Help Children Learn and Grow: Prevent Anemia

Summary Report
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The Problem of Iron Deficiency

Iron deficiency negatively impacts work capacity and impairs motor and mental development in infants, children and adolescents (Haas et al, 2001; Grantham-McGregor et al, 2001). Maternal iron-deficiency anemia may be a factor in low birth weight and pre-term delivery (Rasmussen, 2001). The US Department of Health and Human Services has targeted a 3 - 4% reduction in the prevalence of iron deficiency among vulnerable populations as one of its health objectives for the year 2010 (US Dept HHS, 2000). A recent report from the Centers for Disease Control and Prevention compared the prevalence of iron deficiency and iron-deficiency anemia from NHANES III and NHANES 1999-2000, and found that iron deficiency remains 2 to 5 percentage points above the 2010 national health objectives (MMWR, 2002).

Contra Costa County Anemia Task Force was formed in 1994 to address the issue of anemia in pre school aged children. Priority activities included review of available data, organizing the task force and goal setting. The goal was to reduce the rate of anemia for each age group by 2 percentage points per year. The baseline was the 1994 Pediatric Nutrition Surveillance System data.

The Anemia Task Force initiated the following activities:

Health care provider training

- Newsletters
- "Cheat sheets" protocol for intervention
- Training including technique for sampling blood

Public Education Campaign Design

- Needs assessment & message definition
  - Focus group interviews with clientele
  - Group process
- Materials development – English and Spanish
  - Video & support materials
  - Food Stamp mailer & handouts
  - Bus posters (inside and outside)
  - Magnets/stickers, shopping list pads
  - Walk through & table top displays

Public Education Campaign Implementation

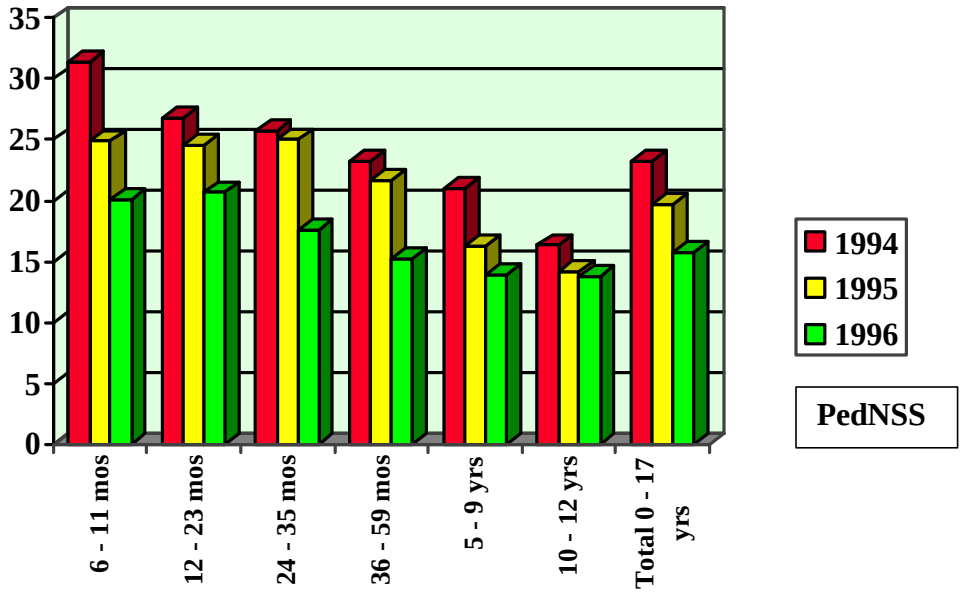
- Media
- Identification of community collaborators

  - Health care/health education providers
  - Community agencies with mutual clientele
  - Board of Supervisors endorsement
- Training of collaborators
- Establish an 800 call in referral/information line

Public Education Campaign Activities

- WIC, EFNEP, Head Start classes
- >22,000 Food Stamp household mailings
- Food Bank & Soup Kitchen outreach
- Child Care Council newsletters and provider training
- Video showing on cable TV and County welfare office waiting room closed circuit programming

Contra Costa County Reduction in Anemia Rates



In 2000, grant money from the University of California Division of Agriculture and Natural Resources, USDA-ERS Small Grant Program and an anonymous donor supported a study to examine more closely at the issue of iron deficiency in Contra Costa county. In addition to hemoglobin, this study provides a more sensitive measure of iron deficiency than is available in the clinic setting, namely, serum ferritin.

Summary report on research project

The purposes of the study were to examine the iron status of children 12 to 36 months of age enrolled in the supplemental feeding program, WIC, and to identify factors associated with low iron status. Additionally, other family characteristics thought to be related to iron deficiency and iron deficiency anemia were examined. The results of this study guide field work to develop a comprehensive nutrition education program to address iron deficiency prevention.

Participant Description of the Group Studied:

A convenience sample of 200 women with children aged 12 to 36 months in the Richmond, California WIC clinic were interviewed between August 1 through October 28, 2000. A bilingual, bicultural interviewer approached women, explained the study and sought their consent to participate. Participation in the project included a 30 to 45 minute interview with the mother to assess risk factors and a venous blood draw from the child. Over 80% (n=161) of the interviews were conducted in Spanish, 19.5% (n=39) in English.

Characteristics of the mothers

Age: The mothers' ages ranged from 16 to 56 years. The mean maternal age was 28 and the median was 27. Over half were between 24 and 31 years of age.
Prenatal Care: Nearly all (94%) had received prenatal care, with the vast majority (89%) receiving care in the first trimester. Nine percent started prenatal care in the second trimester and only 2% initiated care in the third trimester.
Supplements/anemia: Seventy eight percent of the mothers reported taking iron supplements during pregnancy while 24% were told they were anemic or had low iron during their pregnancy. Nearly 20% reported taking supplements other than iron during pregnancy.
Gestational Diabetes: Nine percent of the women reported being diagnosed with gestational diabetes during their pregnancy.
Education: Forty two percent of the mothers in the study had eight or fewer years of education, 48% had some high school or completed high school and 10% had more than a high school education.
Family Composition: Only 13% of the households was headed by a single adult. Fifty five percent of the households had two or three children under 18 years of age; over one fifth of the households had 4 or 5 minor children at home.
Public Assistance: Seventy eight percent of the women interviewed received WIC benefits while pregnant, while only 21% used Food Stamps. Fourteen percent reported using emergency food pantries or soup kitchens.
Employment: Less than one fourth of the mothers were employed outside the home.
Transportation: Forty percent used their own car for transportation. Almost 30% depended on others for transportation and about one fourth of the group used a bus or taxi for transportation. Nearly 30% report that their transportation limits the frequency or quantity of food purchased for the family.

Characteristics of the children

Gender/Ethnicity: The children in the sample were 42% female, 82% Hispanic, 9% Black and 9% White and other ethnic groups.
Age: Half of the children were between 17 and 28 months of age. Twenty four months was the mode. All of the children were between 12 and 36 months of age.
Breast/bottle feeding: At the time of the survey, 16.4% of the children were being breast fed. More than half the children in the study, 53.9%, were drinking from a bottle at the time of the survey.

Supplements/anemia: Slightly more than 20% of mothers reported that their children were prescribed iron. Fifteen per cent of children took supplements other than iron. Thirty percent of the study children had previously been diagnosed as anemic. Slightly more than a quarter of the mothers reported other children in the home had been diagnosed with anemia.
Lead testing: Twenty nine percent of the children had been tested for blood lead levels; of those, 6 children were found to have high lead.

Analysis on the hematology

This study was undertaken to further examine the anemia rates described in the Pediatric Nutrition Surveillance System (PedNSS). The blood iron status measures reported into the PedNSS is a mixture of venapuncture and finger sticks; hemoglobins and hematocrits. The blood work for this project was based only on venous blood draws. A CBC analysis was run on the samples at the Richmond Health Clinic. The samples were then taken to the UC Davis campus laboratory and assessed for hemolysis and abnormal C reactive protein to rule out false positive ferritin readings. Serum ferritin tests were run on the resulting samples (n = 173).

Iron deficiency anemia or IDA, is the end stage of iron deficiency. Cognitive and motor development abnormalities have been documented at iron levels higher than IDA standard cut off levels. Serum ferritin is considered the best test to assess iron stores with cut offs at either10 or 12µg/l, depressed iron stores below 12µg/l. Clinically, two parameters, hemoglobin and serum ferritin, are recommended as ideal for iron status assessment. As mentioned previously, this is not always economically possible, nor practical in community based clinics.

Our results confirm that in this population, recruited at a WIC clinic, iron deficiency is a serious problem. Nearly 42% of the children tested were iron deficient as defined by serum ferritin levels equal to or below 12µg/l.

	Ferritin = 12 µg/l	Ferritin > 12 µg/l
HgB = 11 g/dl	15 (8.7%)	8 (4.6%)
HgB > 11 g/dl	57 (32.9%)	93 (53.8%)

The survey results were then compared for those children with sufficient iron stores – serum ferritins > 12 µg/l with children whose iron stores were deficient – serum ferritins = 12 µg/l. With this comparison we found five relationships:

Current bottle use: Children who are current bottle drinkers are more likely to be iron deficient than non-bottle drinkers. The rate of bottle drinking was 50% in the iron sufficient group and 85% in the group with low iron status.

Prior Diagnosis of anemia: Children whose mothers reported that their child had been previously diagnosed with anemia were more likely to be iron deficient at the time of the study than children with no prior diagnosis.

Maternal anemia: Children whose mothers reported being anemic during the pregnancy with the study child were more likely to be iron deficient than children of mothers who did not report being anemic during pregnancy.

Preterm delivery: Children who were preterm were almost three times more likely to be iron deficient at ages 12 through 36 months than children who were full term.

Food stamp use: The use of food stamps was low in both iron deficient (9.5%) and iron sufficient (25%) children's households.

Other issues

Other issues on the risk factor survey of interest to Anemia Task Force members could not be analyzed in terms of correlates to iron deficiency. Information on dietary patterns to examine issues such as combination of foods (containing iron and vitamin C, which increases absorption of iron) was insufficient. Once subsetted, the numbers of children in the study were not large enough to examine all issues of interest. Questions regarding food consumption were especially problematic. It appears that the children who drank more orange juice were less likely to be iron deficient than those who drank less orange juice. It appears that most children drink more than the recommended 16 ounces of milk and 4 to 6 ounces of juice. We did not see appreciable amounts of tea or coffee consumed by children in the study.

Pica: There was no difference in the rate of pica (10%) practiced by the mothers of both iron deficient and iron sufficient children. The pica item reported most often was ice, followed distantly by starch. Ten percent of the mothers reported their children, regardless of the child's iron status, ate crayons, dirt or sand.

Family conditions were of particular interest of Task Force members. Eighty seven percent of the respondents shared their home life with another adult or partner.

Stress: An 11 point scale was used to represent stress from low to high. The responses for all of the questions using this scale fell into the same pattern – a sizable number of responses fell at the mid-point, with another group of respondents at either end of the scale. When asked to describe the *stress level in the home on a daily basis*, the most frequent answer (given 30.5% of the time) was in the middle of the scale. About a quarter of the moms indicated very low stress and about 30% ranked their stress level high (10 or 11.)

The respondents rated *stress during mealtimes* lower than overall stress in the home. Forty two percent of the respondents rated stress at meal time at the low end of the scale. Only 25% rated stress at meals at the mid-point and 17.5% of the respondents rated their meal time stress as high or at 10 or 11 on the scale.

Support with home life: The question asking for a rank of *support with home life* yielded non-intuitive results based on the previous questions. Forty four percent of the respondents indicated that they received the lowest level of support. Twenty five percent indicated that they had a high level of support, 10 or 11 on the scale. Only 18% ranked their support mid-range.

Implications

Anemia is far too common, especially for women of child-bearing age. As a result of the high prevalence, iron deficiency and iron deficiency anemia are often not addressed aggressively and effectively. Because women and children experience symptoms, such as malaise or tiredness, that can easily be attributed to other factors such as busy, hectic lifestyles, iron deficiency anemia may not be perceived as such a serious condition. However, since there is now strong evidence linking cognitive impairment and low iron stores, anemia prevention must be more seriously addressed.

Four Clinic screens: Often the blood work on young children is assessed *after* the child has left the exam room. This study indicates several indices which should be in the chart for discussion *while the mother is still with the health care provider*. Maternal anemia and preterm birth appear to have consequences for children one to three years later. Prior diagnosis of anemia is a screening index for health care providers that should immediately trigger aggressively addressing anemia prevention. Also, one fourth of the mothers reported other children in the family who were diagnosed with anemia; this is also an indicator for intervention.

Education: Health and nutrition education to prevent anemia needs to stress food sources of heme and non-heme iron. The mothers in this survey were asked to provide examples of "junk food". Meat (beef, pork, poultry, seafood) eggs, beans, and "anything from a fast food restaurant" or from a can were listed along with the chips, fried and "greasy" foods, sweets, and soft drinks. Hamburgers were mentioned repeatedly as a junk food. The misconception that hamburgers along with other meat are considered "junk food" is a major concern.

Parent education needs to include information about the best sources of iron, in commonly eaten foods. In the 12 to 36 month age range, dietary advice should also include increasing the consumption of iron-fortified, ready-to-eat cereals at meal and snack times since meat per se is not typically consumed by very young children.

In response to the request for examples of a "healthy meal", these predominately Latina mothers included many variations of soup/stews (especially home made), vegetables, meats, beans, fruit and cereal products. The emphasis in nutrition education should be on encouraging consumption of these soups/stews made with meat, vegetables and broth when the child is hungry, at meal times. That is, an emphasis should be put on reducing snacking just before meals. Transitioning to a cup would also reduce between meal drinking of caloric beverages.

NHANES National Health and Nutrition Examination Survey Comparison: The Anemia Task Force members were interested in the potential for comparing our data with NHANES. NHANES is a national surveillance survey conducted continuously, gathering data on nutrition and health, including biological measures on a random, representative sample of the U.S. The most recent NHANES data of interest is the NHANES 2000; as of the time of this report, there are too few data points of the 2 to 3 year olds and women of child-bearing age to examine. In the near future, the NHANES 2000 data will provide a useful comparison.

Final Summary:

1) The prevalence of iron deficiency in Contra Costa County is high at 41.6%, using serum ferritin in conjunction with hemoglobin to assess deficiency. Clinic data of hemoglobin are identifying the iron deficiency anemia and the lowest of the iron deficient children, yet there is another 34% who are iron deficient who would not be identified in a routine clinic visit with blood test.
2) Prior history of anemia for mother while pregnant, child (patient) and the child's siblings are correlates with current iron deficiency. These data are easy clinic screening tools.
3) Rate of bottle use at more than 50% was particularly high, especially given the age of the children.
4) Lack of Food Stamp use is correlated with iron deficiency.

Analysis support: Analysis for this report was conducted by Julie Schneider, under the direction of Sheri Zidenberg-Cherr for a doctoral dissertation research project in the Department of Nutrition University of California, Davis. Independent analysis was done by Patsy Wakimoto with the NIH National Center for Minority Health and Health Disparities at Children's Hospital Oakland Research Institute (CHORI). Patsy Wakimoto is also an associate researcher at the School of Public Health UC Berkeley. The author gratefully acknowledges these essential contributions along with those of the Contra Costa County Anemia Task Force members.

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Data collected included:

Ethnicity of sample
Estimated family income, family size
Utilization of food-assistance programs
Maternal demographics, pregnancy history
Prevalence of breastfeeding
Infant feeding practices
Prevalence of iron deficiency, and iron deficiency anemia in Contra Costa

Child's History
Question 8: Was (C) born before (his/her) due date?
Question 9: How early was (C) born?
Question 59: Please describe (C's) temperament or feelings toward food and eating.
Question 60: What do you do if (C) refuses to eat at meal time?
Question 61: What form of transportation do you use to go other places?
Question 62: From very much to not at all, how much does "…" limit how often you buy food?
Question 63: From very much to not at all, how much does "…" limit how much food you buy?
Question 64: From very much to not at all, how much does "…" limit were you buy your food?
Question 65: From very much to not at all, how much does "…" limit what types of food you buy?
Question 27: From very bad to very good, how would you feel if I told you that (C) is anemic?
Question 70: From not stressful to very stressful, how would you describe the level of stress in your home on a daily basis?
Question 71: From not stressful to very stressful, how would you describe the level of stress during mealtimes?
Question 72: Not including money, from no support to a lot of support, how would you describe the help you get with home-life?

Acknowledgments:

Contra Costa County Anemia Task Force Members

- Lead Poisoning Prevention Program
- Public Health Clinic Services
- WIC
- Community Wellness & Prevention
- Hunger Task Force/Food & Nutrition Policy Consortium
- Head Start
- Contra Costa Child Care Council
- University of California Cooperative Extension
- Health Services Pediatric Physicians
- Contra Costa Food Bank
- Board of Supervisor DeSaulnier's office
- CHDP Nutrition, Nursing, Medical

Campaign fund sources

- CHDP
- Anonymous Donor
- Contra Costa Health Plan
- Contra Costa Television
- Expanded Food & Nutrition Education Program - UCCE
- In-kind from task force members