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## Village Health Workers Improve Child Health: The Jamkhed, India Experience

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# VILLAGE HEALTH WORKERS IMPROVE CHILD HEALTH: THE JAMKHED, INDIA EXPERIENCE

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## ABSTRACT

### OBJECTIVE:

To assess the effect of the three-decade old Comprehensive Rural Health Project (CRHP) on morbidity, mortality, immunization rates, and health care utilization among children under 5 years of age in Jamkhed, Central India.

### METHODS:

We conducted a cross-sectional survey of a stratified, cluster sample of 879 children (under-fives) in 15 Jamkhed villages served by CRHP. CRHP has a three-tiered primary health care model that comprises a tertiary care facility, a mobile health program supporting 30 subcenters, and community-based health workers.

### FINDINGS:

We found a prevalence of diarrhea [6.4%, 95% CI: 4.0%-8.8%], measles [2.3%, 95% CI: 0%-5.6%], tuberculosis [0.3%, 95% CI: 0%-0.8%], bronchopneumonia [0.1%, 95% CI: 0-0.3%], and no cases of poliomyelitis, pertussis, diphtheria, and tetanus among under-fives. Malnutrition (using WHO criteria) was less evident in infants [mean Z-score: -0.8] compared to children aged 1-5 years [mean Z-scores: -1.6 to -1.8]. The child

mortality rate of 10.9 [95% CI: 0.9/20.7] per 1,000 live births per year [95% CI: 0.9/20.7] was 10-20 fold lower than corresponding state (58.1) and national (103.7) figures. The infant diarrhea prevalence rate of 6.4% [95% CI 4.0% to 8.8%] was also substantially lower than state (25.4%) and national data (19.6%). There was  $\geq 99\%$  immunization coverage for DPT3/OPV3 and measles after the child's first year.

#### CONCLUSION:

These data document the effectiveness of village health workers in improving child health. If confirmed by other studies, these findings call for even greater allocation of primary health care resources to train, supervise and use community health workers.

## INTRODUCTION

The vision of the World Health Organization's 1978 Alma Ata Conference was to achieve health for all by the year 2000 based on the primary health care model (1). This approach required maximum community and individual participation in planning, implementing, and evaluating health care activities, and involvement in not only the health sector but all sectors of community development such as agriculture, food, education, industry, and animal husbandry (1). Since 1978 many have questioned the validity of comprehensive primary health care believing the approach to be unrealistic (2). A selective approach, which takes away responsibility for healthcare decisions from the community is now more commonly utilized to combat public health problems (3). Today, reaching the goal of health for all appears even more elusive as earlier declining trends in morbidity and mortality rates show signs of slowing or reversing in the developing world (4,5).

Every year over 10 million children under five years die from easily preventable illnesses, half of which are further complicated by underlying malnutrition (6,7). In India, where national childhood immunization coverage is 51% for measles and 55% and 63% for third doses of DPT and OPV respectively (rural India=36.2%, 46.6%, and 54.4% correspondingly), 429,000 deaths due to vaccine-preventable diseases occur each year (8,9). Nearly 50% of rural India's under-five population is malnourished (reaching as high as 85% in some areas) with a child-mortality rate of 103.7 per 1,000 live births (9,10). Key health indices vary substantially between rural and urban areas of the country (10).

In 1970, in response to the basic health needs of a rural population of 40,000, the Comprehensive Rural Health Project (CHRP), Jamkhed was initiated in the Jamkhed Community Development Block (380 kilometers east of Mumbai), a remote, drought-prone region in Maharashtra state, central India (11,12). At the time, Jamkhed one of the most economically depressed areas of the state, also struggled with the endemic health problems common in developing countries – malnutrition, diarrheal diseases, typhoid, acute respiratory infections, tetanus, malaria, anemia, leprosy, and tuberculosis. The poor health of residents was only worsened by a pronounced lack of health services. Over 50% of children under five years of age were malnourished and almost none had been immunized.

CRHP has attempted to address the identified health and development challenges by creating a three-tiered health care system that involves i) the community (which

includes trained village health workers, a key resource and the critical first line of contact with the community), where 80% of the health problems can be easily diagnosed and treated; ii) the Mobile Health Team, which facilitates programs in the villages and project subcenters; and iii) the tertiary hospital to which patients with more serious health problems are referred and where health workers receive training in the principles and practice of primary health care. This project has been in continuous operation since 1970 and currently serves a population of over 100,000 people clustered in villages within a 30-kilometer radius of Jamkhed (11,12).

The purpose of this study was to evaluate the efficacy of the CRHP intervention in the villages that continue to be served by CRHP by assessing the following: 1. current mortality rates; 2. current morbidity rates; and 3. current utilization of CRHP's services. To date, there are few published studies or reports describing the relationship between primary health care (in which community health workers play a central role) and child morbidity/mortality in India (13-17).

## METHODS

### STUDY POPULATION

During the period October to December 2002, 15 out of the 35 CRHP project villages in the Jamkhed Community Development Block were surveyed as part of a cross-sectional study. The 15 villages were selected as part of a stratified cluster sample of villages where a village health worker (VHW) had been continuously present for at least three years. The villages were stratified according to the number of years CRHP had been working in each village: less than five years (two villages), five to nine years (seven villages), 10 to 15 years (three villages), and more than 15 years (three villages).

### DATA COLLECTION

Data identified weight and nutritional status, immunizations received, any illnesses suffered by the child in the last fifteen days, type of health care provider, and deaths that occurred to children ages one month to five years in the interval between Dusserah 2001 and Dusserah 2002 (a religious festival that takes place between September and October). This information was collected using a 10-question survey form administered to parents or other caregivers (familiar with the child's health) of children under five years in each village.

All children under five years who lived in the village or in a surrounding area within a one-kilometer radius of the village were included in the study. In every village, the VHW, who was familiar with the community layout and health status, accompanied the four-member survey team to each house. Two members of the survey team were also part of CRHP's Mobile Health Team that visits each of the villages at least once every month.

Each child was weighed using a Hanson spring scale. The informant was asked to answer questions regarding the child's demographic information, immunizations, illnesses, death, and source of health care provider. Health care providers included CRHP hospital, the VHW, "other doctors" (Ayurvedic doctors and traditional/indigenous medical practitioners), home treatment, and no treatment. Nutritional status was as-

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 assessed based on the child's age and weight according to the World Health Organization (WHO) cut points (18). When a child was found to be malnourished, the VHW or a member of the survey team advised the parents on appropriate feeding practices, and when necessary encouraged parents to bring their child to the hospital to receive medical attention or screening.

Data regarding three vaccinations were obtained in the survey: OPV3 (attenuated oral poliovirus vaccine dose three), DPT3 (diphtheria, pertussis, and tetanus dose three), and measles.

**DATA ANALYSIS**

Prevalence, odds ratios, and 95% confidence limits for these measures were computed for disease status, immunizations, and treatment provider variables. Design effects and weighting factors were incorporated into the calculations to allow for the stratified cluster design (18). Z-scores were calculated for weight-for-age measures using EpiInfo 2002 software. The percentile and Z-score cut points depicted in Figures 1-5 are from the WHO reference database (18).

**RESULTS**

Of all children in the 15 villages in our study population, we obtained a 98% participant response rate. Among the 879 children in the sample (47% girls; 53% boys) the mean age was 27 months.

**IMMUNIZATIONS**

Table 1 summarizes the results for children who had been immunized for DPT3, OPV3, and measles. Among children at least 12 months of age, immunization coverage for DPT3, OPV3, and measles was about 99%. This high value is consistent with the intervention protocol that required village health workers to monitor the immunization status of each child to ensure that immunizations were received in a timely manner (10).

TABLE 1. IMMUNIZATION RATES AMONG CHILDREN 12 MONTHS TO FIVE YEARS

Variables	Prevalence	Design Effect	95% Confidence Interval
DPT3	99.3	1.03	98.7 to 99.9
OPV3	99.3	1.03	98.7 to 99.9
Measles	98.7	1.32	97.8 to 99.7

**NUTRITIONAL STATUS**

Figures 1 to 5 show the nutritional status of the survey subjects according to WHO weight-for-age cut points (18). Figure 1 indicates that malnutrition was less evident among children ages 0 to < 1 year (mean Z-score = -0.8, 95% CI -0.55 to -1.06) as compared to years 1 to 5 (mean Z-score [95% CI] = -1.6 [-1.4 to -1.8] for 1 to <2 years, -1.7 [-1.5 to -1.9] for 2 to < 3years, -1.7 [-1.4 to -1.9] for 3 to < 4 years, -1.8

[-1.6 to -1.9] for 4 to 5 years). Figures 2-5 indicate a decline in nutritional status after about 6 to 9 months of age. These figures indicated no important differences in weight-for-age data by gender. Analyses (not shown) using the Centers for Disease Control and Prevention weight-for-age recommendations yielded similar results (19).

#### MORBIDITY IN THE LAST 15 DAYS

Table 2 shows the prevalence of child morbidity in the last 15 days. "Other" illnesses, primarily colds, coughs or fevers, were reported in 313 cases. All but one of the measles cases occurred in children who had already been immunized. Seventeen of the 20 cases occurred in one village. There were no cases of polio, whooping cough, diphtheria, or tetanus in the fifteen days prior to the administration of the survey.

TABLE 2. UNDER-FIVE MORBIDITY IN THE TWO WEEKS PRIOR TO BEING SURVEYED

Variables	Cases	Prevalence (%)	Design Effect	95% Confidence Interval
Diarrhea	56	6.4	2.1	4.0 to 8.8
Bronchopneumonia	1	0.1	1	0 to 0.3
Tuberculosis	3	0.3	1.6	0 to 0.8
Measles	20	2.3	11.3	0 to 5.6
Pertussis	0	0	-	-
Diphtheria	0	0	-	-
Tetanus	0	0	-	-
Poliomyelitis	0	0	-	-

#### TREATMENT PATTERNS

Table 3 shows the frequency of the chosen health care provider. The most commonly chosen provider was "other doctor" followed by "no treatment." An analysis was done to determine if there was an association between gender and the health care provider chosen. Male children were nearly twice as likely as female children to receive treatment in case of illness (OR = 1.6, 95% CI = 1.11, 2.27).

TABLE 3. PREVALENCE OF TREATMENT PROVIDER CHOSEN AMONG UNDER-FIVES DURING THE TWO WEEKS PRIOR TO BEING SURVEYED

Variables	Frequency	Prevalence (%)	Design Effect	95% Confidence Interval
Home Treatment	22	2.5	1.8	1.1 to 3.9
No Treatment	71	8.6	2.7	5.5 to 11.6
VHW	15	1.7	2.3	0.4 to 3.0
CRHP Hospital	42	4.8	20.5	0 to 11.2
Other Doctor	210	24.8	4.8	18.5 to 31.1
Other	13	1.5	2.5	0.3 to 2.7

Among children ages one month to five years, the one-year mortality rate (Dusserah 2001 and Dusserah 2002) was 4.6 deaths per 1,000 (95% confidence interval 0 to 9 deaths per 1,000). This rate is due to four deaths – the causes of which were starvation (following the mother's death earlier), bronchitis, scorpion bite, and a congenital heart defect.

## DISCUSSION

Data from this survey show substantially improved child health trends in the villages in Jamkhed that were served by the Comprehensive Rural Health Project (CRHP). In Table 4 we have given data indicating that mortality rates were 10- to 20-fold lower in the intervention villages as compared to the region as a whole (Maharashtra State) or rural India. Table 4 also indicates that, as compared to regional and national trends, the prevalence of diarrhea was at least 2-fold lower.

TABLE 4. KEY HEALTH INDICATORS IN CRHP-SERVED VILLAGES, RURAL INDIA AND MAHARASHTRA STATE

	CRHP-served Villages	Rural India*	Maharashtra State*
DPT3	99.3%	46.6%	89.4%
OPV3	99.3%	54.4%	90.8%
Measles (vaccine)	98.7%	36.2%	84.3%
All Vaccines	98.7%	29.3%	78.4%
Child Mortality Rate (per 1000 live births)	4.6	103.7	58.1%
Diarrhea prevalence rate	6.4%	19.6%	25.4%

\* From Reference 9

A plausible explanation for these marked trends is that immunization coverage in the fifteen project villages was considerably higher than national and rural rates (Table 4) and this may have contributed to a reduction of vaccine-preventable childhood illnesses in the population (9,20). Furthermore, when outbreaks occurred (as in the 17 measles cases in one village) the severity of the disease was likely diminished. When considering the effect of the intervention on disease morbidity, it is also noteworthy that only three reported cases of tuberculosis and one case of bronchopneumonia occurred in the fifteen days prior to the survey. There were no reported deaths resulting from bronchopneumonia, diarrhea, or tuberculosis in this study although these diseases represent leading causes of infectious disease mortality in India (8).

The data suggest that CRHP interventions are especially effective in minimizing malnutrition among children up to nine months of age. The low rates of malnutrition among children under nine months are largely due to a high prevalence of breastfeeding

in the population. After nine months of age there is an increase of malnutrition according to the WHO cut points, a trend that is consistent with that observed elsewhere with the introduction of complementary foods at six to nine months of age (18). However, when using the Indian Academy of Pediatrics (IAP) weight-for-age recommendations (21), which have lower cut points that are more reflective of national Indian normative values, malnutrition among under-fives for the fifteen intervention villages was less than 15%, with no severe cases. Our study based malnutrition solely on standards of weight-for-age and did not utilize other methods such as weight-for-height and arm circumference.

#### THE GENDER FACTOR

Malnutrition, morbidity, and mortality rates were similar between males and females in the study population. This finding differs from Indian national norms in which female children generally have higher rates of malnutrition, morbidity, and mortality than male children (22). However, our results reveal that when sick, male children were nearly twice as likely to receive treatment than female children, suggesting that the differential, gender-based status still exists today.

#### MIGRATORY PATTERNS

The majority of children who were malnourished were from families who migrated to the sugarcane factories in the past or who lived in outlying areas of the villages. Working in sugarcane factories is seen as source of additional income, and for some a necessity for their livelihood. Generally, whole families migrate together, but with increased village prosperity it has become more common for only the head-of-household to migrate. Because of poor living conditions at the factories and lack of CRHP interventions during migratory periods, malnutrition and disease appear to be higher in these migratory populations. Many of the children who were malnourished in the survey had migrated with their families the previous year.

#### ACCESS TO SERVICE

CRHP programs are more likely to impact those living closer to the center of the village than among those living further away. The explanation for CRHP's limited success in outlying areas may be due to multiple factors. The VHW has difficulty reaching outlying areas on a regular basis because of time constraints. While it is feasible for the VHW to visit homes in close proximity, reaching those living in outlying areas logistically cannot be done daily. Consequently, these outlying communities receive less support and education from the VHW. Additionally, those living in these communities are generally from lower castes and live in greater poverty than that seen in the village. Most have received little or no education and have been driven from their villages because of their lower caste. Their limited education combined with poverty and low social status further hinders their ability to accept changes in health behavior.

The results of the survey suggest that villagers are more likely to use “other doctors” than to use CRHP health personnel (CRHP hospital and VHW). Due to their daily visits to families in the village, village health workers are aware of the health problems of the community and appropriately refer patients to seek treatment from CRHP, sometimes personally escorting them to the hospital. For minor illnesses, the VHW will teach the family regarding prevention and treatment. Some still prefer to go to “other doctors,” whose treatment may be expensive and not always effective, because of the pervasive attitude that one must pay for good treatment (advice from the VHW is free). As a result of this perception, subjects likely underreported their use of the VHW and may not have seen her assistance as a form of treatment (subjects were allowed to report more than one form of treatment).

For minor illnesses, villagers tend to go to other doctors instead of CRHP hospital because of the distance required to reach the hospital (up to one hour). The more comprehensive investigation of the individual’s health problems as undertaken at the hospital also takes up more of the patient’s time and consequently reduces his/her earning or productivity. However, when the illness is of a more serious nature the survey findings show the increased likelihood of choosing CRHP programs, which is indicative of the trust the community has in CRHP.

#### VHW AND COMMUNITY INVOLVEMENT

Villages with committed health workers and community groups (Farmers Clubs and Women’s Clubs) tend to have lower morbidity burdens than villages where the health worker and community groups play a less active role. The villages of Sangvi, Jawalka, and Khurdaithan illustrate how VHWs and community groups influence the nutritional status of children under five years of age.

In Sangvi, the VHW has built a relationship of trust and respect with the community. The VHW visits with each household in the village regularly, educating them on positive health habits and encouraging healthy childhood feeding practices. Every month she weighs children three years and younger and monitors their growth on their “Road to Health” cards. Malnutrition in Sangvi was among the lowest of all the villages surveyed.

The primary purpose of Jawalka’s Women’s Club is to educate women and their families about health and to improve the village’s economic situation through income generation projects. Owing to the actions of this club, villagers are better educated about health, women have become empowered, and the economic status of women and their families has improved. This may have influenced the low rate of malnutrition observed among the under-five population and the absence of cases of diarrhea.

In contrast, the village of Khurdaithan has the highest rate of childhood malnutrition among the fifteen surveyed villages. At the time of the survey, Khurdaithan’s VHW did not visit households in her community regularly and was largely unaware of their health problems. Caste inequalities (indicative of less active community groups) which may have been more apparent in Khurdaithan than in all other surveyed villages surveyed appears to be associated with the higher malnutrition rates in the under-fives.

## LESSONS LEARNED FROM CRHP

For over three decades, the principles of primary health care based on community participation have been consistently implemented in the Jamkhed Block. Using a health team approach in which the VHW functions as the key interface with the community, the CRHP project's sustained efforts have resulted in low rates of childhood illnesses, very high (over 98%) immunization coverage rates among children more than 12 months of age, significantly reduced rates of malnutrition among children under one year of age, and an under-five mortality rate that is well below national norms.

Our study findings suggest that comprehensive primary health care, as outlined at the Alma Ata Conference, is an effective and feasible means of combating morbidity and mortality among children even among resource-poor communities. As communities actively participate in identifying and prioritizing their problems, selecting and implementing appropriate interventions, and utilizing trained, adequately supervised and supported community health workers (who in reality form the backbone of the primary healthcare delivery system), the majority of common health problems are prevented or treated in the early stages (17). The empowerment of communities in decision-making and support in the delivery of basic health services is vital if "health for all" is to be achieved.

## RECOMMENDATIONS FOR FUTURE STUDIES

Despite CRHP's success in decreasing childhood morbidity and mortality rates, few challenges remain to be overcome. Malnutrition appears to be still present among under-fives children; there are logistical limitations to providing healthcare for migrant households and children living in outlying areas; and the services of the village health worker and CRHP hospital are somewhat under-utilized. Other issues that may be studied include: the effect of household location and migration on morbidity and mortality, and means to effectively strengthen capacity of village health workers in clinical assessment, treatment and referral.

This preliminary study was undertaken to assess the effect of primary health care involving the use of VHWs on under-five morbidity and mortality. More in-depth studies are necessary to evaluate i. the association between household location and under-five morbidity and mortality and causality for this association; ii. the association between migration and under-five morbidity and mortality; iii. the prevailing community perception of the community health worker's role and the individual/community's compliance with treatment recommendations; and iv. the cost-effectiveness of utilizing comprehensive primary health care methods.

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FIGURE 1. MEAN AND 95% CONFIDENCE INTERVALS FOR WEIGHT-FOR-AGE Z-SCORES (18) GIVEN BY AGE (N = 879 CHILDREN)

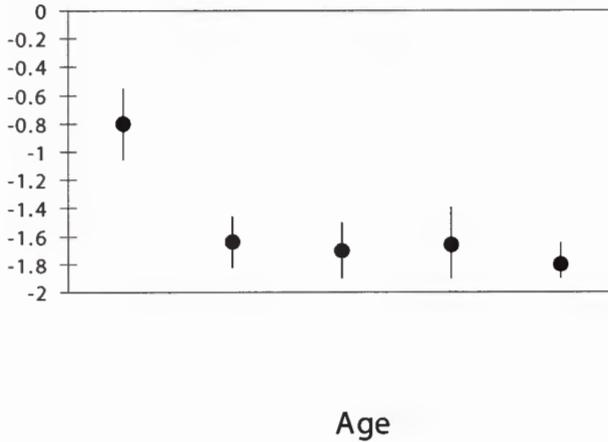


FIGURE 2. WEIGHT-FOR-AGE OF FEMALES (BIRTH –23 MONTHS) PLOTTED AGAINST WHO PERCENTILE CUT POINTS (18)

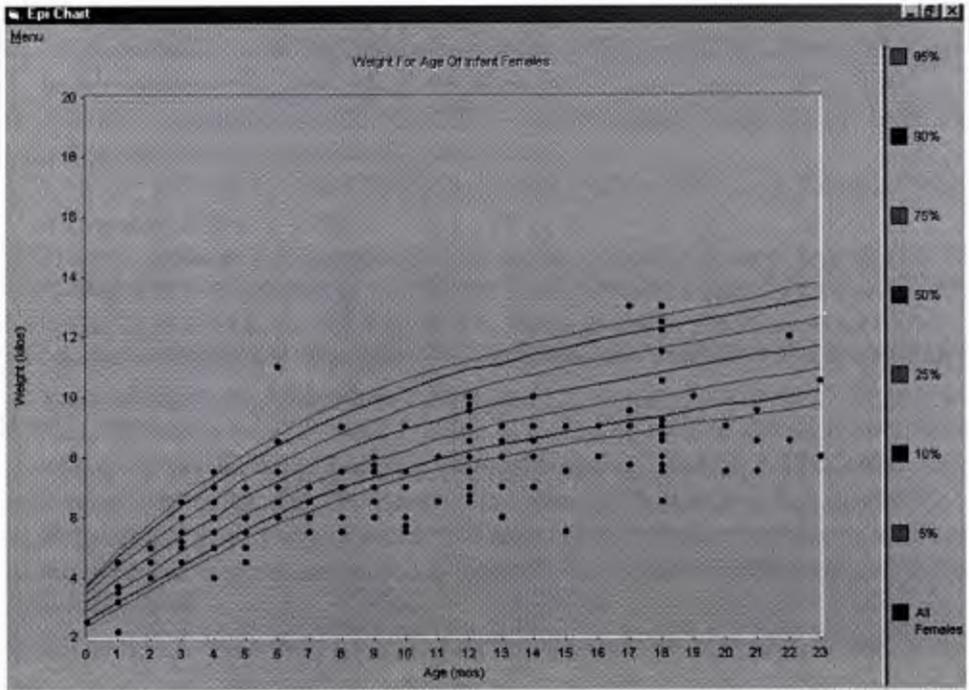


FIGURE 3. WEIGHT-FOR-AGE OF FEMALES (2-5 YEARS) PLOTTED AGAINST WHO PERCENTILE CUT POINTS (18)

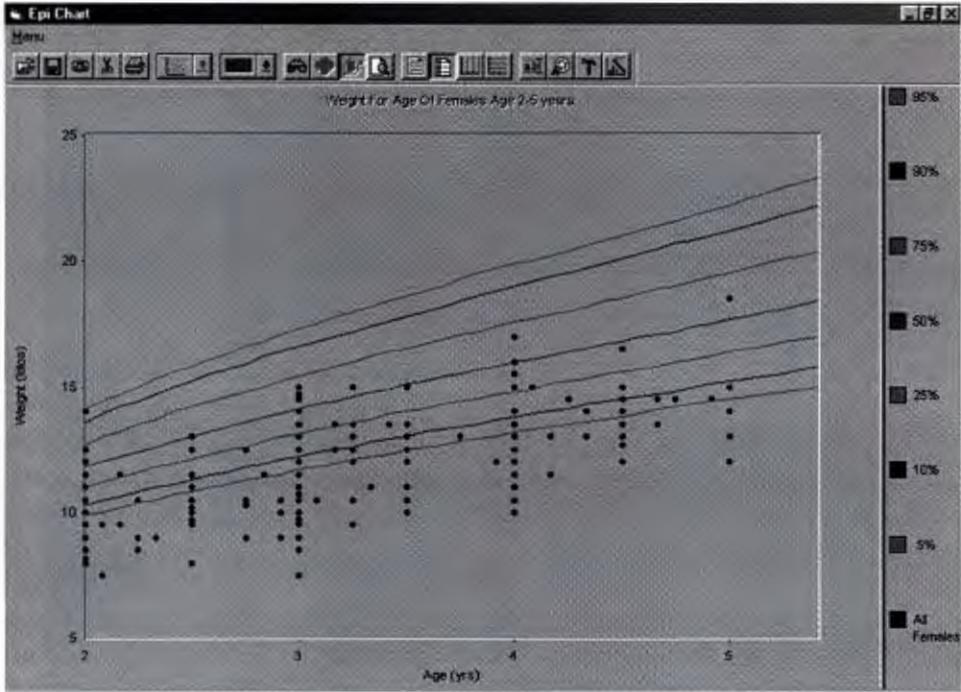


FIGURE 4. WEIGHT-FOR-AGE OF MALES (BIRTH – 23 MONTHS) PLOTTED AGAINST WHO PERCENTILE CUT POINTS (18)

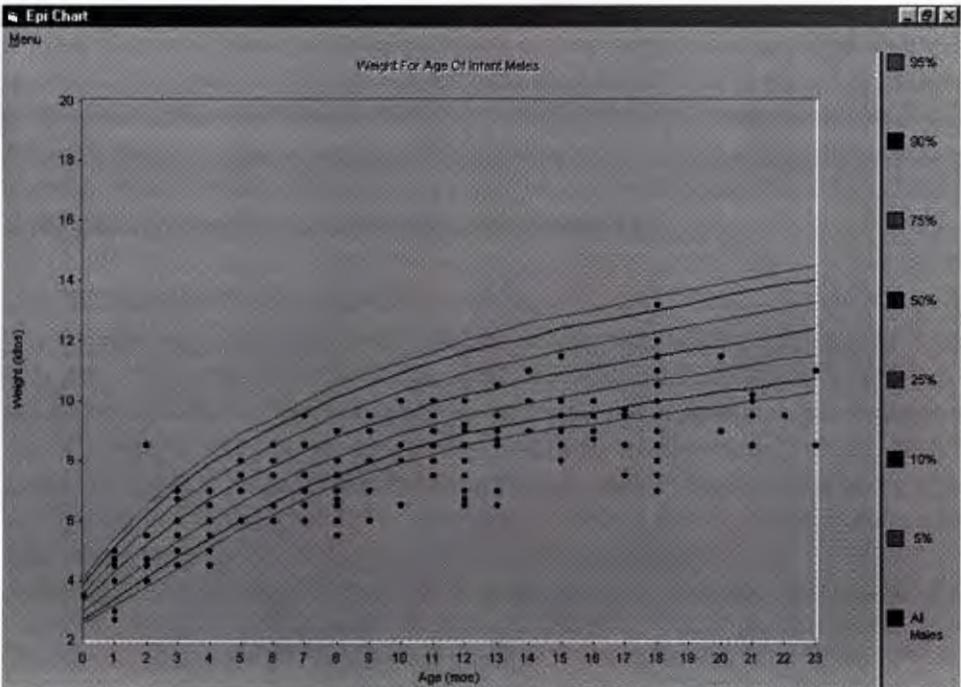


FIGURE 5. WEIGHT-FOR-AGE OF MALES (2-5 YEARS) PLOTTED AGAINST WHO PERCENTILE CUT POINTS (18)

