MotherCare™

THE ALLEVIATION OF MATERNAL ANEMIA IN INDRAMAYU REGENCY, INDONESIA: RESULTS FROM THE MOTHERCARE PROJECT

WORKING PAPER: 23

September, 1993

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MotherCare Working Paper 23, is compiled from five separate Indramayu project working papers detailing specific foci of the Indramayu MotherCare project aimed at alleviating anemia. The project was carried out by a team of investigators from the Center for Child Survival of the University of Indonesia, headed by Dr. Budi Utomo (August 1990-June, 1992) and Dr. Endang Achadi (July 1992-February 1993). This project was performed as part of the MotherCare project under Contract No. DPE-5966-Z-00-8083-00 with the U.S. Agency for International Development.

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THE ALLEVIATION OF MATERNAL ANEMIA IN INDRAMAYU REGENCY, INDONESIA: RESULTS FROM THE MOTHERCARE PROJECT

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I. INTRODUCTION

During the 1980s, concerns with improving child survival and reducing very high infant mortality rates dominated international health efforts. Infant mortality rates fell significantly as maternal and child health programs proliferated, adopting multidisciplinary approaches to address these issues. As an understanding developed of the links between infant and maternal mortality, these programs increasingly began to focus on the relationship between child survival and maternal health.

In particular, pregnancy-related complications drew attention as potentially threatening to both a mother and her infant. Research supports this emphasis: when the mother suffers, the fetus or newborn is also vulnerable. In many developing countries, more than one quarter of all deaths to women of reproductive age are pregnancy-related. In addition, seven million perinatal deaths are associated with maternal complications, with problems during labor and delivery, or with a woman's general health and nutritional status before and during pregnancy. Illnesses such as malaria and anemia are often aggravated by pregnancy and impact not only on the woman but on the infant as well. In response to these problems, safe motherhood programs developed to ensure better health for both women and children.

In Indonesia, the infant mortality rate (IMR) began to decline rapidly in the late 1970s. Estimates based on the 1980 census revealed an IMR of 112/1000 in 1977. By the early 1980s, this had declined to 71/1000 (Mamas, 1988). Even as the IMR continued to decline, the perinatal mortality rate (PMR), which is defined as fetal and early neonatal mortality, did not show any significant decline (Alisjahbana, 1985; Budiarso, 1988). Estimates show that total neonatal mortality accounts for 40% of mortality among all age groups (Household Health Survey 1986). According to the Household Health Survey of 1986, neonatal tetanus and perinatal causes of death, including asphyxia, hypoxia, infection, and other obstetric complications related directly to birth processes, are the predominant causes of death in the neonatal period. Neonatal mortality is generally aggravated by low birth weight and prematurity, both of which are related to maternal nutritional status.

The relationship of maternal nutritional and immunization status with pregnancy outcome and the survival of the newborn is well documented (Krasovec and Anderson, 1991). Nutritional supplementation, such as increased intake of iron folate, is aimed at improving the mother's energy reserves and her nutritional status. In addition, many studies indicate that the maternal anthropometric indicators of pregnancy, including weight, height, weight gain in pregnancy and arm circumference, are important predictors of pregnancy outcomes. These indicators often point to problems such as low birthweight, perinatal, neonatal and infant mortality, and poor infant growth. Evidence has shown that women with low pre-pregnancy weight or low weight gain during pregnancy, and even more so with both of these conditions, were at the greatest risk of having low birthweight (LBW) infants (Krasovec and Anderson, 1991).

Although there has so far been no national level survey of maternal mortality in Indonesia, the 1980 Household Health Survey estimated a maternal mortality rate of 40/10,000 live births. Using the typological approach presented by Tinker and Koblinsky, (1993), Indonesia is defined as a "B"

setting, falling in the middle of the continuum from a resource-poor (Setting A) to a resource-rich (Setting C) environment. This continuum reflects a range of levels of maternal mortality, women's isolation--including exposure to health information and influence in decision-making, capacity of the health system to deliver health and family planning services, and effectiveness of the referral system. In order to reduce maternal mortality in a given setting, each situation has objectives for policy development, project-level interventions aimed at improving services, and for behavior change.

The provision of adequate maternal health services represents a priority intervention in all settings. Without adequate services and regular utilization of these services by women during pregnancy, their health problems remain hidden and difficult to address. The prenatal period is an essential period for imparting health and nutrition education to women and for monitoring their health and the health of their fetus. An important part of prenatal care is ensuring maternal weight gain during pregnancy and healthy growth of the fetus, as well as reducing nutritional deficiency in the woman and strengthening her immunity to infection.

In Indonesia, anemia is an important and preventable health problem, affecting between 58 and 80 percent of pregnant women (Household Health Survey, 1992). In 1985, the World Health Organization estimated that 59% of women in developing countries (except China) were anemic. Anemia can be caused by dietary deficiencies such as a shortage of iron, folic acid, or vitamin B12, or by diseases such as malaria and hookworm infestation. In fact, iron deficiency is the most common nutritional deficiency in the world. A study of five Southeast Asian countries showed that pregnant women in Indonesia had the lowest hemoglobin (Hb) levels (WHO, 1982). Estimates based on the Household Health Survey (1986) show that the prevalence of anemia in Indonesia as a whole was 73.7 percent, while in the Bogor Regency of West Java it was 68.6 percent. The study also showed that the severity of anemia increased with parity and maternal age. This situation exists even though the iron folate tablets are distributed from village level community health centers and clinics.

The Survey of Maternal Mortality conducted in Central Java (Agoestina, 1990) estimates a maternal mortality rate of 45/10,000 live births. About 40% of deaths to women aged 15-44 are thought to have been caused by complications of pregnancy and childbirth, with the vast majority of these deaths attributed to hemorrhage, infection and toxemia (Chi et al., 1981; Fortney et al., 1985). Throughout Indonesia, the factors contributing to high maternal mortality include age, parity, socio-economic status, distance to the hospital (Daryono et al., 1981), and poor nutrition, anemia, short inter-pregnancy interval and poor hygiene (CBS-UNICEF, 1984). Yet the number of Community Health Centers (puskemas) and Integrated Family Planning and Health Posts (posyandu) has increased significantly since the 1970s throughout the country. As a result, health care services and child care facilities are more accessible to most communities than before. Maternal health care services are integrated into these various health care facilities, but such services often have not received the attention of health care providers, nor have women made use of these services. As a result, estimates show that 80% of all deliveries continue to take place at home (CBS-UNICEF, 1984).

In these respects, Indonesia represents a typical "B" setting. Characteristics of a "B" setting include an established public health system with hospitals, health centers, and appropriate medically trained staff that provide both family planning and maternal care, but where women remain outside the formal structure, using traditional birth attendants at the time of delivery. Birth-related mortality remains moderately high, both for women and infants (Tinker and Koblinsky, 1993).

As part of a larger program to reduce maternal mortality, the Ministry of Health targeted a reduction in the prevalence of maternal anemia from 74% to 40% during its last Five Year Plan. This goal was not achieved, however, and new strategies were necessary. In particular, the Ministry encountered

logistical problems in its efforts to distribute iron folate tablets. There was a clear need to develop an alternative delivery model. Also, better information about anemia needed to be distributed to women, and the prevalence of anemia and other nutritional problems needed to be better documented.

In conjunction with the Center for Child Survival at the University of Indonesia (CCS-UI), and with collaboration from the Population Council and the Manoff Group, MotherCare undertook a project aimed at addressing these problems in the Indramayu region of West Java. The project was added onto a longitudinal data collection system, called the Sample Registration System (SRS). CCS-UI started the SRS in January, 1989 in a defined population as a prospective study of family planning and health in two sub-districts of the Indramayu Regency, Gabus Wetan and Sliyeg, in collaboration with the National Family Planning Coordinating Board (BKKBN) and the Ministry of Health. Site selection was based on a review of national survey and census data to determine sites of high fertility and mortality, minimal urban influences, a health system typical of the country as a whole, and a lack of previous health interventions. CCS-UI was familiar with this setting, having previously conducted various research projects in this area aimed at understanding the determinants of child survival and responding with suitable interventions.

Indramayu Regency is located in the northeastern corner of West Java, approximately 200 kilometers from Jakarta. The population is estimated at 1.3 million, with 13.5% children under five. Village level statistics, which may not be entirely reliable, estimated the number of births in 1986 at 330,209, giving a crude birth rate (CBR) of 10.2 per thousand. Women marry at young ages, and childbirth generally occurs at home with the help of a traditional birth attendant (TBA). In the Household Health Survey of 1986, not more than half of the mothers reported receiving any immunization during childhood, and not more than one third received a tetanus toxoid injection during their last pregnancy. About fifty percent reported using some method of family planning in the month preceding the survey. Table 1 illustrates some of the basic demographic information about West Java as compared to Indonesia as a whole.

Table 1: Selected Demographic and Health Indicators for Indonesia and West Java[1]

Demographic/Health Indicator	Indonesia	West Java
Infant Mort. Rate	71.8+	94.7*
Perinatal Mort.Rate	40.5+	43.7#
Total Fert. Rate	3.3*	3.4+
Maternal Mort. Rate	4.5+	4.9#
% Preg. Women Anemic	73.7+	68.6+

[1]Sources for these statistics are: *) the National Indonesian Contraceptive Prevalence Survey, 1987 and +) the National Household Health Survey, 1986. #The perinatal mortality rate given is for Bandung Regency, West Java (Alisjahbana, 1985), and the percentage of pregnant women who are anemic is that of Bogor Regency, West Java, as estimated by the Household Health Survey, 1986. $The maternal rate given is from the Maternal Mortality Survey, 1990.

The health system in Indramayu consists of 25 puskemas, community health centers at the sub-district level, 45 puskemas pembantu, or auxiliary community health centers, and 2,027 posyandu, or integrated family planning and health posts at the village level. The community health centers and the family planning clinics together provide the services of a doctor and a midwife. In addition, there are several mobile posyandu which set up once a month in each village.

Within this context, the MotherCare Project aimed to describe maternal and neonatal health and nutritional problems and to test the effects of practical interventions. Specifically, the objectives of the project were:

- To describe the indices of maternal and neonatal health, including maternal nutrition, complications of pregnancy and delivery, utilization of prenatal services at the community level, use of medications during pregnancy, and birth outcomes;
- To assess the knowledge, attitudes and practices concerning nutrition, iron folate consumption and maternal anemia among midwives, outreach workers (health volunteers and TBAs) and the community (members of women's organizations and pregnant women);
- To assess the use of antepartum and intrapartum health services and the use of medications, including traditional medicines, during pregnancy;
- To assess the nutritional and health status of pregnant and nonpregnant women;
- To increase utilization of prenatal care and consumption of iron folate tablets;
- To improve the distribution of iron folate tablets to pregnant women through an improved iron folate distribution system;
- To increase knowledge of anemia and maternal consumption of iron folate tablets;
- To test the utility of the prospective data collection system, the Sample Registration (SRS) in identifying pregnancies; and
- To examine the outcome indicators of pregnancy, including fetal loss, birth weight and maternal and neonatal mortality.

Data about demographic events were collected on a continuous basis from the households originally selected in the sample. Selection of the intervention and control sub-districts attempted to ensure that the two areas were similar with regard to health services, demographic characteristics, economic conditions, and ecological characteristics. Gabus Wetan, the experimental area, and Sliyeg, the control area, are approximately 40 kilometers apart and are separated by a subdistrict, thus minimizing the possibility of contamination.

In addition to CCS-UI, other participants in the project were the District Health Office in Indramayu and the Health Center (puskemas) staff, the staff of the Indramayu Internal Affairs Office, the Women's Organization, and the local health volunteers. The Population Council provided technical assistance as a sub-contractor to John Snow, Inc. (JSI) for the MotherCare project, and Manoff International, Inc., another sub-contractor to JSI, assisted CCS-UI with the development of the social marketing campaign.

II. ASSESSMENT OF THE PROBLEM

The MotherCare Project focused specifically on the problem of anemia during pregnancy, a problem that is exacerbated by high levels of non-compliance among pregnant women in taking iron folate tablets. Initial research confirmed the high prevalence of maternal anemia and other nutritional deficiencies in the Indramayu Regency.

In general, the nutritional status of Indonesian women is poor. In a study of the nutritional status of pregnant women in East Java, Kardjati (1985) found that their pre-pregnancy weight was low. The total weight gain during pregnancy was only 6.6 kg., which was 15 per cent of the pre-pregnancy weight and only half the weight gain recommended in the United States for women with initially low pre-pregnancy weight. She further found that fetal growth was impaired and seasonal fluctuations in birth weight coincided with those in food consumption. The habitual dietary intake was marginal, so that there was no allowance for building up reserves to offset the deficit during lean seasons.

Weight gain is not the only indicator of improvement in the nutritional status of pregnant women as deficiencies in other nutrients, particularly iron and iodine, become more marked during pregnancy even though body weight may increase. Anemia is often exacerbated by pregnancy, since the need for additional iron often may not be met. The normal hemoglobin (Hb) level for an adult, non-pregnant woman should be above 12 grams/deciliter (12 g/dl). In general, the Hb level declines from the twentieth to the thirty-fifth week of pregnancy. According to the World Health Organization (WHO) (1972; 1975), a woman is classified as anemic if the Hb level goes below 11 g/dl. An Hb level below 9 g/dl threatens maternal health. A level below 6.5 g/dl directly threatens maternal survival. Furthermore, the risk of maternal death increases eight-fold in cases of severe anemia (Belsey and Royston, 1987). In addition, some studies of malnourished groups have shown that low Hb level (< 9 g/dl) is associated with low birth weight and higher perinatal mortality (Murphy, 1986; Kuizon, 1985).

Programs to address anemia among pregnant women exist through the posyandu and puskemas. Iron supplements are supposed to be distributed to all pregnant women in their last trimester from these health posts and clinics. The policy of the Ministry of Health advises that women take one tablet daily for at least 90 days during pregnancy. For this purpose, UNICEF supplies packets of 30 tablets containing 200mg of ferrous sulphate (equivalent to 60 mg of elemental iron, the dose/tablet recommended by WHO) (DeMaeyer, 1989) and .25mg of folic acid. Still, evidence shows that only 33% of pregnant women receive iron folate supplementation, indicating a problem in distribution of the tablets. Furthermore, prior to the MotherCare Project little was known about local beliefs and practices surrounding the use of iron tablets during pregnancy or about women's acceptance of these tablets.

Maternal anemia emerged as the target of intervention based on the high prevalence of anemia and little previous success in addressing the problem. Although anemia is often ignored during pregnancy, its consequences are potentially severe. Also, potential areas of intervention were highlighted by the discrepancy between availability of tablets and actual usage, which was low. The MotherCare Project decided to address the project objectives with several strategies:

- a community-based study of the nutritional status of pregnant women;
- an intervention which designed and implemented an experimental iron-folate distribution system in which the project assured the supply of iron folate tablets to the TBAs and health volunteers who then served as distributors of the iron folate tablets;

- an information, education and communications (IEC) campaign to promote behavior change;

- the creation of a pregnancy data collection instrument, the MotherCare Module, which would be added to the already established Sample Registration System (SRS); and

- the initiation of policy dialogue with the Ministry of Health to encourage further Safe Motherhood activities.

These five strategies developed into the components of the MotherCare Project.

III. THE PREGNANCY DATA COLLECTION SYSTEM

Before the implementation of any practical intervention to address better compliance with and distribution of iron folate tablets, an accurate system for identifying and tracking pregnant women was needed.

The Sample Registration System (SRS) is a longitudinal demographic surveillance system, which collects information in Gabus Wetan and Sliyeg from about 10,000 sample households and their individual members at three month intervals. Two types of data are collected in the SRS: longitudinal and fixed record data. The longitudinal data consist of information about households and individuals that change over time, and thus are collected and recorded at 90 day intervals.

The SRS as a whole contains three types of data collection instruments:

- household baseline data, which consist of basic data on the socio-economic characteristics of the household and its members, including some key information about ever married women and their children;

- household cyclical data, which consist of several modules. Module A is a household follow-up module for collecting data on demographic events. Modules B and C are known as the Mother and Child Module and provide follow-up information based on recall of various events in the mother and child's lives over the previous three months; and

- Module D, which contains household data on current pregnancies and is known as the MotherCare Module.

Module D, or the MotherCare Module, was fielded from June 2, 1991 through November 30, 1992 specifically for the MotherCare Project. The research team and the project consultants developed the module jointly, and it was pre-tested before being adopted in its final form. It consisted of three parts: antepartum, or the period from the time of pregnancy detection until pregnancy termination; intrapartum, or the period from the beginning of labor to delivery; and postpartum, or the period from delivery to 42 days after delivery. Following identification, all pregnant women were interviewed and examined. The women were then followed up monthly to check their nutritional status, including height, weight and mid-upper arm circumference.

Pregnancies are identified through modules B and C, by asking every woman aged 12-49 years a set of questions on the date of last menstruation and other conditions related to menstruation or

amenorrhea. For those confirmed to be pregnant, Module D was also used. A set of probing questions on the signs and symptoms of morbidity-related conditions, health seeking treatment, and other related information are asked monthly to the women during pregnancy, immediately after delivery, and at the 7th and 42nd days post-partum.

The SRS MotherCare procedure for identification of pregnancy involved a coordination of activities between SRS interviewers, data entry persons, and MotherCare interviewers. Once a pregnancy was identified during a tri-monthly visit, a sticker with the woman's name and ID number was prepared. One month after the date of identification of suspected pregnancy, the MotherCare interviewer visited that woman and asked a set of questions related to pregnancy. If it was a confirmed pregnancy, the interviewer placed a sticker on the pregnancy questionnaire, conducted an interview, and regularly visited that woman every month to obtain morbidity and nutritional status-related information during pregnancy, at delivery, and at the 7th and 42nd days post-partum. The MotherCare stickers helped to reduce data linkage errors in use of the MotherCare data. For analyses of the MotherCare Project, data on pregnant women was extracted from the pregnancy module and the household baseline data.

A weakness of other studies requiring early identification of pregnancies has been the use of the date of the last menstrual period (LMP) to confirm pregnancy. This has been a problem particularly with unmarried pregnant women or women with an unclear marital status, who are ashamed to say they are pregnant. Memory lapse is also a problem in some instances. In addition, some respondents are hesitant to give their last date of menstruation because they do not want to be visited monthly for an interview if they are known to be pregnant. Some of these problems can be addressed by interviews with other household members, or by waiting until the pregnancy develops further.

In order to assess the value of the SRS-MotherCare procedure for identification of pregnancy, another procedure called the key-informant method was used. Key informants, who were hamlet heads in the study area, were asked to list the names of all pregnant women in their area in a specified time period. The hamlet heads used various methods of listing: visiting households, asking any person who might know of a pregnant woman, using pregnancy records at the posyandu, using their own records, and asking TBAs. Fifty-two key informants were used in Gabus Wetan and 60 in Sliyeg.

Assuming that all reported pregnancies were true pregnancies and that no pregnancy was missed by both procedures, the SRS-MotherCare procedure identified pregnancies at earlier stages of gestation. Overall, the SRS-MotherCare procedure identified 86% of all pregnancies, while the key-informant procedure identified only 65%. If the comparison was made only on pregnancies having an age of gestation of less than four months, the SRS-MotherCare procedure identified 91% of all pregnancies, while the key-informant procedure identified only 63%. The mean age of gestation at identification of pregnancy was sixteen weeks for the SRS-MotherCare procedure and twenty-three weeks for the key informant procedure.

Development of the capacity to collect pregnancy-related data on a regular basis is essential to addressing both maternal anemia and other maternal and child health problems. The SRS aided this process in Indramayu Regency although some of the pregnancies were identified later than anticipated because cyclical household visits occurred only once every three months. If it were important for pregnancy identification to occur before 4-5 months of gestation, then household visits would have to occur more frequently. Despite this, development of the MotherCare module has allowed the collection of baseline data important to the development of safe motherhood projects. Even so, this type of data system remains controversial within the MotherCare project because of the costs in time and personnel required to set up and to maintain it.

The research team monitored all pregnancies identified in this sample at the time of the SRS quarterly visits. Assuming 8-10 percent of the married female population would be pregnant at any time, it was expected that a sub-sample of approximately 500 pregnant respondents would be generated in each of the subdistricts, given continuous quarterly detection and participation of newly identified pregnant women. Thus, pregnant women identified at different stages of pregnancy were followed up prospectively until 42 days post-partum. Assuming identification of pregnancy did not occur until the fourth or fifth month of pregnancy, the sample of women followed at least from the beginning of the third trimester through pregnancy termination would be sufficient to test the study hypothesis. The MotherCare module of the SRS, designed to provide information regarding the pregnancy and its outcomes, was used to follow up on the pregnant women.

Data Collection:

The study questionnaire, Module D, was developed as a collaborative effort between the project participants. The questionnaire was developed in English, translated by CCS personnel into Indonesian, pretested with ten women in each subdistrict, and subsequently modified as necessary to improve clarity. The average length of an interview was estimated at 15 minutes.

Socio-demographic data were collected by interviewers previously trained by the Indramayu Project as part of the initial SRS, and data on marital status was updated quarterly. An additional five interviewers per subdistrict were hired and trained over a five day period to collect information regarding maternal health and health service utilization, dietary behavior and receipt and consumption of iron folate tablets. All interviewers were women and had completed high school. One supervisor for the interviewers in each subdistrict was responsible for review and quality control of the data, submitted to the field office on a weekly basis.

Midwives in both subdistricts received a one day training session in obtaining and reading micro-hemoglobin samples using the Hemocue instrument. Due to mechanical problems, however, few samples were collected during the study. The representativeness and reliability of this data are questionable, and therefore not reported in this article.

The data were sent to CCS-UI in Jakarta for entry. Data entry was conducted using FoxPro software. Project specific software was developed in FoxPro and was then examined for data verification, consistency and logical checks simultaneous to data entry to reduce data entry errors and to minimize subsequent data cleaning.

IV. THE COMMUNITY-BASED NUTRITION STUDY

Although the problems of maternal anemia specifically and nutritional problems in general were known to be widespread in Indramayu Regency, little specific epidemiologic information existed. In order to obtain more reliable assessments of the prevalence of anemia and other nutritional problems, the MotherCare Project undertook a study to assess the nutritional status of women.

During this study, pregnant and non-pregnant women in the Gabus Wetan and Sliyeg sub-districts of Indramayu Regency were interviewed, and measurements of height, weight and mid-upper arm circumference were taken in order to examine nutritional status. The sample consisted of 845 pregnant women who were measured between June 1, 1991 and November 30, 1992. This study used combined data from both of the sub-districts for the sample of pregnant women, and a cross-sectional sample of non-pregnant women from both sub-districts was added. The cross-sectional

sample of non-pregnant women was selected using systematic and stratified random sampling. Using the enumeration areas from the SRS as clusters, the research team selected ten areas systematically in each subdistrict. Then the women were stratified by age categories (12-19, 20-29, 30-39, and 40-49) in order to form a sample with ages similar to that of the population. From each cluster, twenty-five women were chosen, providing a proportional sample of 500 non-pregnant women. The sample size was based on finding a prevalence of malnutrition of 10% $\pm$ 2.5% given a two-tailed test and a Type 1 error of 5%.

Data analyses were conducted using SPSS-PC. Chi-square, t-test and ANOVA were used to compare the nutritional status of non-pregnant and pregnant women, and to examine the relationships between nutritional status and other individual characteristics. Multiple linear and logistic regression models were analyzed to examine factors associated with pregnancy weight gain and adequacy of pregnancy weight gain.

The dependent variables were weight, height, body mass index (BMI=weight in kg/height in meters squared), mid-upper arm circumference (MUAC), estimated pregnancy weight gain, and adequacy of estimated pregnancy weight gain. The weight and BMI variables for the pregnant women were based on estimates of the pre-pregnant weight. Estimated pregnancy weight gain was calculated from two weight measurements taken during pregnancy. The judgement as to whether pregnancy weight gain was adequate was based upon a comparison of the woman's estimated weight gain with the computation of adequate weight gain for a woman of her pre-pregnant weight and height.

Tables 2a and 2b show the socio-demographic and reproductive characteristics of the pregnant and non-pregnant women. The nonpregnant women were older, slightly less educated, and slightly less well off. Marital status differed between the pregnant and non-pregnant women. Virtually all of the pregnant women were married, while significantly more of the non-pregnant women were not yet married (13%), or were separated or widowed from their husbands. Non-pregnant women had slightly higher parity than pregnant women.

Table 2a. Socio-demographic Characteristics of Pregnant and Non-Pregnant Women

	N	%	N	%	
Age:	481		424		p < .001
<17		12.7		10.6	
18-27		45.9		28.5	
28-37		34.7		34.2	
38+		6.7		26.7	
Education:	481		424		N.S.
None		40.9		43.9	
Low (1-6 yrs.)		51.1		48.8	
High (>6 yrs.)		7.9		7.3	
Own Bicycle	425	81.9	446	83.0	N.S.
Own Motorcycle	425	6.1	446	9.2	N.S.
Own Radio	481	47.0	446	50.9	N.S.
Own Land	425	79.3	446	82.7	N.S.

Statistically significant differences were found between nutritional status, age and parity of the pregnant and non-pregnant women. On average, the pregnant women were lighter in pre-pregnant weight and thinner. Age and parity contributed to this difference in nutritional status. Specifically, pre-pregnant weights of the pregnant group were significantly more likely to be in the lowest categories of less than 40 kg (18% versus 9%) and 40-44.9 kg (29% versus 24%) In arm circumference, the pregnant women were significantly more likely to be in the categories reflecting deficiencies.

ANOVA was used to look at the nutritional status of the women after stratifying by pregnancy status and individual characteristics. Stratified by age groups, weight and height were not significantly different between pregnant and non-pregnant women, while MUAC and BMI were significantly different. Weight, MUAC and BMI were significantly different between pregnant and non-pregnant women after stratifying by education, motorcycle and radio ownership, occupation and parity. Weight, MUAC and BMI were significantly different among parity categories after controlling for pregnancy status. Weight, MUAC and BMI were not significantly different by women's occupation and radio ownership after stratifying by pregnancy status. Tables 1 and 2 of the appendix illustrate these findings.

Table 2b. Socio-Demographic Characteristics of Pregnant and Non-Pregnant Women

	Pregnant		Non-Pregnant		P Values
Marital Status:	N	%	N	%	
Widow/Div/Sep.	481	1.0	424	7.1	$p < .001$
Married w/spouse		98.5		80.0	
Not yet married		0.4		13.0	
Mother's Occup:	481		424		N.S.
houseworker		56.3		59.2	
working not farm		16.2		11.3	
working farmer		12.3		16.7	
not yet working		15.2		12.7	
Parity:	481		423		N.S.
None		31.2		25.5	
1-2		36.2		37.4	
3-4		20.0		23.4	
5 +		12.7		13.7	

Table 3 shows a few characteristics of the pregnant women. On average, the pregnant women were first measured at 20 weeks of gestation. The mean previous birth interval of the multigravid women was more than four years. Nearly 40% of the women said "no" to the question, "Were you planning to be pregnant and have a child now?"

Table 3. Characteristics of Pregnant Women

	X	(SD)	N
Mean Wks. Gestation at 1st Interview	20.34	(7.0)	774
Days Previous Birth Interval	1,600	(1253)	534
Planned Pregnancy	60.7%		774

Comparing the average nutritional status of nonpregnant women with standard references, the women in West Java placed in the 25th percentile or less on all indicators. Using original formulae to estimate pre-pregnant weight and pregnancy weight gain, the study showed that 18% of pregnant women had a pre-pregnant weight of 40 kg. or less. The estimated average total weight gain during pregnancy was examined by categorized variables. Estimated total weight gain was 8.94 kg, or 57% of the 15.5 kg considered adequate for this population with a mean pre-pregnant weight of 46 kg and mean height of 152 cm. The estimated weight gain during pregnancy was significantly different by

pre-pregnant weight, height and BMI categories. Those who were younger and thus lighter, taller or with few previous births were more likely to gain more weight. Women with better economic status, as shown by ownership of a motorcycle and a radio, gained more weight during pregnancy as compared to those with lower economic status. Women with higher education status, who were also younger, gained significantly more weight than those with lower education. Weight gain was also significantly different by women's occupation. Table 3 of the appendix shows these findings.

Comparing estimated pregnancy weight gain with the amount of weight gain needed to compensate for generally low pre-pregnancy weight, only about 9% of women in the study area gained weight adequately. Adequate weight gain is based on predictions of adequate birthweight rather than low birthweight. Only 1% of the women in the lowest category of pre-pregnancy weight gained adequate weight. On the other hand, 24% of women who weighed over 50 kg before pregnancy gained adequate weight.

Multiple regression analyses were conducted on estimated pregnancy weight gain. BMI, parity, ownership of a motorcycle and having planned the pregnancy were statistically significant variables in the model. Logistic regression was run on adequacy of pregnancy weight gain. BMI, age, low education and owning a motorcycle were statistically significant predictors.

The overall results of the nutritional assessment show that the nutritional status of a high proportion of women in Indramayu is poor, and 90% are estimated to have had inadequate weight gain. Individually and jointly, these factors increase the risk of low birthweight, a problem affecting approximately 8% of deliveries in Indramayu. More attention should be focused on improving the nutritional status of women of childbearing age prior to pregnancy. Furthermore, greater pregnancy weight gain should be encouraged for women who are short and thin. This study adds to the body of knowledge about the nutritional status of women of childbearing age in Indonesia. Clearly, more attention needs to be focused on the dietary intake of girls and women in order to improve the height, weight and other nutritional indicators during the childbearing years. These data on the nutritional status of pregnant women will be useful in predicting the incidence of low birthweight.

V. INTERVENTIONS TO INCREASE IRON FOLATE CONSUMPTION

The community-based research project on the nutritional status of women in Indramayu identified two major problems with iron folate consumption:

- few women received iron tablets in spite of their distribution to health centers throughout the district, and
- even where women did receive tablets, compliance remained low.

Thus, the overall objective of all interventions was to alleviate maternal anemia through the improved distribution of iron folate tablets and increased awareness about maternal anemia.

In addition to maternal health status, the level of effectiveness in providing maternal health services greatly affects pregnancy outcome. Neonatal problems including low birth weight and perinatal mortality are more common among women who do not get prenatal care (Trivedi and Mavlankar, 1985; Harrison, 1985; Brown, 1985). In Indonesia, prenatal care is an integral part of the MCH program and is available to all pregnant women at very low cost. Service statistics and surveys

indicate, however, that utilization of these services does not meet the Government of Indonesia recommendation of four or more visits during pregnancy.

Although 50-70 percent of the target population visit a health facility at least once during pregnancy, only a third or fewer have been examined at least four times during pregnancy. Most women attending a posyandu have their children weighed, but do not receive any prenatal care, and many of those who visit a puskemas receive only a cursory examination. In addition, there is little management or referral for the conditions diagnosed during these visits. In fact, one of the conclusions of the 1986 Household Health Survey is that the frequency of prenatal care does not influence perinatal mortality in any significant manner, implying that the quality of care received is extremely poor (Budiarso, 1988).

Recent findings from the Indramayu Prospective Study of Family Planning and Health demonstrate that although almost 70% of pregnant women visited the nurse-midwife for a prenatal check, almost 80% of the deliveries were attended only by a traditional birth attendant (TBA) (Indonesian Epidemiology Network, 1989). In spite of training a large number of TBAs and outreach workers (cadres) throughout the country to improve their skills, there still appears to be a lack of awareness about the need for comprehensive and regular prenatal care, identification of high risk pregnancies, and their referral to a health center or trained professional. Women in the community share this lack of awareness, and inadequate logistical support and monitoring of services at the district health service points aggravates the problem.

To be effective in providing comprehensive health services for women, particularly pregnant women, a health system needs the following characteristics:

- a high level of training for service providers;
- a high level of participation by women; and
- good prenatal care services in which maternal morbidities or complications are identified on time and either appropriately managed or referrals are made.

The Indramayu health system was weak in these areas, suggesting that better training and organization of services would reduce problems with iron folate tablet distribution.

The widespread prevalence of maternal anemia raised further questions about the effectiveness of the local health system. Even though the health centers received the iron folate tablets for pregnant women, it seemed clear that few women received the tablets. In cases where they were distributed, compliance was low. Part of this appeared to be due to poor prenatal care routines, with few women appearing at the local clinics more than a few times during pregnancy. Women who did attend the clinics and received the tablets did not take them in the prescribed quantity. Local beliefs and practices may have inhibited compliance with a pill-taking regimen, but little was known at the puskemas and posyanydu about local beliefs regarding this issue.

As a result of these findings, two areas of improvement were identified: better compliance on the part of women through improved understanding of local cultural beliefs, and an improved distribution system so that more women actually received the pills. In order to achieve this objective, two main areas of project level intervention were selected. These were:

- improving the distribution of iron folate tablets in the Indramayu district through an experimental delivery system using TBAs and local health volunteers, and

- achieving behavioral change related to the consumption of iron folate tablets through an information, education and communications (IEC) campaign.

In turn, it was expected that these interventions would have a positive effect on the quality of health services for pregnant women and maternal nutritional status overall.

The experimental iron-folate distribution system addressed the objective of improving health services for pregnant women by attempting to improve distribution of and compliance with iron folate requirements. An experimental distribution system was designed in which the TBA, cadre (local health worker) or other health service provider living in the community served as the distributor of iron-folate supplies. The woman could obtain the pills by visiting the TBA's home in addition to the usual health facilities. This service delivery model was expected to increase accessibility of iron-folate in comparison to the existing system of pre-natal iron folate supplementation, in which iron folate tablets are distributed at the posyandu once a month. Table 4 illustrates the socio-demographic characteristics of the intervention and control areas.

Under the government program, the iron folate distribution system relies on the puskemas staff, on the cadre at the posyandu level, and on women's visits to the puskemas and posyandu. The low attendance at the posyandu strongly suggested that a new distribution system might result in improved iron folate intake and lowered anemia levels.

A health education and social marketing strategy to improve maternal and neonatal health and nutritional status was designed in conjunction with this distribution system. This social marketing strategy focused on increasing the utilization of prenatal care and increasing the demand for and coverage of iron-folate supplementation. Messages were designed to be delivered through outreach workers, health care workers, and other non-health workers, such as community leaders and agricultural workers. These people served as the channels through which the pregnant women were reached. The health care providers were trained and they in turn trained outreach workers in nutrition, specifically iron folate supplementation, and prenatal consultations. The non-health workers were trained in integrating these messages into their own routine activities.

Table 4. Socio-demographic Characteristics of the Intervention vs. Control Areas

Characteristics	Sliyeg	Gabus Wetan
Marital Status	97% (n=204)	98% (n=197)
Education	62% (n=204)	57% (n=197)
Bicycle Ownership	84% (n=174)	81% (n=183)
Motorcycle Owner	3% (n=174)	10% (n=183)
Land Ownership	16.9 (n=174;sd± 15.4)	28.0 (n=183;sd±30.8)
Electricity	52% (n=174)	12% (n=183)
Radio	38% (n=183)	59% (n=183)
Literacy	71% (n=174)	69% (n=183)

Improving Services:

The objective of this intervention was to implement an experimental iron folate distribution system in which the Gabus Wetan health center was assured of an adequate supply of iron folate tablets for distribution to TBAs living in the Gabus Wetan communities.

Based on the results of the formative research, a package of community-based interventions was developed, including both the use of traditional birth attendants (TBAs) as distributors of iron tablets and an increase in the supply of tablets to meet the demand generated by TBAs. This community-based distribution system was added to the existing government system of iron tablet distribution through puskemas and posyandu. As in other parts of the MotherCare project, the sub-district of Sliyeg was used as the control area. Iron tablet distribution in Sliyeg was limited to the existing government system for distribution and supply.

During their routine monthly visits, the TBAs picked up the tablets from the health center to supply to their clients who visited the TBA's home for prenatal care The puskemas doctor and midwife at Gabus Wetan subdistrict received a half day training session on anemia and the distribution of iron tablets to pregnant women, and, to TBAs to provide to pregnant women in the community. The puskemas doctor in the intervention area conducted a similar training session for thirty-four of the forty-one TBAs as part of their monthly half day sessions at the health center.

In order to assure an adequate supply of iron folate tablets, a chain of interaction was specified for all members of the health system. TBAs were instructed to request the number of tablets needed from the midwife at the intervention area health center, who would then notify the doctor, who would then check the health center supply, and if needed, notify the government supplier at the regency level, and also the field coordinators for the study if needed. The field coordinators notified the field supervisor and principal investigator of the study, who could then notify the government agencies who obtained the supplies from UNICEF. This system, with links from bottom to top, ensured a more consistent supply of iron folate tablets. A delivery of 144,000 tablets was made to the intervention area health center six months before the project was started. Two additional deliveries were made to maintain an adequate supply.

This experimental service delivery model was initiated in the hope that it would increase the accessibility of iron folate tablets in comparison to the existing delivery system of iron folate tablets at the puskemas and posyandu. In turn, this increased accessibility was expected to increase prenatal consumption of iron folate tablets, thus improving maternal hemoglobin levels.

Promoting Behavior Change:

The social marketing and health education campaign was designed to provide basic information about the need for iron supplementation during pregnancy. To assess how to provide this information, an operations research project was carried out, building on information collected through the maternal morbidity and mortality section of the CCS-UI family planning and health project. As part of that project, research was conducted on community-based iron tablet distribution using a social marketing approach. Table 5 outlines characteristics of the women from both sub-districts involved in the interventions.

Social marketing involves including the community in project development, using formative qualitative research to identify the community's perception of the health problem and their suggestions for solutions (Manoff, 1990). Formative research in Indramayu indicated that the lack of availability of iron tablets and the lack of knowledge about iron tablets were the major obstacles to iron supplementation efforts. The research also indicated that traditional birth attendants are major sources of information about prenatal health care and important sources of support for pregnant women (Moore, 1991).

Table 5. Maternal Characteristics: Intervention vs. Control Areas

Characteristics	Sliyeg	Gabus Wetan
Age: 1st Interview	25.6 (sd=7.0)	26.0 (sd=7.0)
Parity	2.3	1.7
First Trimester Wt.	45.9 (sd=8.8)	48.7 (sd=8.5)
Height	151.9 (sd=4.9)	151.2 (sd=16.2)
Planned Pregnancy	50% (n=204)	69% (n=197)
Intergest Pd.(Days)	1191.7	1898.3
Pregnant at Ident.	122.1 (sd=34.0)	129.1 (sd=36.3)
Gest: 1st Hb Meas.	144.2 (sd=38.3)	155.5 (sd=40.8)
Initial Hb	11.3 (sd=1.8)	11.0 (sd=1.7)
Fever/Chills	20% (n=204)	18% (n=197)
Baseline Diet. Iron	3.8	3.2
Alcohol	7%	4%
Traditional Herbs	7%	6%

Nine months after the community-based distribution system was implemented in Gabus Wetan, a communications component was added to iron tablet programs in both Gabus Wetan and Sliyeg. The campaign included development of materials--posters, banners, leaflets, action cards for pregnant women, counseling cards for health providers and stickers--and activities, including iron tablet awareness days at puskemas and posyandu to promote iron tablet use during pregnancy.

The actual messages targeted to women during this campaign were:

- Why iron-folate tablets are important;
- How to take iron folate tablets correctly;
- How to deal with the side effects of iron-folate tablets; and
- Where to get the tablets.

These were the areas which seemed to confuse women and turn them away from taking the tablets.

The objective of this operations research study was to determine the effectiveness of a communications campaign on increasing iron tablet coverage and compliance by pregnant women. The same communications campaign was conducted in both sub-districts, in order to test the additive effect of a communications component to the government distribution system in Sliyeg, where there were no other interventions. This was then compared to the additive effect of communications on the community-based distribution system in Gabus Wetan, where a package of interventions was already underway, as previously described.

Methodology:

The interventions were carried out in the same area using a similar methodology was used for each of the interventions. Both interventions used a quasi-experimental design, with an experimental intervention area and a control. The alternative distribution model tested the following hypothesis:

- that the assurance of adequate iron folate supplies to the central clinic for distribution to TBAs would increase iron folate distribution to pregnant women,
- that the delivery of prenatal iron folate supplements by community-based TBAs would increase iron folate distribution to pregnant women, and
- that the number of tablets taken by pregnant women would be 50% greater in the intervention area than in the control area.

The communications and social marketing intervention tested this hypothesis:

- that the promotion of iron tablets to pregnant women through a communications campaign would increase the proportion of pregnant women who take iron tablets, and
- that this proportion would increase by at least 17%, from 60%--the estimated iron tablet coverage before the communications campaign--to 77% after the communications campaign.

For both interventions, the required sample size to test these hypotheses was 131 pregnant women in each subdistrict, assuming a Type I error of .05, a Type II error of .20, and a two-tailed test. For the communications and experimental distribution interventions, the sample of pregnant women was identified from Modules A and B of the Sample Registration System (SRS). The study population consists of all pregnant women in Gabus Wetan and Sliyeg between June 1, 1991 and April 22, 1992. Monthly prospective data regarding the receipt and consumption of iron-folate tablets, dietary behavior, maternal morbidity and health service utilization were collected, and are the data used here to test the study hypothesis.

Data Analysis:

Data analysis was conducted using SPSS-PC software. Bivariate analyses (chi-square and t-test) were conducted to compare socio-economic and reproductive health status between the control and intervention areas. Linear multiple regression analyses were conducted, controlling for theoretically important covariates, such as maternal age and education, and socio-economic and reproductive health indices that could potentially confound the associations between intervention and outcome, due to significant differences between the two subdistricts.

Outcome variables were defined as:

- the average number of iron folate tablets taken in the week prior to interview (social marketing intervention) or as the average number of iron folate tablets taken in a month (experimental distribution intervention),
- the total number of iron tablets taken over the course of pregnancy, and
- the proportion of women taking any iron tablets in the week prior to the interview.

To evaluate the social marketing intervention, results of the data showing iron tablet practices in the week prior to interview were multiplied by 4.25, for the 4.25 weeks of each month, in order to derive monthly and total estimates. For both interventions, analyses excluded women who had fewer than three monthly interviews, amounting to approximately fifteen percent.

Three regression models were used to estimate the effect of the intervention on each outcome variable. The regression models are defined below:

- Model 1: unadjusted, except for the number of interviews upon which the outcome variable is based (adjusted for the average number of tablets and the proportion taking no tablets), or for gestation at identification of the pregnancy (adjusted for the total number of tablets taken);
- Model 2: Model 1 plus the following covariates: electricity in the home, ownership of radio, motorcycle, size of household land, level of formal education, whether the current pregnancy was planned, live birth as a previous pregnancy outcome (for multiparous women), infant shorter than 145 cm, and maternal age;
- Model 3: Model 2 plus the study participants' frequency of consuming animal and vegetable iron-rich foods, and intake of foods and beverages that promote or inhibit iron absorption in the week prior to interview;

- Model 4: Model 1 only for women who ever took tablets in this pregnancy, excluding those who took no tablets, for the outcomes of average number of tablets and total tablets taken.

Results:

The Experimental Service Delivery Model:

The intervention of making iron-folate tablets available to the TBAs in the community to distribute to pregnant women via assuring an adequate supply of tablets available to the puskemas for distribution and by TBA distribution significantly increased the availability, coverage, and consumption of iron-folate tablets.

Table 6 (A: Models 1-3) shows that, on average, women in the TBA intervention sub-district, Gabus Wetan, took about 8 tablets more per month than those in Sliyeg, the control district ($p<0.001$).

Table 6. Effect of the Service Delivery Model on Iron-Folate Tablet Consumption

A. # of Tablets/Month	Sliyeg	Gabus Wetan
Model 1	4.8	13.01***
Model 2	4.76	12.92***
Model 3	4.85	12.84***
Model 4 (n=289)	11.14	16.32***
B. Total Number Tablets/Pregnancy		
Model 1	23.38	64.26***
Model 2	23.42	62.52***
Model 3	23.97	62.01***
Model 4	43.86	70.25***
C. Proportion of Preg. Women Taking Tablets		
Model 1	53.3%	91.5%***
Model 2	50.8%	92.7%***
Model 3	51.1%	92.5%***

***$p<.001$

Women in Sliyeg reported taking a total of about 23 tablets during pregnancy (B: Models 1-3). Women in Gabus Wetan reported taking about 64 tablets during pregnancy ($p<0.001$). These

differences are mediated by excluding the women who took no iron folate tablets during pregnancy. Nearly 40 percent more women reported taking tablets during pregnancy in the intervention area than the control area (C: Models 1-3, $p<0.001$). Of women who took iron folate tablets during pregnancy, women in the intervention area took five more tablets per month (A: Model 4) and about 26 more tablets (B: Model 4) throughout pregnancy than women in the control area ($p<0.001$).

The Social Marketing Campaign:

Table 7 presents the results of this intervention. The results show that, on average, women in Indramayu took about 4.5 iron tablets more per month after the communications campaign than before (A: Models 1-3). This difference was highly significant ($p<0.001$).

Prior to the communications campaign, pregnant women in both sub-districts reported taking a total of approximately 43 tablets over the course of pregnancy, compared to 59 tablets over the course of pregnancy after the communications campaign (B: Models 1.3). This difference was also significant ($p<0.05$ - $p<0.001$). The total number of tablets taken during pregnancy, however, is still far below the number of iron tablets needed to adequately treat, or even prevent anemia.

Table 7. Effect of Communications Intervention on Iron Tablet Consumption Pre- and Post-Intervention

Iron Tablet Indices	Pre	Post
Avg. # Tablets/Month		
Model 1	8.37	12.71***
Model 2	6.33	10.75***
Model 3	9.1	12.58***
Model 4	11.56	13.69***
Total # Tablets/Preg.		
Model 1	43.1	59.42***
Model 2	42.67	60.14***
Model 3	43.99	56.36***
Model 4	59.25	64.35***
Proportion Women Taking Iron Tablets This Preg.		
Model 1	72.56%	99.93%***
Model 2	40.68%	62.8%***
Model 3	55.84%	73.34%***

***$p<.001$

When adjusted for pre-post differences in socio-economic and reproductive health status, the model (Model 3) shows that only 56% of women had taken iron tablets during pregnancy before exposure to the communications campaign. This proportion increased to 73% after exposure to the communications campaign ($p<0.001$).

Table 8: Effect of Communications Intervention with and without TBA Distribution on Iron Tablet Consumption in Sliyeg and Gabus Wetan

	Sliyeg		Gabus Wetan	
Iron Tablet Index	Pre	Post	Pre	Post
A. Avg. # Tablets/Month				
Model 1	4.8	10.8***	13.13	15.73
Model 2	4.97	10.67***	12.45	14.92
Model 3	5.74	10.63***	13.01	14.75
Model 4	25.8	28.73*	30.43	32.6
B. Total # Tablets During Pregnancy				
Model 1	24.48	48.54***	65.58	70.3
Model 2	24.82	50.79***	64.69	69.49
Model 3	26.39	47.69***	64.73	65.71
Model 4	44.84	54.95*	69.32	72.89
C. Proportion of Women Taking Tablets This Preg				
Model 1	64%	88%***	94%	98%
Model 2	34%	41%***	44%	48%
Model 3	53%	86%***	92%	98%

The differences between pre- and post-test intervention are mediated by reducing the proportion of women who took no iron tablets during pregnancy. The improvement in average monthly consumption or total consumption of tablets during pregnancy was limited in women who already reported taking tablets (Model 4), indicating that the communications campaign had the greatest impact on women who didn't initially take tablets.

On average, women in Sliyeg, where the communications campaign was the only intervention, took approximately six tablets more per month (A: Models 1-3) after the campaign than before (Table 8). This difference was highly significant ($p<0.001$). The increase in iron tablet consumption per month after the communication campaign was limited in the TBA distribution area of Gabus Wetan, where

the communications campaign was added to the package of service delivery intervention. Women in Gabus Wetan took approximately fifteen tablets per month after the communications campaign, compared to thirteen before, a difference which is not significant.

Similarly, before the communications campaign, women in Sliyeg reported taking a total of approximately twenty-eight tablets during pregnancy, compared to 48 tablets after exposure to the campaign (B:Models 1-3). This difference was also significant ($p<0.001$). In Gabus Wetan, the difference was minimal, approximately seventy tablets after the campaign compared to 65 tablets before, a change which was not significant. Even in Gabus Wetan, however, with the combined interventions--communications and community-based intervention--the number of iron tablets taken throughout pregnancy is still far below the number needed to adequately treat or prevent anemia. According to WHO guidelines, this number is two tablets, or 120 mg., per day during at least the second and third trimesters (DeMaeyer, 1989).

Again, the differences between pre- and post-intervention are mediated by reducing the proportion of women who reported taking no iron tablets during pregnancy (Model 4). These results once more indicate that the greatest impact of the TBA distribution and of the communications campaign was in the women who had not taken iron tablets prior to these interventions.

In terms of the proportion of women reporting iron tablet use in this pregnancy, in the model adjusted for socio-economic and reproductive health status (Model 3), only 53% of the women in Sliyeg reported taking iron tablets before exposure to the communications campaign. This increase to 86% after exposure to communications, a significant change ($p<0.001$). This difference was minimal in Gabus Wetan, 92% before the campaign and 98% after the campaign) as coverage was almost universal prior to the campaign.

These results indicate that a communications campaign or TBA distribution alone is effective in increasing the proportion of women taking iron tablets and the number of tablets they consume. To surpass the observed effects on increased coverage, communications campaigns need to make further efforts to incrase the number of tablets taken by women. Thus, for increased effectiveness, the future communications campaigns should be directed more at compliance.

VI. POLICY DIALOGUE

The final objective of the MotherCare Project was to enhance policy dialogue between the Ministry of Health and various local governmental and non-governmental participants in health care. The project planned to hold two national seminars to provide a review of study methods and findings to policymakers in the Government of Indonesia (GOI). Also, the project hoped to disseminate its findings within the government and promote their use in future policy decisions.

MotherCare was successful in reviewing its findings and project results with officials in the Ministry of Health. After hearing the results from the MotherCare project, the Ministry of Health expressed interest in using the same model of TBA-based iron folate distribution in other areas. The Ministry also indicated concern at the high prevalence of poor nutritional status among pregnant women, and expressed interest in further study of pregnancy weight gain, particularly in relation to birth weight.

The Ministry also adopted several questions from the MotherCare module for an expanded IEC campaign for anemia control in South Sulawesi and West Java. This will allow for a test of the

generalizability of the Indramayu results. Specifically, this study seeks to validate a mother's history of anemia symptomatology with hemoglobin status.

These are initial but successful efforts to bring the importance of the MotherCare results to the attention of government officials, and further efforts are planned.

VII. CONCLUSIONS

The MotherCare Project in Indramayu has developed interventions which provide important inputs for ongoing efforts to alleviate the problem of maternal anemia. Taken as a whole, the MotherCare Project has developed a strong set of systems at the community level which will continue to address maternal anemia through an improved distribution system and attention the importance of regular iron folate tablet consumption. The project also has provided an initial assessment of the extent of nutritional problems among pregnant women, establishing a basis for future interventions. Finally, the initiation of policy dialogue at the Ministry level paves the way for a careful review of this project and its replication elsewhere.

The various components of the MotherCare Project are in keeping with the needs of the area and the resources available to address them. Indramayu is typical of a "B" setting: there is an established public health system but women remain outside its boundaries for issues related to pregnancy and delivery, and the prevalence of problems related to pregnancy--including maternal mortality--remain high. Through establishing a community-based system designed to provide better services to women, the MotherCare Project has laid the foundations for future safe motherhood projects designed to address a broad range of maternal health issues.

The results of the community-based interventions demonstrate that increased availability of iron folate tablets and a communications campaign to promote behavior change surrounding the use of these tablets can be effective in increasing both coverage and compliance in areas which do not already have an effective community-based program in place. The communications intervention was particularly effective in areas of low iron tablet use, where it served to increase the number of tablets taken during pregnancy. In high coverage areas, however, a different type of campaign could be more effective, particularly if it focuses on behavior change. Where access to health services and tablets is not an issue, increased compliance should be stressed through the communications campaign.

Distribution through TBAs and other local health workers is clearly an improvement over previous models of distribution. Such strategies should continue to be implemented in other districts. Dialogue should continue with the government to encourage such strategies, and to promote qualitative research on the local perceptions and understandings about anemia.

Further research into how local conditions affect coverage and compliance, and on the distinct patterns of iron folate tablet use at the district level would be helpful for designing future communications efforts. Although anemia has been a priority health concern in Indonesia for some time, most women do not have adequate iron intake even when they do take tablets regularly. Thus, dialogue with the government to encourage research at the local level should be encouraged. Other possibilities include the promotion of a higher dose tablet or a change in the current "one tablet per day" policy, along with research into the effect of either of these changes.

Based on the results of these studies, it is recommended that the government agencies responsible for supplying iron folate tablets to pregnant women devise a system to assure better distribution of these tablets to puskemas and that TBAs be provided the training and supplies necessary to provide their clients with iron folate tablets during pregnancy. The extent of other nutritional problems is now known, and efforts should be made to address these issues as well. Additional communications interventions could further increase the use of iron folate tablets and could help to address other nutritional problems among women. Finally, the existing community-based distribution and data collection system provides a model which can be replicated elsewhere to further the goals of safe motherhood projects, whether they deal specifically with maternal anemia or with other issues.

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APPENDIX

Table 1

The Comparison of Nutritional Status and Individual Characteristics in Pregnant and Non-Pregnant Women

	Pregnant N	Pregnant %	Non-pregnant N	Non-pregnant %	Chi-Square
Weight *	481		418		
< 40 kg		17.7		8.6	
40 - <45 kg		29.3		24.2	
45 - <50 kg		27.7		26.6	
50 + kg		25.4		40.7	p <.001
Height	481		418		
<= 145 Cm		6.4		9.1	
145.1 - <150 Cm		22.9		27.0	
150 - <155 Cm		42.6		39.2	
> 155 Cm		28.1		24.6	N.S
Mid. Upper Arm Circumference	259		418		
< 24		42.1		28.9	
24 - <26		29.7		24.2	
26 - <29		21.6		28.9	
29 +		6.6		17.9	p <.001
Body Mass Index *	481		418		
< 19		37.0		23.9	
19 - <22		44.9		39.2	
22 - <26		14.8		25.6	
26 +		3.3		11.2	p <.001

* For Pregnant women, weight and BMI are based on estimates of pre-pregnant weight, See text for computation.

Table 2

Weight Gain by Nutritional Status and by Individual Characteristics

		X	(SD)	N	
Overall		8.94	4.67	481	
Weight **	< 40 kg	12.05	4.25	85	
	40-< 45 kg	8.68	4.01	141	
	45-< 50 kg	8.75	4.88	133	
	>=50 kg	7.29	4.42	122	p < .001
Height	<= 145 cm	7.04	3.89	31	
	>145-<150 cm	8.48	3.81	110	
	150-<155 cm	9.00	4.85	205	
	>= 150 cm	9.65	5.03	135	p < .05
MUAC	< 24	9.70	4.07	109	
	24 - < 26	8.36	3.96	77	
	26 - < 29	8.89	5.14	56	
	29 +	4.47	3.24	17	p < .001
Body Mass Index ***	< 19	10.99	4.50	178	
	19 - < 22	8.28	4.35	216	
	22 - < 26	6.62	3.96	71	
	26 +	5.32	4.29	16	p < .001
Age	< 17	10.03	4.80	61	
	18 - 27	9.66	4.81	221	
	28 - 37	7.91	4.27	167	
	38 +	7.27	4.06	32	p <.001
Previous Birth Interval	<= 3 Years	8.89	4.70	138	
	> 3 Years	8.41	4.53	202	N.S
Parity	None	10.01	4.64	150	
	1 - 2	8.84	4.58	174	
	3 - 4	8.29	4.49	96	
	5 +	7.63	4.30	61	p <.005
Own Bicycle	Yes	8.86	4.49	348	
	No	9.30	5.17	77	N.S
Own Motorcycle	Yes	12.18	5.82	26	
	No	8.73	4.46	799	p <.001
Own Radio	Yes	9.66	4.89	202	
	No	8.29	4.27	223	p <.005
Own Land	Yes	8.92	4.91	337	
	No	9.01	4.55	88	N.S
Education	None	8.48	4.41	196	
	Low	8.89	4.7	246	
	High	11.63	5.03	37	p <.001
Work	Housework	8.82	4.60	270	
	Work non farmer	9.26	5.17	77	
	Work farmer	7.75	3.62	59	
	Not Yet	9.96	5.00	73	p <.05
Planned Pregnancy	Yes	9.49	4.87	287	
	No	8.12	4.23	194	p <.01

* Weight gain is the estimated weight gain at the end of pregnancy, See text for compulation

** Weight and BMI are based on estimates of pre pregnant weight, See text for compulation

Table 3

Adequate Weight Gain by Pre-Pregnant Weight and Height and Maternal Characteristics

	Adequate Weight Gain		
	N	% Adequate	
Overall	477	9.2	
Weight :			
< 45 kg	226	1.3	
45-< 50 kg	132	9.1	
>+50 kg	119	24.4	p <.001
Height			
<=145 cm	30	13.3	
145.1-<150 cm	109	3.7	
150-155 cm	205	9.8	
> 155 cm	133	12.0	N.S
BMI			
< 19	178	2.2	
19 - < 22	216	7.4	
22 - < 26	67	26.9	
26 +	16	37.5	p <.001
Age			
< 17	61	8.2	
18 - 27	220	9.5	
28 - 37	166	9.0	
38 +	30	10.0	N.S
Parity			
None	149	7.4	
1 - 2	173	9.8	
3 - 4	95	8.4	
5 +	60	13.3	N.S
Own Bicycle			
Yes	345	10.1	
No	77	9.1	N.S
Own Motorcycle			
Yes	25	28.0	
No	397	8.8	p <.005
Own Radio			
Yes	201	9.5	
No	221	10.4	N.S
Own Land			
Yes	334	9.6	
No	88	11.4	N.S
Education			
None	193	9.8	
Low	245	6.9	
High	38	21.1	p <.05
Mother's Occup			
Housework	268	9.3	
Working, not farmer	77	6.5	
Working, farmer	58	10.3	
Not Yet working	72	11.1	N.S
Planned Pregnancy			
Yes	284	9.5	
No	193	8.8	N.S