)	0.17 (0.02)	0 (0.04)	0 (0)
Shellfish	0.92	2.7962	82.88 (84.55)	2.42 (2.70)	0.09 (3.76)	0 (0.12)

Table 17 cont. Sources of Iron in the Diets of Honduran Children (Sorted by amount of iron /day for consuming and non consuming children)

Food Categories	% of children consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming children/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming children Mean (SD)	Average amount eaten (including non consuming children) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming children Mean (SD)
Processed meats	0.96	2.7185	25.09 (17.17)	0.92 (1.05)	0.03 (0.99)	0 (0.05)
Sardines	0.14	2.4	24.63 (4.56)	0.59 (0.11)	0 (0.31)	0 (0.01)
Raw sugar	14.36	1.9	14.45 (15.92)	0.27 (0.30)	0.23 (2.71)	0 (0.05)
Coconut	0.18	1.4	25.95 (24.23)	0.36 (0.34)	0.01 (0.48)	0 (0.01)
Wheat flour	7.05	1.2	30.51 (40.94)	0.37 (0.49)	0.24 (4.52)	0 (0.05)
Pastas	12.23	1.2	26.89 (21.26)	0.32 (0.26)	0.37 (3.99)	0 (0.05)
Tripe	0.53	1	47.76 (52.52)	0.48 (0.53)	0.03 (1.7)	0 (0.02)
Avocado	4.32	1	75.03 (46.42)	0.75 (0.46)	0.36 (6.12)	0 (0.06)
Beef	5.88	0.8783	48.65 (50.66)	0.47 (0.57)	0.32 (5.68)	0 (0.06)
Cracker	1.17	0.7303	90.89 (76.07)	0.64 (0.53)	0.12 (4.26)	0 (0.03)
Powdered milk	3.97	0.7	41.57 (40.76)	0.29 (0.29)	0.18 (3.87)	0 (0.03)
Milk Powder for Babies	0.39	0.7	83.71 (97.66)	0.59 (0.69)	0.04 (2.62)	0 (0.02)

Table 17 cont. Sources of Iron in the Diets of Honduran Children (Sorted by amount of iron /day for consuming and non consuming children)

Food Categories	% of children consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming children/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming children Mean (SD)	Average amount eaten (including non consuming children) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming children Mean (SD)
Hard cheese	3.62	0.7	34.60 (20.96)	0.24 (0.15)	0.14 (2.57)	0 (0.02)
Pork	3.72	0.7	64.43 (72.39)	0.45 (0.51)	0.27 (6.23)	0 (0.04)
Banana	8.40	0.6615	96.76 (99.40)	0.49 (0.89)	0.91 (13.41)	0 (0.1)
Bread	0.82	0.5	53.21 (54.82)	0.27 (0.27)	0.05 (2.28)	0 (0.01)
Sweetpotato	0.32	0.4	24.65 (10.47)	0.10 (0.04)	0.01 (0.5)	0 (0)
Fresh cheese	9.25	0.4	42.42 (37.14)	0.17 (0.15)	0.44 (5.72)	0 (0.02)
Fresh fish	3.62	0.4	72.96 (50.89)	0.00 (0.00)	0.3 (5.64)	0 (0)
Butuco banana	0.92	0.35	64.58 (49.59)	0.00 (0.00)	0.07 (2.6)	0 (0)
Squash	16.77	0.3116	58.39 (74.23)	0.18 (0.23)	1.1 (12.88)	0 (0.04)
Juices	0.18	0.175	183.12 (109.06)	0.55 (0.81)	0.04 (2.92)	0 (0.01)
Potato	28.04	0.1	48.94 (45.04)	0.05 (0.05)	1.54 (11.68)	0 (0.01)

Table 17 cont. Sources of Iron in the Diets of Honduran Children (Sorted by amount of iron /day for consuming and non consuming children)

Food Categories	% of children consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming children/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming children Mean (SD)	Average amount eaten (including non consuming children) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming children Mean (SD)
Quesillo	0.46	0.1	37.85 (18.25)	0.04 (0.02)	0.02 (0.95)	0 (0)
Cuajada	25.70	0.1	23.23 (12.89)	0.02 (0.01)	0.67 (4.45)	0 (0)
Papaya	0.04	0.1	73.18 (.)	0.07 (.)	0 (0.46)	0 (0)
Refined sugar	74.87	0.1	22.33 (27.21)	0.02 (0.03)	1.87 (10.01)	0 (0.01)
Cream	28.22	0	25.39 (16.39)	0.00 (0.00)	0.8 (5.31)	0 (0)
Veg shortening	84.93	0	21.19 (16.65)	0.00 (0.00)	2.01 (8.06)	0 (0)
Lard	1.60	0	8.92 (11.50)	0.00 (0.00)	0.02 (0.61)	0 (0)
Veg oil	2.62	0	7.21 (4.88)	0.00 (0.00)	0.02 (0.47)	0 (0)
Margarine	5.14	0	10.19 (13.16)	0.00 (0.00)	0.06 (1.26)	0 (0)

Table 18. Sources of Iron in the Diets of Honduran Children (Sorted by amount of iron /100 g of food)

Food Categories	% of children consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming children/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming children Mean (SD)	Average amount eaten (including non consuming children) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming children Mean (SD)
Dried Fish	0.32	18.4	54.21 (30.28)	9.76 (5.45)	0.02 (1.16)	0 (0.21)
CSB	0.74	18	37.04 (35.33)	6.67 (6.36)	0.03 (1.46)	0.01 (0.26)
Other cheese	2.62	6.8568	41.95 (24.69)	2.80 (1.72)	0.12 (2.63)	0.01 (0.18)
Soy bean	0.60	6.4	13.03 (13.45)	0.84 (0.86)	0.01 (0.48)	0 (0.03)
Oatmeal	1.21	6	7.78 (6.54)	0.47 (0.39)	0.01 (0.37)	0 (0.02)
Liver	0.07	5	49.48 (17.49)	2.48 (0.87)	0 (0.45)	0 (0.02)
Spinach and greens	1.52	4.3423	26.46 (55.95)	1.06 (2.24)	0.05 (2.53)	0 (0.1)
Sorghum	4.18	4.1	179.56 (127.24)	7.36 (5.22)	0.84 (15.01)	0.03 (0.62)
Other egg	0.28	3.9	13.97 (9.10)	0.55 (0.36)	0 (0.29)	0 (0.01)
Corn flour	31.44	3.5	166.60 (124.46)	5.83 (4.36)	5.86 (38.56)	0.21 (1.35)
Corn flakes	0.07	3.5	4.77 (0.52)	0.17 (0.02)	0 (0.04)	0 (0)

Table 18 cont. Sources of Iron in the Diets of Honduran Children (Sorted by amount of iron /100 g of food)

Food Categories	% of children consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming children/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming children Mean (SD)	Average amount eaten (including non consuming children) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming children Mean (SD)
Maize	85.47	3.4996	281.94 (192.91)	9.87 (6.75)	26.97 (102.15)	0.94 (3.57)
Red bean	78.70	2.9	63.63 (46.50)	1.85 (1.35)	5.6 (22.7)	0.16 (0.66)
Black bean	12.90	2.9	33.10 (24.95)	0.96 (0.72)	0.48 (4.96)	0.01 (0.14)
Shellfish	0.92	2.7962	82.88 (84.55)	2.42 (2.70)	0.09 (3.76)	0 (0.12)
Processed meats	0.96	2.7185	25.09 (17.17)	0.92 (1.05)	0.03 (0.99)	0 (0.05)
Sardines	0.14	2.4	24.63 (4.56)	0.59 (0.11)	0 (0.31)	0 (0.01)
Raw sugar	14.36	1.9	14.45 (15.92)	0.27 (0.30)	0.23 (2.71)	0 (0.05)
Coconut	0.18	1.4	25.95 (24.23)	0.36 (0.34)	0.01 (0.48)	0 (0.01)
Chicken egg	56.33	1.2	27.14 (20.54)	0.33 (0.25)	1.71 (8.37)	0.02 (0.1)
Wheat flour	7.05	1.2	30.51 (40.94)	0.37 (0.49)	0.24 (4.52)	0 (0.05)
Pastas	12.23	1.2	26.89 (21.26)	0.32 (0.26)	0.37 (3.99)	0 (0.05)

Table 18 cont. Sources of Iron in the Diets of Honduran Children (Sorted by amount of iron /100 g of food)

Food Categories	% of children consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming children/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming children Mean (SD)	Average amount eaten (including non consuming children) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming children Mean (SD)
Chicken	12.19	1.0847	48.45 (48.63)	0.53 (0.53)	0.66 (7.99)	0.01 (0.09)
Tripe	0.53	1	47.76 (52.52)	0.48 (0.53)	0.03 (1.7)	0 (0.02)
Avocado	4.32	1	75.03 (46.42)	0.75 (0.46)	0.36 (6.12)	0 (0.06)
Beef	5.88	0.8783	48.65 (50.66)	0.47 (0.57)	0.32 (5.68)	0 (0.06)
Cassava	5.67	0.8	135.24 (172.55)	1.08 (1.38)	0.86 (17.41)	0.01 (0.14)
Plantain	5.39	0.792	155.71 (134.97)	1.52 (1.33)	0.94 (15.95)	0.01 (0.16)
Cracker	1.17	0.7303	90.89 (76.07)	0.64 (0.53)	0.12 (4.26)	0 (0.03)
Powdered milk	3.97	0.7	41.57 (40.76)	0.29 (0.29)	0.18 (3.87)	0 (0.03)
Milk Powder for Babies	0.39	0.7	83.71 (97.66)	0.59 (0.69)	0.04 (2.62)	0 (0.02)
Hard cheese	3.62	0.7	34.60 (20.96)	0.24 (0.15)	0.14 (2.57)	0 (0.02)
Pork	3.72	0.7	64.43 (72.39)	0.45 (0.51)	0.27 (6.23)	0 (0.04)

Table 18 cont. Sources of Iron in the Diets of Honduran Children (Sorted by amount of iron /100 g of food)

Food Categories	% of children consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming children/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming children Mean (SD)	Average amount eaten (including non consuming children) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming children Mean (SD)
Banana	8.40	0.6615	96.76 (99.40)	0.49 (0.89)	0.91 (13.41)	0 (0.1)
Rice	69.62	0.6046	37.62 (31.58)	0.23 (0.19)	2.93 (13.39)	0.02 (0.08)
Carrot	1.52	0.6	12.96 (15.22)	0.08 (0.09)	0.02 (0.82)	0 (0)
Tomato	35.52	0.5	42.79 (46.93)	0.21 (0.23)	1.7 (12.54)	0.01 (0.06)
Bread	0.82	0.5	53.21 (54.82)	0.27 (0.27)	0.05 (2.28)	0 (0.01)
Sweetpotato	0.32	0.4	24.65 (10.47)	0.10 (0.04)	0.01 (0.5)	0 (0)
Fresh cheese	9.25	0.4	42.42 (37.14)	0.17 (0.15)	0.44 (5.72)	0 (0.02)
Fresh fish	3.62	0.4	72.96 (50.89)	0.00 (0.00)	0.3 (5.64)	0 (0)
Butuco banana	0.92	0.35	64.58 (49.59)	0.00 (0.00)	0.07 (2.6)	0 (0)
Squash	16.77	0.3116	58.39 (74.23)	0.18 (0.23)	1.1 (12.88)	0 (0.04)
Juices	0.18	0.175	183.12 (109.06)	0.55 (0.81)	0.04 (2.92)	0 (0.01)

Table 18 cont. Sources of Iron in the Diets of Honduran Children (Sorted by amount of iron /100 g of food)

Food Categories	% of children consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming children/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming children Mean (SD)	Average amount eaten (including non consuming children) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming children Mean (SD)
Liquid milk	39.28	0.1	228.74 (231.77)	0.23 (0.23)	10.05 (67.51)	0.01 (0.07)
Potato	28.04	0.1	48.94 (45.04)	0.05 (0.05)	1.54 (11.68)	0 (0.01)
Quesillo	0.46	0.1	37.85 (18.25)	0.04 (0.02)	0.02 (0.95)	0 (0)
Cuajada	25.70	0.1	23.23 (12.89)	0.02 (0.01)	0.67 (4.45)	0 (0)
Papaya	0.04	0.1	73.18 (.)	0.07 (.)	0 (0.46)	0 (0)
Refined sugar	74.87	0.1	22.33 (27.21)	0.02 (0.03)	1.87 (10.01)	0 (0.01)
Cream	28.22	0	25.39 (16.39)	0.00 (0.00)	0.8 (5.31)	0 (0)
Veg shortening	84.93	0	21.19 (16.65)	0.00 (0.00)	2.01 (8.06)	0 (0)
Lard	1.60	0	8.92 (11.50)	0.00 (0.00)	0.02 (0.61)	0 (0)
Veg oil	2.62	0	7.21 (4.88)	0.00 (0.00)	0.02 (0.47)	0 (0)
Margarine	5.14	0	10.19 (13.16)	0.00 (0.00)	0.06 (1.26)	0 (0)

Table 19. Sources of Iron in the Diets for Honduran Women (Sorted by amount of iron /day for consuming and non consuming women)

Food Categories	% of women consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming women/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming women Mean (SD)	Average amount eaten (including non consuming women) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming women) Mean (SD)
Maize	97.11	3.50	566.59 (272.14)	19.83 (9.53)	55.66 (188.97)	1.95 (6.61)
Red bean	89.42	2.90	106.52 (71.15)	3.09 (2.06)	9.64 (37.3)	0.28 (1.08)
Corn flour	34.27	3.50	206.89 (160.15)	7.24 (5.61)	7.17 (48.17)	0.25 (1.69)
Sorghum	4.72	4.10	370.93 (224.98)	15.21 (9.22)	1.77 (29.88)	0.07 (1.23)
Chicken egg	62.20	1.20	38.23 (21.25)	0.46 (0.26)	2.41 (10.7)	0.03 (0.13)
Rice	78.77	0.60	58.17 (42.35)	0.35 (0.26)	4.63 (19.77)	0.03 (0.12)
Black bean	13.96	2.90	53.68 (37.72)	1.56 (1.09)	0.76 (7.75)	0.02 (0.22)
Dried Fish	0.35	18.40	91.56 (44.13)	16.48 (7.94)	0.03 (1.88)	0.01 (0.34)
CSB	0.85	18.00	52.24 (66.99)	9.40 (12.06)	0.04 (2.42)	0.01 (0.44)
Other cheese	2.82	6.75	53.02 (27.49)	3.47 (1.89)	0.15 (3.18)	0.01 (0.21)
Raw sugar	15.51	1.90	22.57 (25.80)	0.43 (0.49)	0.35 (4.27)	0.01 (0.08)
Pastas	14.10	1.20	47.01 (37.74)	0.56 (0.45)	0.67 (7.16)	0.01 (0.09)

Table 19 cont. Sources of Iron in the Diets for Honduran Women (Sorted by amount of iron /day for consuming and non consuming women)

Food Categories	% of women consuming	Average amount of Iron (mg) / 100 g of food category	Average amount eaten by consuming women/ day (g)	Average amount of iron (mg) / day from food category by consuming women	Average amount eaten (including non consuming women) /day (g)	Average amount of iron (mg)/day from food category (including non consuming women)
	%	Mean	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Chicken	14.46	1.08	93.44 (100.67)	1.02 (1.10)	1.37 (16.53)	0.01 (0.18)
Avocado	4.94	1.00	116.39 (84.97)	1.16 (0.85)	0.58 (10.14)	0.01 (0.10)
Beef	7.33	0.88	79.99 (74.46)	0.74 (0.80)	0.59 (9.37)	0.01 (0.09)
Cassava	6.35	0.80	228.66 (229.69)	1.83 (1.84)	1.47 (25.86)	0.01 (0.21)
Plantain	6.77	0.79	206.94 (158.52)	2.01 (1.60)	1.42 (21.48)	0.01 (0.21)
Banana	8.60	0.69	135.93 (150.31)	0.78 (1.30)	1.18 (18.83)	0.01 (0.14)
Tomato	41.04	0.50	68.46 (70.97)	0.34 (0.35)	2.84 (19.88)	0.01 (0.10)
Squash	18.83	0.31	93.22 (107.37)	0.28 (0.33)	1.78 (19.52)	0.01 (0.06)
Liquid milk	42.17	0.10	286.27 (245.21)	0.29 (0.25)	12.21 (76.86)	0.01 (0.08)
Soy bean	0.63	6.40	18.35 (17.88)	1.18 (1.15)	0.01 (0.63)	0.00 (0.04)
Oatmeal	1.27	6.00	10.16 (5.26)	0.61 (0.32)	0.01 (0.41)	0.00 (0.02)

Table 19 cont. Sources of Iron in the Diets for Honduran Women (Sorted by amount of iron /day for consuming and non consuming women)

Food Categories	% of women consuming	Average amount of Iron (mg) / 100 g of food category	Average amount eaten by consuming women/ day (g)	Average amount of iron (mg) / day from food category by consuming women	Average amount eaten (including non consuming women) /day (g)	Average amount of iron (mg)/day from food category (including non consuming women)
	%	Mean	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Liver	0.28	5.00	219.16 (125.55)	10.96 (6.28)	0.06 (4.13)	0.00 (0.21)
Spinach and greens	1.90	4.35	58.76 (102.17)	2.35 (4.09)	0.11 (5.1)	0.00 (0.20)
Other egg	0.21	3.90	15.86 (10.38)	0.62 (0.40)	0 (0.26)	0.00 (0.01)
Carrot	1.83	0.60	20.58 (28.62)	0.12 (0.17)	0.04 (1.5)	0.00 (0.01)
Corn flakes	0.07	3.50	5.14 (.)	0.18 (.)	0 (0.04)	0.00 (0.00)
Shellfish	1.20	2.76	96.36 (80.79)	2.70 (2.25)	0.12 (4.32)	0.00 (0.12)
Sardines	0.21	2.40	49.81 (25.44)	1.20 (0.61)	0.01 (0.79)	0.00 (0.02)
Processed meats	1.13	2.38	34.81 (29.81)	1.23 (1.74)	0.04 (1.53)	0.00 (0.07)
Coconut	0.14	1.40	17.10 (18.86)	0.24 (0.27)	0 (0.26)	0.00 (0.00)
Wheat flour	6.77	1.20	49.05 (77.21)	0.59 (0.93)	0.34 (7.53)	0.00 (0.09)
Tripe	0.78	1.00	84.73 (63.04)	0.85 (0.63)	0.07 (2.91)	0.00 (0.03)
Cracker	0.92	0.74	108.30 (90.81)	0.76 (0.63)	0.1 (4.23)	0.00 (0.03)

Table 19 cont. Sources of Iron in the Diets for Honduran Women (Sorted by amount of iron /day for consuming and non consuming women)

Food Categories	% of women consuming	Average amount of Iron (mg) / 100 g of food category	Average amount eaten by consuming women/ day (g)	Average amount of iron (mg) / day from food category by consuming women	Average amount eaten (including non consuming women) /day (g)	Average amount of iron (mg)/day from food category (including non consuming women)
	%	Mean	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Powdered milk	1.62	0.70	24.30 (19.74)	0.17 (0.14)	0.04 (1.26)	0.00 (0.01)
Milk Powder for Babies	0.07	0.70	43.47 (.)	0.30 (.)	0 (0.37)	0.00 (0.00)
Hard cheese	4.51	0.70	69.39 (92.81)	0.49 (0.65)	0.32 (7.78)	0.00 (0.05)
Pork	4.65	0.70	108.85 (120.21)	0.76 (0.84)	0.51 (11.07)	0.00 (0.08)
Bread	1.13	0.50	55.49 (49.77)	0.28 (0.25)	0.06 (2.48)	0.00 (0.01)
Sweetpotato	0.42	0.40	38.55 (17.70)	0.16 (0.07)	0.02 (0.86)	0.00 (0.00)
Fresh cheese	10.65	0.40	70.61 (62.62)	0.28 (0.25)	0.76 (9.75)	0.00 (0.04)
Fresh fish	4.51	0.40	111.59 (107.20)	0.00 (0.00)	0.51 (10.4)	0.00 (0.00)
Butuco banana	0.99	0.35	72.48 (44.79)	0.00 (0.00)	0.07 (2.67)	0.00 (0.00)
Juices	0.21	0.20	158.67 (117.58)	0.18 (0.08)	0.03 (2.71)	0.00 (0.00)
Potato	32.23	0.10	80.24 (70.72)	0.08 (0.07)	2.62 (19.13)	0.00 (0.02)

Table 19 cont. Sources of Iron in the Diets for Honduran Women (Sorted by amount of iron /day for consuming and non consuming women)

Food Categories	% of women consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming women/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming women Mean (SD)	Average amount eaten (including non consuming women) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming women) Mean (SD)
Quesillo	0.56	0.10	71.21 (26.75)	0.07 (0.03)	0.04 (1.8)	0.00 (0.00)
Cuajada	27.50	0.10	28.37 (16.44)	0.03 (0.02)	0.79 (5.41)	0.00 (0.01)
Papaya	0.07	0.10	119.48 (.)	0.12 (.)	0.01 (1.01)	0.00 (0.00)
Refined sugar	84.70	0.10	30.37 (23.82)	0.03 (0.02)	2.6 (10.99)	0.00 (0.01)
Cream	30.82	0.00	32.58 (21.78)	0.00 (0.00)	1.02 (6.84)	0.00 (0.00)
Veg shortening	95.70	0.00	34.55 (23.80)	0.00 (0.00)	3.34 (12.62)	0.00 (0.00)
Lard	1.48	0.00	17.75 (17.25)	0.00 (0.00)	0.03 (0.95)	0.00 (0.00)
Veg oil	2.96	0.00	12.76 (8.35)	0.00 (0.00)	0.04 (0.83)	0.00 (0.00)
Margarine	5.71	0.00	18.97 (16.81)	0.00 (0.00)	0.11 (1.92)	0.00 (0.00)

Table 20 **Sources of Iron in the Diets for Honduran Women (Sorted by amount of iron /100 g of food)**

Food Categories	% of women consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming women/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming women Mean (SD)	Average amount eaten (including non consuming women) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming women) Mean (SD)
Dried Fish	0.35	18.40	91.56 (44.13)	16.48 (7.94)	0.03 (1.88)	0.01 (0.34)
CSB	0.85	18.00	52.24 (66.99)	9.40 (12.06)	0.04 (2.42)	0.01 (0.44)
Other cheese	2.82	6.75	53.02 (27.49)	3.47 (1.89)	0.15 (3.18)	0.01 (0.21)
Soy bean	0.63	6.40	18.35 (17.88)	1.18 (1.15)	0.01 (0.63)	0.00 (0.04)
Oatmeal	1.27	6.00	10.16 (5.26)	0.61 (0.32)	0.01 (0.41)	0.00 (0.02)
Liver	0.28	5.00	219.16 (125.55)	10.96 (6.28)	0.06 (4.13)	0.00 (0.21)
Spinach and greens	1.90	4.35	58.76 (102.17)	2.35 (4.09)	0.11 (5.1)	0.00 (0.20)
Sorghum	4.72	4.10	370.93 (224.98)	15.21 (9.22)	1.77 (29.88)	0.07 (1.23)
Other egg	0.21	3.90	15.86 (10.38)	0.62 (0.40)	0 (0.26)	0.00 (0.01)
Maize	97.11	3.50	566.59 (272.14)	19.83 (9.53)	55.66 (188.97)	1.95 (6.61)
Corn flour	34.27	3.50	206.89 (160.15)	7.24 (5.61)	7.17 (48.17)	0.25 (1.69)

Table 20 cont. Sources of Iron in the Diets for Honduran Women (Sorted by amount of iron /100 g of food)

Food Categories	% of women consuming %	Average amount of Iron (mg) / 100 g of food category Mean	Average amount eaten by consuming women/ day (g) Mean (SD)	Average amount of iron (mg) / day from food category by consuming women Mean (SD)	Average amount eaten (including non consuming women) /day (g) Mean (SD)	Average amount of iron (mg)/day from food category (including non consuming women) Mean (SD)
Corn flakes	0.07	3.50	5.14 (.)	0.18 (.)	0 (0.04)	0.00 (0.00)
Red bean	89.42	2.90	106.52 (71.15)	3.09 (2.06)	9.64 (37.3)	0.28 (1.08)
Black bean	13.96	2.90	53.68 (37.72)	1.56 (1.09)	0.76 (7.75)	0.02 (0.22)
Shellfish	1.20	2.76	96.36 (80.79)	2.70 (2.25)	0.12 (4.32)	0.00 (0.12)
Sardines	0.21	2.40	49.81 (25.44)	1.20 (0.61)	0.01 (0.79)	0.00 (0.02)
Processed meats	1.13	2.38	34.81 (29.81)	1.23 (1.74)	0.04 (1.53)	0.00 (0.07)
Raw sugar	15.51	1.90	22.57 (25.80)	0.43 (0.49)	0.35 (4.27)	0.01 (0.08)
Coconut	0.14	1.40	17.10 (18.86)	0.24 (0.27)	0 (0.26)	0.00 (0.00)
Chicken egg	62.20	1.20	38.23 (21.25)	0.46 (0.26)	2.41 (10.7)	0.03 (0.13)
Pastas	14.10	1.20	47.01 (37.74)	0.56 (0.45)	0.67 (7.16)	0.01 (0.09)
Wheat flour	6.77	1.20	49.05 (77.21)	0.59 (0.93)	0.34 (7.53)	0.00 (0.09)

Table 20 cont. Sources of Iron in the Diets for Honduran Women (Sorted by amount of iron /100 g of food)

Food Categories	% of women consuming	Average amount of Iron (mg) / 100 g of food category	Average amount eaten by consuming women/ day (g)	Average amount of iron (mg) / day from food category by consuming women	Average amount eaten (including non consuming women) /day (g)	Average amount of iron (mg)/day from food category (including non consuming women)
	%	Mean	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Chicken	14.46	1.08	93.44 (100.67)	1.02 (1.10)	1.37 (16.53)	0.01 (0.18)
Avocado	4.94	1.00	116.39 (84.97)	1.16 (0.85)	0.58 (10.14)	0.01 (0.10)
Tripe	0.78	1.00	84.73 (63.04)	0.85 (0.63)	0.07 (2.91)	0.00 (0.03)
Beef	7.33	0.88	79.99 (74.46)	0.74 (0.80)	0.59 (9.37)	0.01 (0.09)
Cassava	6.35	0.80	228.66 (229.69)	1.83 (1.84)	1.47 (25.86)	0.01 (0.21)
Plantain	6.77	0.79	206.94 (158.52)	2.01 (1.60)	1.42 (21.48)	0.01 (0.21)
Cracker	0.92	0.74	108.30 (90.81)	0.76 (0.63)	0.1 (4.23)	0.00 (0.03)
Powdered milk	1.62	0.70	24.30 (19.74)	0.17 (0.14)	0.04 (1.26)	0.00 (0.01)
Milk Powder for Babies	0.07	0.70	43.47 (.)	0.30 (.)	0 (0.37)	0.00 (0.00)
Hard cheese	4.51	0.70	69.39 (92.81)	0.49 (0.65)	0.32 (7.78)	0.00 (0.05)
Pork	4.65	0.70	108.85 (120.21)	0.76 (0.84)	0.51 (11.07)	0.00 (0.08)

Table 20 cont. Sources of Iron in the Diets for Honduran Women (Sorted by amount of iron /100 g of food)

Food Categories	% of women consuming	Average amount of Iron (mg) / 100 g of food category	Average amount eaten by consuming women/ day (g)	Average amount of iron (mg) / day from food category by consuming women	Average amount eaten (including non consuming women) /day (g)	Average amount of iron (mg)/day from food category (including non consuming women)
	%	Mean	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Banana	8.60	0.69	135.93 (150.31)	0.78 (1.30)	1.18 (18.83)	0.01 (0.14)
Rice	78.77	0.60	58.17 (42.35)	0.35 (0.26)	4.63 (19.77)	0.03 (0.12)
Carrot	1.83	0.60	20.58 (28.62)	0.12 (0.17)	0.04 (1.5)	0.00 (0.01)
Tomato	41.04	0.50	68.46 (70.97)	0.34 (0.35)	2.84 (19.88)	0.01 (0.10)
Bread	1.13	0.50	55.49 (49.77)	0.28 (0.25)	0.06 (2.48)	0.00 (0.01)
Sweetpotato	0.42	0.40	38.55 (17.70)	0.16 (0.07)	0.02 (0.86)	0.00 (0.00)
Fresh cheese	10.65	0.40	70.61 (62.62)	0.28 (0.25)	0.76 (9.75)	0.00 (0.04)
Fresh fish	4.51	0.40	111.59 (107.20)	0.00 (0.00)	0.51 (10.4)	0.00 (0.00)
Butuco banana	0.99	0.35	72.48 (44.79)	0.00 (0.00)	0.07 (2.67)	0.00 (0.00)
Squash	18.83	0.31	93.22 (107.37)	0.28 (0.33)	1.78 (19.52)	0.01 (0.06)
Juices	0.21	0.20	158.67 (117.58)	0.18 (0.08)	0.03 (2.71)	0.00 (0.00)

Table 20 cont. Sources of Iron in the Diets for Honduran Women (Sorted by amount of iron /100 g of food)

Food Categories	% of women consuming	Average amount of Iron (mg) / 100 g of food category	Average amount eaten by consuming women/ day (g)	Average amount of iron (mg) / day from food category by consuming women	Average amount eaten (including non consuming women) /day (g)	Average amount of iron (mg)/day from food category (including non consuming women)
	%	Mean	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Liquid milk	42.17	0.10	286.27 (245.21)	0.29 (0.25)	12.21 (76.86)	0.01 (0.08)
Potato	32.23	0.10	80.24 (70.72)	0.08 (0.07)	2.62 (19.13)	0.00 (0.02)
Quesillo	0.56	0.10	71.21 (26.75)	0.07 (0.03)	0.04 (1.8)	0.00 (0.00)
Cuajada	27.50	0.10	28.37 (16.44)	0.03 (0.02)	0.79 (5.41)	0.00 (0.01)
Papaya	0.07	0.10	119.48 (.)	0.12 (.)	0.01 (1.01)	0.00 (0.00)
Refined sugar	84.70	0.10	30.37 (23.82)	0.03 (0.02)	2.6 (10.99)	0.00 (0.01)
Cream	30.82	0.00	32.58 (21.78)	0.00 (0.00)	1.02 (6.84)	0.00 (0.00)
Veg shortening	95.70	0.00	34.55 (23.80)	0.00 (0.00)	3.34 (12.62)	0.00 (0.00)
Lard	1.48	0.00	17.75 (17.25)	0.00 (0.00)	0.03 (0.95)	0.00 (0.00)
Veg oil	2.96	0.00	12.76 (8.35)	0.00 (0.00)	0.04 (0.83)	0.00 (0.00)
Margarine	5.71	0.00	18.97 (16.81)	0.00 (0.00)	0.11 (1.92)	0.00 (0.00)