

THE 1987/88 NATIONAL NUTRITION SURVEY OF THE
FEDERATED STATES OF MICRONESIA

SUMMARY REPORT PREPARED FOR THE GOVERNMENT AND DEPARTMENT OF
HUMAN RESOURCES OF THE
FEDERATED STATES OF MICRONESIA

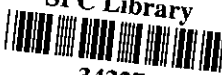
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Noumea,
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South Pacific Commission
Noumea New Caledonia
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Jane Elymore
Nutrition Survey Coordinator

INTRODUCTION AND SUMMARY

1. The National Nutrition Survey for the Federated States of Micronesia was carried out from January 1987 - April 1988 and was co-ordinated by the FSM Division of Health Services. The survey was designed to form a basis for future nutrition programme and policy formulation at national and state level. It was initiated in response to concern at the observed changing food supply and dietary pattern, and the increasing incidence of clinical malnutrition in children and adults reported at hospitals and clinics in FSM.

Historically, the increasing incidence of nutritionally related deaths and disease conditions in the Federated States of Micronesia has been indentified and discussed in many workshops and conferences at both national and regional levels. Small surveys have provided some information on the nature of nutrition problems in each state. However, these were not adequate for a proper assessment of the population of the Federated States of Micronesia appropriate for planning and development of a co-ordinated food production and nutrition education programme. It was therefore essential that a detailed assessment of the nutritional status of the population of the FSM be made by carrying out a properly planned national nutrition survey. The objectives of the survey were to provide data on the severity of the problem and to identify the groups within the population which are most affected by malnutrition (according to age structure and geographic location).

2. The project was funded by the United Nations Children's Fund (UNICEF) and the Government of the Federated States of Micronesia. The South Pacific Commission provided technical assistance throughout the project.

3. Data was obtained on women 15 - 49 years and children 0 - 4 years on a randomly selected sample which covered 28% of the populations groups. Information collected included dietary habits, infant feeding patterns, maternal and child health care practices and anthropometric indicators including weight, height/length and also hemoglobin readings for females. The survey sample was designed to provide information on a national basis, by state and also according to five zones designated by their geographic location and food supply situation i.e. main island - urban, rural inland and rural coastal, outer island - good and poor resources. The information was collected by four teams of trained enumerators (one team per state) led by a national nutrition survey co-ordinator from the FSM Division of Health Services and assisted by a survey planning committee also from the Division of Health Services.

4. All results were compared to standards derived from internationally recognised sources.

The results indicated:

- a) high prevalence of overweight and obesity among adult women;
- b) high prevalence of malnutrition especially 'stunting' among infants 0-59 months of age;
- c) high prevalence of mild and moderate anemia in women especially among pregnant women;
- d) differences in nutritional status by state and by zone in both adult women and infants;
- e) differences in dietary patterns in each state and zone attributable to availability of foods and other factors.

5. The interrelationships of diet and nutritional status in adults and children are discussed and proposals for future nutrition programs in the Federated States of Micronesia are made.

Detailed information on the background and methodology as well as a complete set of tabulated data for the survey are contained in a full technical report prepared by the Division of Health Services. This short report has been prepared to facilitate the interpretation of the results of the National Nutrition Survey. Only significant data has been included and technical tables have been summarised and are presented here in graphic form.

R E S U L T S
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SAMPLE DESCRIPTION

Accurate census data by state, zone and each age group analysed in this survey were not available at the time of analysis. This has made it impossible to calculate National Estimates of the prevalence of malnutrition and other nutritional parameters, and to make any other adjustments for age distribution or for the size of sample take for each zone within each state.

The sample take was sufficiently great (28%) to provide useful information on a state and zone basis. Sample coverage was also good (approximately 78% overall for women 15-49 years and children 0-59 months, after adjustment for eligible population overestimation at the sampling stage).

Variables grouped in the following data include age, sex, state, nutritional zone for both population target groups and occupation for women 15-49 years.

AGE DISTRIBUTION BY STATE, SAMPLE POPULATION
FOR WOMEN 15 TO 49 YEARS OLD, NATIONAL NUTRITION SURVEY,
NATIONAL NUTRITION SURVEY, FEDERATED STATES OF MICRONESIA, 1987-88.

	KOSRAE		POHNPEI		TRUK		YAP		TOTAL F.S.M.	
	n	%	n	%	n	%	n	%	n	%
AGE GROUPS:										
15-19.....	86	22.9	249	19.1	303	21.0	210	24.1	848	21.2
20-29.....	123	32.8	466	35.8	532	36.9	328	37.6	1449	36.3
30-39.....	113	30.1	400	30.7	412	28.6	239	27.4	1164	29.1
40-49.....	53	14.1	188	14.4	196	13.6	96	11.0	533	13.3
TOTAL F.S.M.....	375	100.0	1303	100.0	1443	100.0	873	100.0	3994	100.0

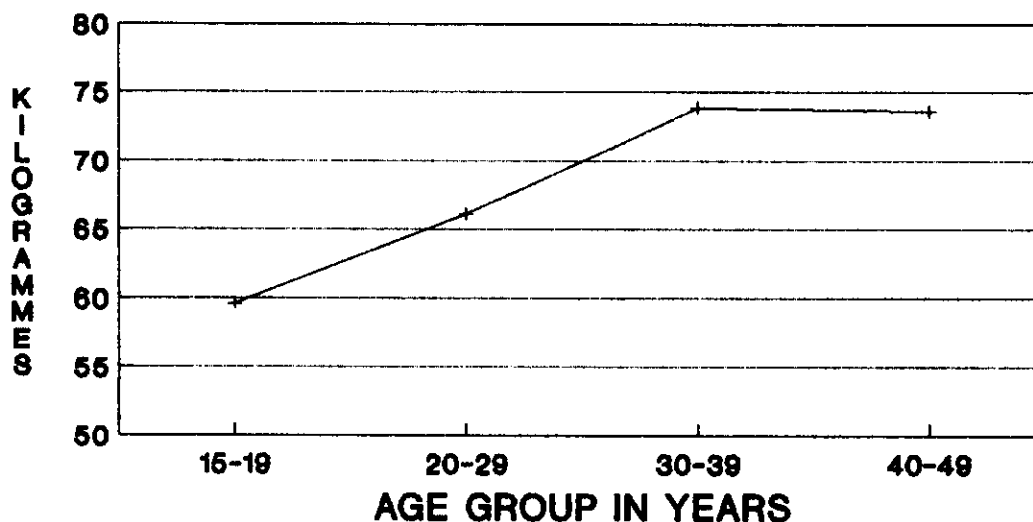
AGE DISTRIBUTION BY STATE AND BY SEX
SAMPLE POPULATION OR CHILDREN AGED 0 TO 59 MONTHS
NATIONAL NUTRITION SURVEY, FEDERATED STATES OF MICRONESIA, 1987-88.

	KOSRAE		POHNPEI		TRUK		YAP		TOTAL F.S.M.	
	n	%	n	%	n	%	n	%	n	%
AGEGP										
0-5 months.....	29	8.6	111	10.3	133	9.2	64	9.8	337	9.6
6-11 months.....	45	13.4	112	10.4	172	11.9	73	11.2	402	11.4
12-17 months.....	36	10.7	118	10.9	133	9.2	66	10.1	353	10.0
18-23 months.....	39	11.6	113	10.5	168	11.6	81	12.4	401	11.4
24-35 months.....	56	16.6	216	20.0	307	21.2	135	20.7	714	20.3
36-47 months.....	62	18.4	210	19.5	267	18.5	125	19.2	664	18.9
48-59 months.....	70	20.8	199	18.4	267	18.5	108	16.6	644	18.3
TOTAL AGES.....	337	100.0	1079	100.0	1447	100.0	652	100.0	3515	100.0

ADULT WOMEN'S NUTRITIONAL STATUS - OBESITY AND OVERWEIGHT

Adult female's nutritional status was determined by using the international classification for Body Mass Index for determining prevalence rates of normal weight, overweight and obese individuals in the population.

MEAN WEIGHT (in kg.) BY AGE GROUP FOR WOMEN 15 TO 65 YEARS OLD* FSM NATIONAL NUTRITION SURVEY 1987-88

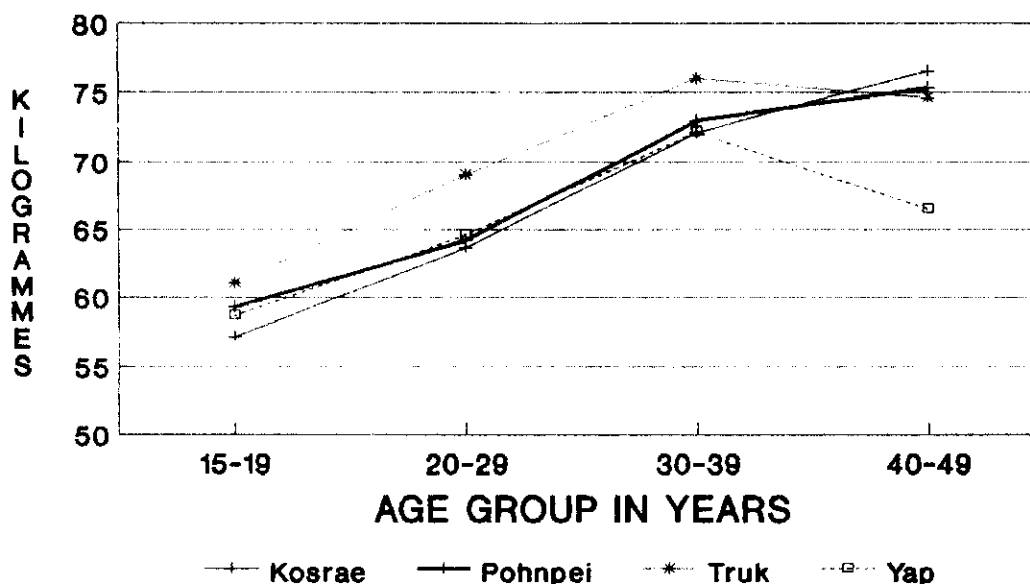


* Excludes pregnant women

. Mean weights of females increased markedly with age in all the states and all the zones.

. Females ages 30 - 49 years had the highest mean weights.

MEAN WEIGHT (in kg.) BY AGE GROUP FOR WOMEN 15 TO 65 YEARS OLD,* BY STATE FSM NATIONAL NUTRITION SURVEY 1987-88



* Excludes pregnant women

. Mean weight values were highest in Truk and lowest in Yap States.

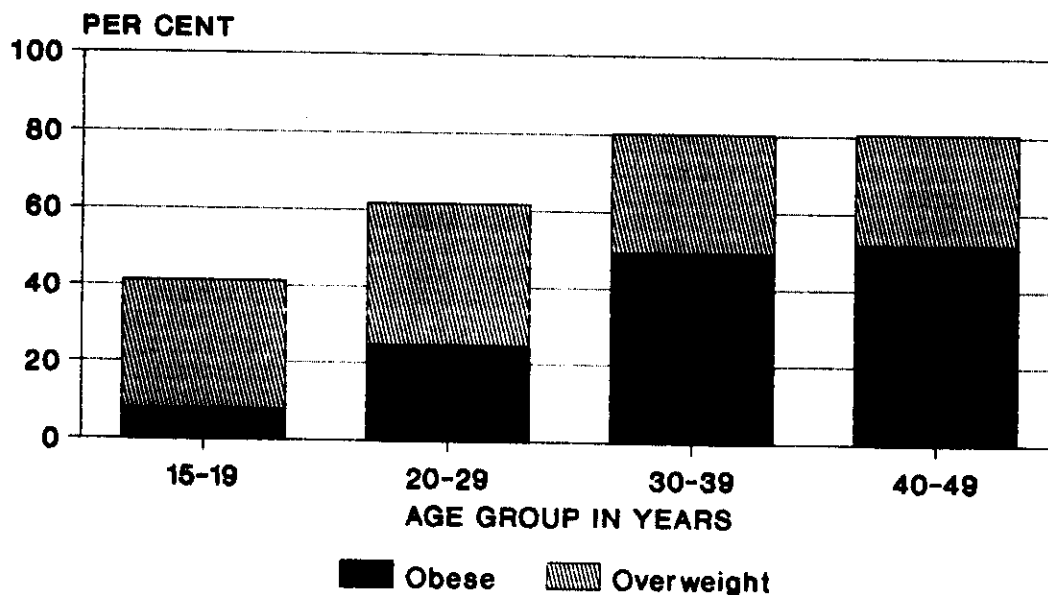
. The outer island poor resource zones in all states except Yap had the highest mean weight and main island inland areas had the lowest mean weights, again with the exception of Yap.

. In Yap, the main island coastal area had the highest and outer islands with good food resources had the lowest mean weights.

. There were few age group, state or zone differences for mean height of females.

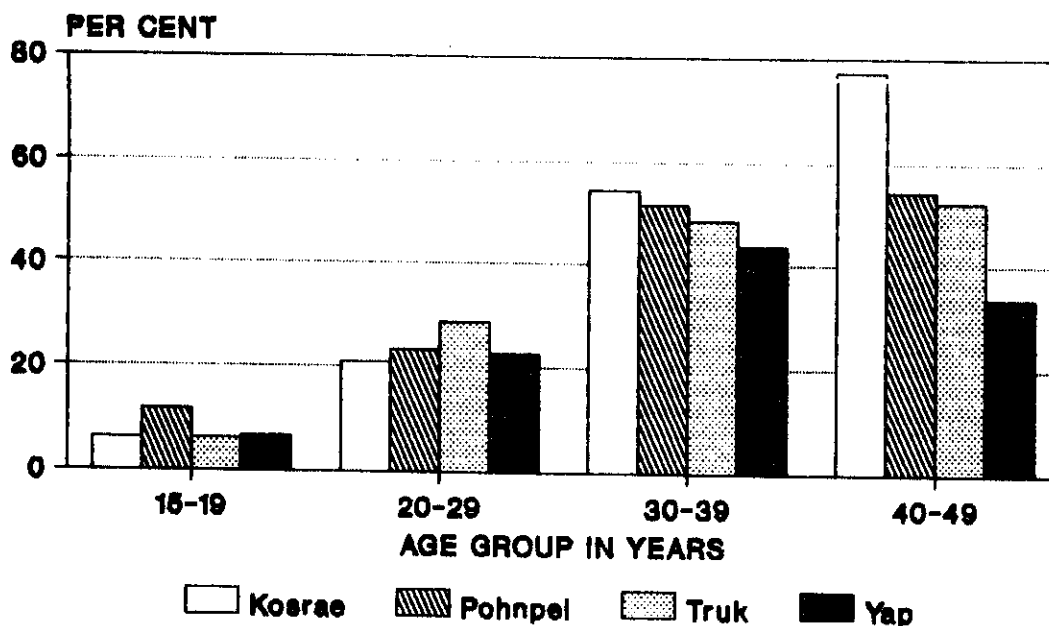
. Mean body mass index had a similar pattern to the mean weight values for females.

**PREVALENCE OF OBESITY(1) IN WOMEN(2)
15-49 YEARS OLD
FSM NATIONAL NUTRITION SURVEY 1987-88**



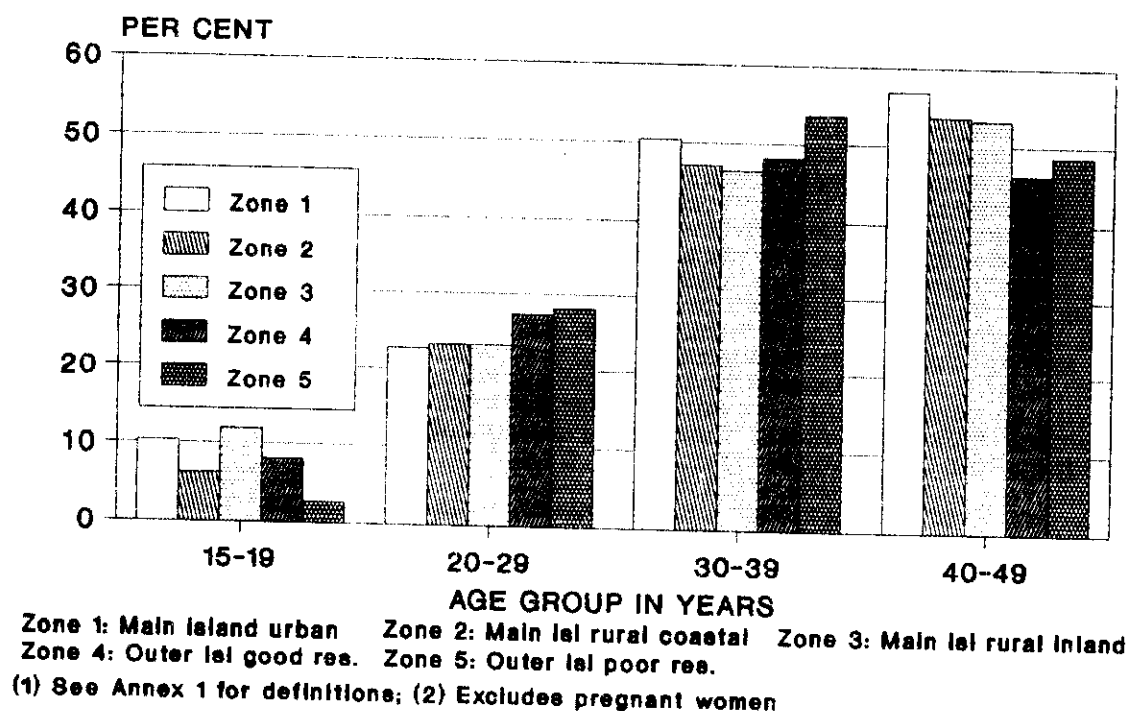
(1) See Annex 1 for definitions
(2) Excludes pregnant women

**PREVALENCE OF OBESITY(1) IN WOMEN(2)
15-49 YEARS OLD, BY STATE
FSM NATIONAL NUTRITION SURVEY, 1987-88**



(1) See Annex 1 for definitions
(2) Excludes pregnant women

PREVALENCE OF OBESITY(1) IN ALL WOMEN(2) 15-49 YEARS OLD BY ZONE FSM NATIONAL NUTRITION SURVEY, 1987-88



. The prevalence of obesity (BMI ≥ 30) in all states increases with age as women increase their body weight.

. In addition, approximately one-third of women in any age group are moderately overweight (BMI 25 - 29).

. This means that there are generally fewer women who can be considered to have a normal BMI (< 25) as age increases.

. The prevalence of obesity was especially high in Kosrae particularly in older age groups.

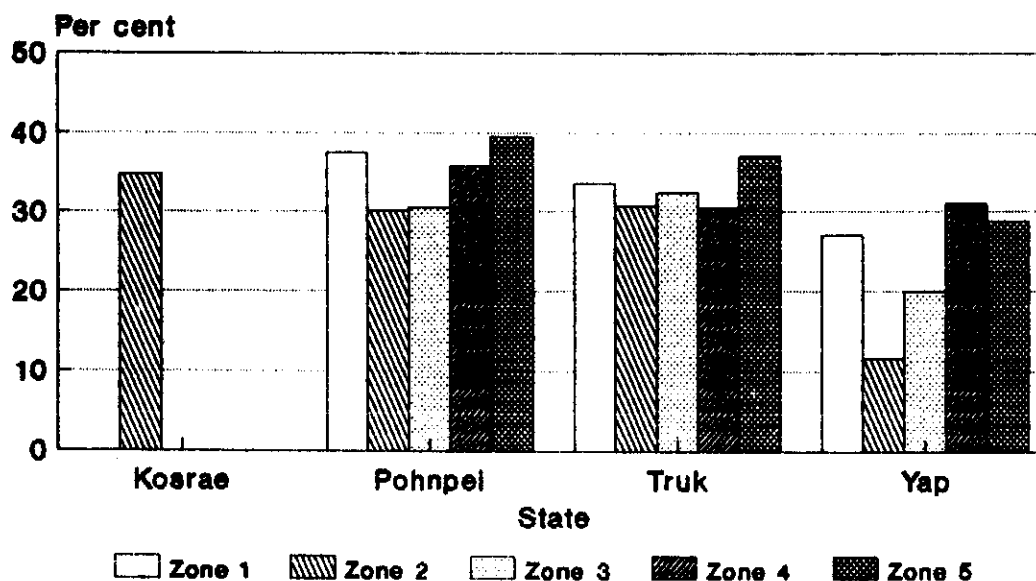
. There were generally less females with obesity and more with normal BMI's in Yap.

. Between zones, all main island zones (urban, rural coastal and rural inland), tended to have a slightly lower prevalence of moderate overweight and obesity than the two outer island zones.

. The net result was that there was a higher prevalence of females with a normal body mass index on the main islands than on the outer islands.

. Looking at all age groups combined, roughly one third of females 15 - 49 years had a normal body mass index, one third were considered moderately overweight and one third were considered obese in all states and in all zones.

**PREVALENCE OF OBESITY (1) IN WOMEN (2)
15-49 YEARS OLD BY STATE AND ZONE
FSM NATIONAL NUTRITION SURVEY 1987-88**



Zone 1: Main island urban
 Zone 2: Main isl. rural coastal
 Zone 3: Main isl. rural inland

Zone 4: Outer isl. good resources
 Zone 5: Outer isl. poor resources

(1) See Annex 1 for definitions; (2) Excludes pregnant women

. Prevalence of obesity and overweight by zone was different between states.

. Kosrae consisted of one zone and so all obesity and overweight was found in this zone (main island, coastal).

. In Pohnpei and Truk the prevalence of obesity and overweight was high in all zones but particularly high in the outer island poor resources zones and lower in the rural inland areas. Urban area obesity levels were high, but not excessively higher than other zones.

. In Yap, the prevalence of obesity was comparatively low in main island areas relative to the other states, but was high in the outer islands especially in the good food supply areas.

ADULT WOMEN'S NUTRITIONAL STATUS - ANEMIA AND MATERNAL HEALTH

a) Non-pregnant, non-lactating women

. Mean hemoglobin levels for non-pregnant, non-lactating women ranged between 12.0 and 13.2g/dl with mean values being highest in Pohnpei and lowest in Kosrae.

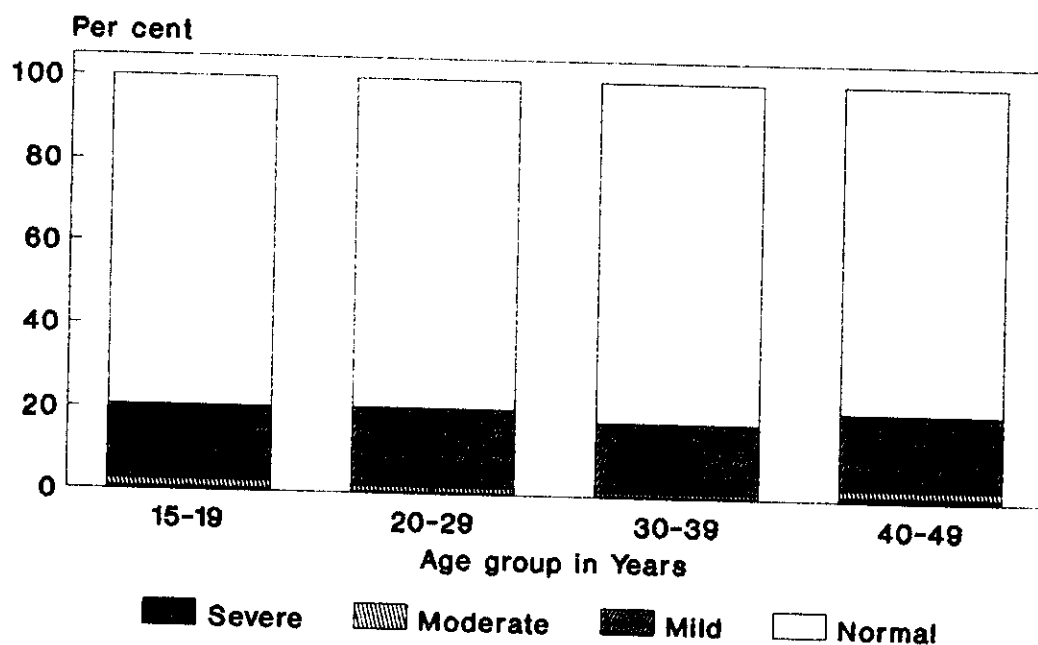
. There were no differences in mean hemoglobin levels between age groups, states, zones and occupation.

. There was very little moderate or severe anemia among non-pregnant, non-lactating women in all age groups, states and zones.

. However, there was a high prevalence of mild anemia in all states but particularly in Kosrae and Truk. There were no significant age group differences for all states.

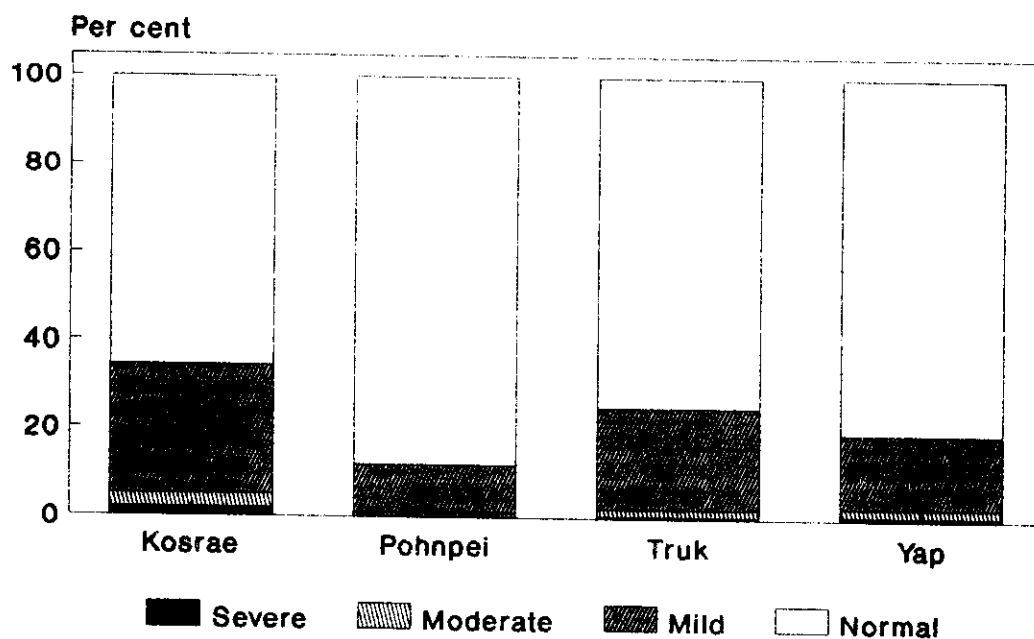
. There was a high prevalence of mild anemia among non-pregnant, non-lactating women in the main island rural coastal areas compared to other zones. However this was not significant and was probably a reflection of the high prevalence in Kosrae which consists entirely of this zone.

PREVALENCE OF ANEMIA(1) IN NON-PREGNANT & NON-LACTATING WOMEN 15-49 YRS. BY AGE, FSM NATIONAL NUTRITION SURVEY 1987-88



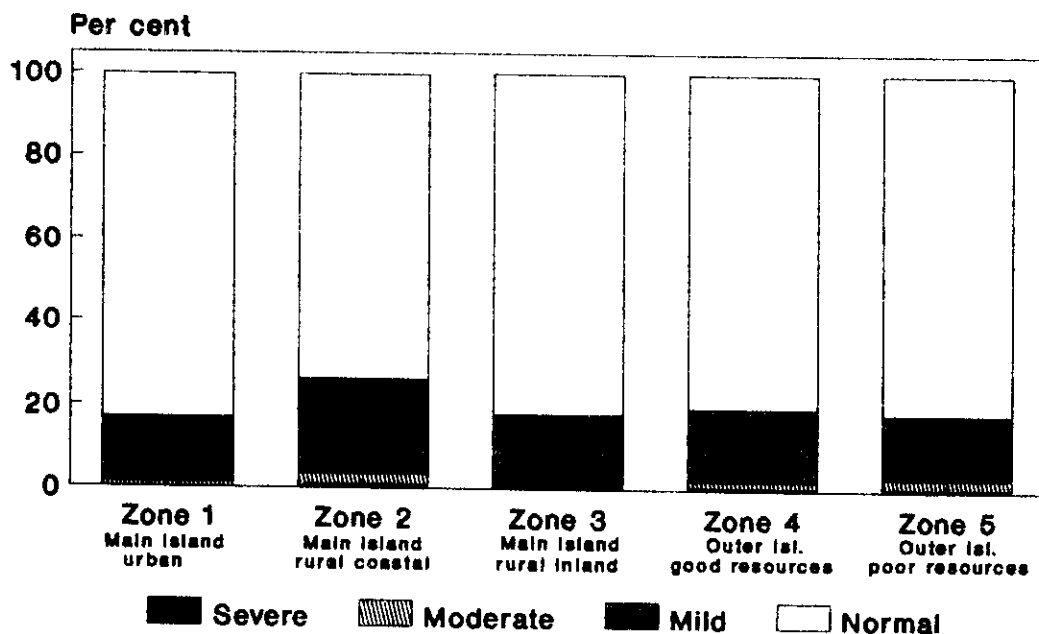
(1) See Annex 1 for definition of anemia

PREVALENCE OF ANEMIA(1) IN NON-PREGNANT & NON-LACTATING WOMEN 15-49 YR BY STATE, FSM NATIONAL NUTRITION SURVEY 1987-88



(1) See Annex 1 for definition of anemia

PREVALENCE OF ANEMIA(1) IN NON-PREGNANT & NON-LACTATING WOMEN 15-49 YRS, BY ZONE FSM NATIONAL NUTRITION SURVEY 1987-88



(1) See Annex 1 for definition of anemia

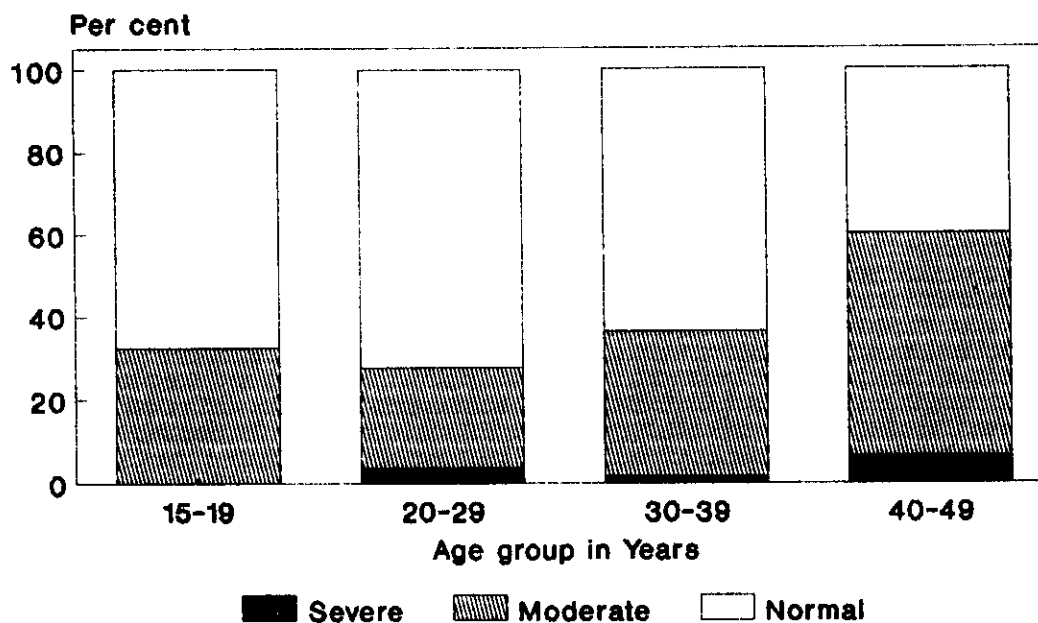
b) Pregnant women

. Mean hemoglobin levels for pregnant women ranged between 9.5 and 12.6 g/dl with no significant differences between age groups, states, zones and occupation.

. Population numbers were fairly low for pregnant women which makes it harder to compare data between states and zones etc. particularly for prevalence of anemia.

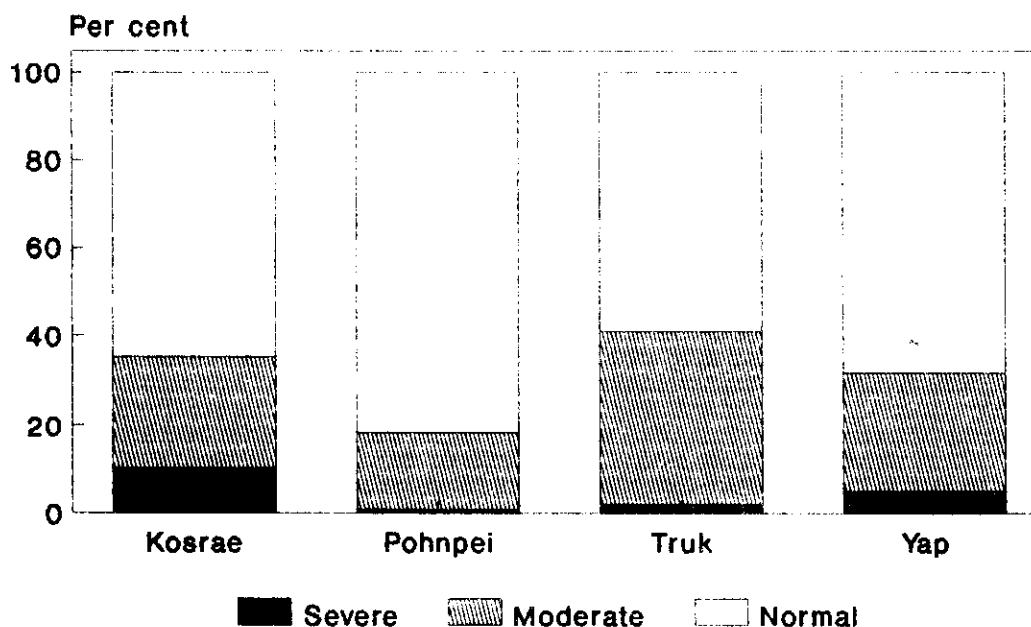
. There was an apparently high prevalence of moderate anemia and some severe anemia in pregnant women. Rates were particularly high in Kosrae and Truk.

PREVALENCE OF ANEMIA(1) IN PREGNANT WOMEN 15-49 YRS, BY AGE GROUP FSM NATIONAL NUTRITION SURVEY 1987-88



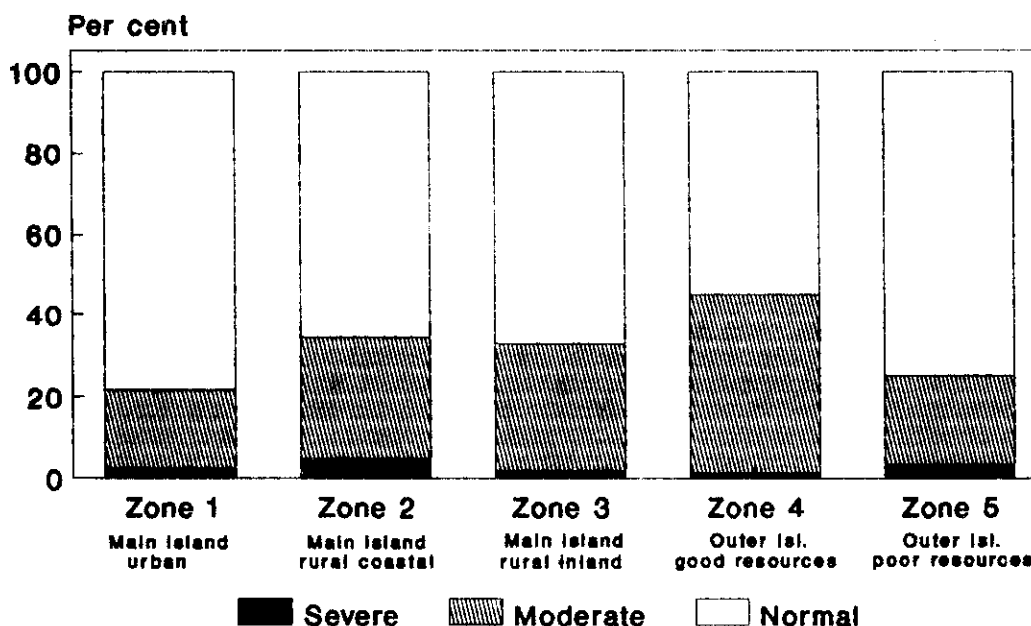
(1) See Annex 1 for definition of anemia

PREVALENCE OF ANEMIA(1) IN PREGNANT WOMEN 15-49 YRS, BY STATE FSM NATIONAL NUTRITION SURVEY 1987-88



(1) See Annex 1 for definition of anemia

PREVALENCE OF ANEMIA(1) IN PREGNANT WOMEN 15-49 YRS, BY ZONE FSM NATIONAL NUTRITION SURVEY 1987-88



(1) See Annex 1 for definition of anemia

c) Lactating women

. Mean hemoglobin levels for lactating women ranged between 11.5 and 13.0g/dl with mean values being highest in Pohnpei and lowest in Kosrae.

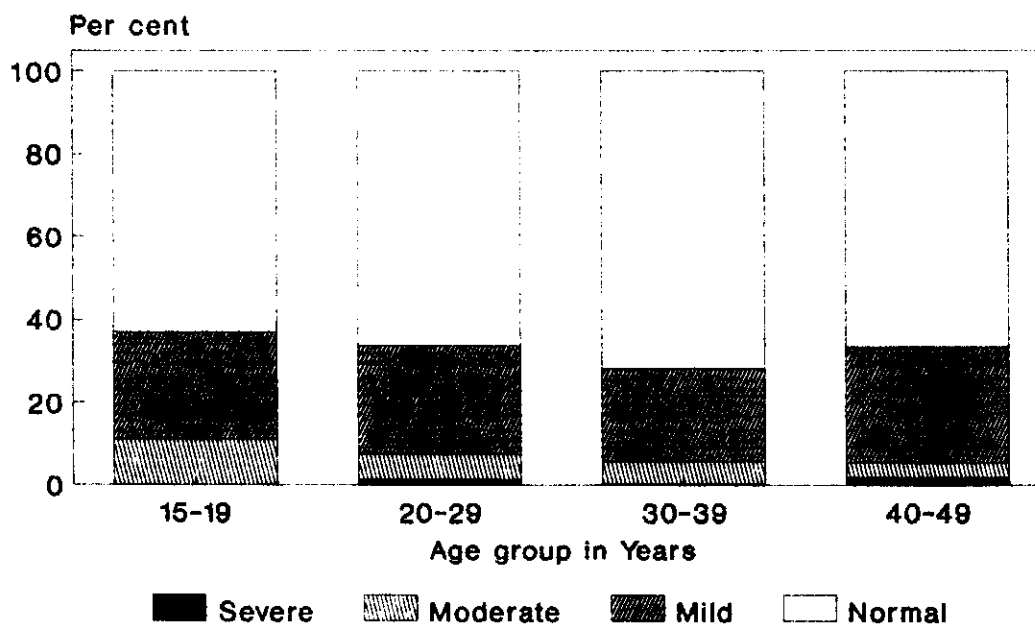
. There were no differences in mean hemoglobin levels between age groups, zones and occupations.

. There was very little moderate or severe anemia among lactating women in all age groups, states and zones.

. However, there was a high prevalence of mild anemia in all states but particularly in Kosrae. There were no significant age group differences for all states.

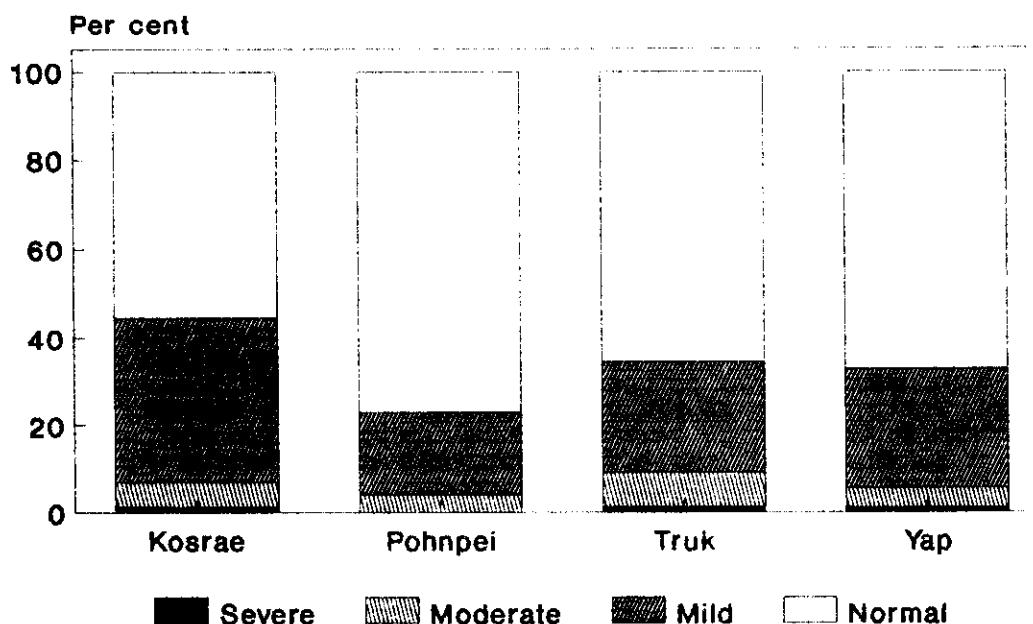
. The main island, rural coastal area had a slightly higher prevalence of mild anemia than other zones but as with non-pregnant and non-lactating women this was probably a reflection of the high prevalence in Kosrae.

PREVALENCE OF ANEMIA(1) IN LACTATING WOMEN 15-49 YRS, BY AGE GROUP FSM NATIONAL NUTRITION SURVEY 1987-88



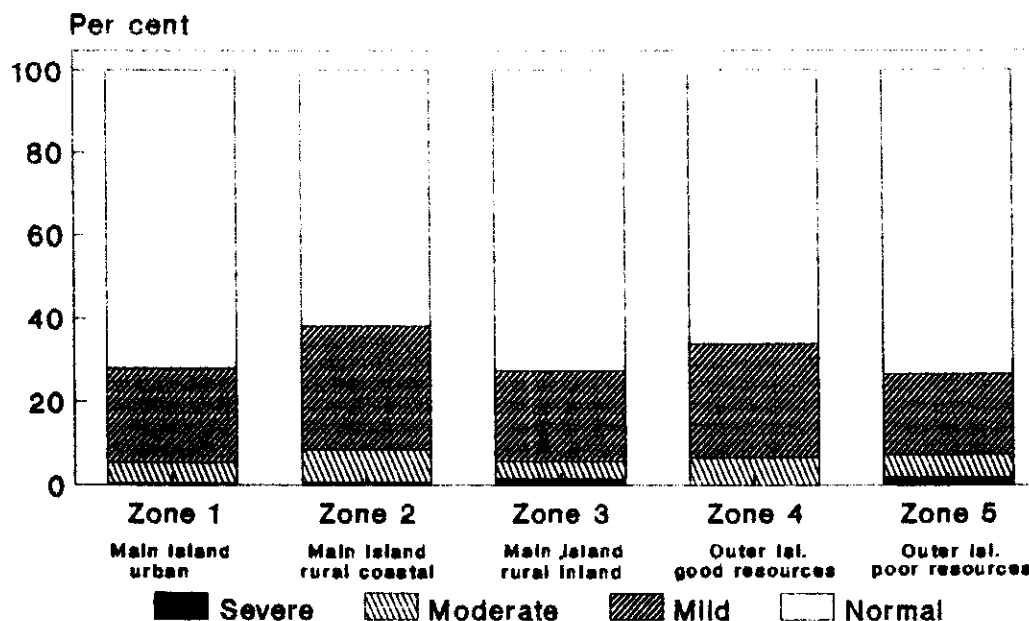
(1) See Annex 1 for definition of anemia

**PREVALENCE OF ANEMIA(1) IN LACTATING
WOMEN 15-49 YRS, BY STATE
FSM NATIONAL NUTRITION SURVEY 1987-88**



(1) See Annex 1 for definition of anemia

**PREVALENCE OF ANEMIA(1) IN LACTATING
WOMEN 15-49 YRS, BY ZONE
FSM NATIONAL NUTRITION SURVEY 1987-88**



(1) See Annex 1 for definition of anemia

d) Avoiding foods during pregnancy & lactation

. The kinds of food most commonly avoided by women during pregnancy were fish (fresh, reef, ocean or sashimi), other seafoods (sea urchin, turtle, crab, octopus, clam, sea cucumber, lobster, or shell fish) meat (canned, chicken or dog), spicy or preserved foods, fruits (lemon, pineapple or banana), coffee and coca cola. The main reason given for avoiding these foods was for cultural beliefs. Other reasons given included causing vomiting, swelling of the body, gastric problems, eye damage to the fetus and difficult labour.

. The kinds of food most commonly avoided by women during lactation were the same range as those avoided during pregnancy, plus coconut, sugarcane, hard yams and taro, chestnuts, pumpkin and fatty foods. The main reasons given for avoiding these foods were cultural beliefs and causing skin rash in the baby. Other reasons given included causing fever in the baby, stopping breastmilk, causing infection in the umbilical cord, causing baby to cry at night, to have a bad stool color, to have abdominal pain, to vomit and have to diarrhoea and the mother to have swollen lips.

. Very few women were avoiding foods in pregnancy related to any food taboos or beliefs (right or wrong) about a mother and child's health, in relation to foods eaten. Foods were generally avoided for practical reasons (e.g. morning sickness, dislike). There were no combinations of foods or lists of foods that would give rise to concern that certain nutrients would be lacking in the diet, although some women were avoiding fish and seafood, which may have been their major protein source. Similarly, no women were avoiding all sources of iron so that anemia might be expected, and the prevalence of anemia was shown to be the same for women who did and did not avoid foods in pregnancy.

. Most foods avoided in lactation were for reasons affecting the baby's health, such as causing rash or diarrhoea. So few foods were avoided by each person that none would be likely to affect the health of mother or child.

f) Pregnancy history of females 15 - 49 years

. Data collected on pregnancy history of adult females aged 15 - 49 years included information on number of children alive, number of children that have died, number of miscarriages and number of still-births. This information was collected to give an accurate picture of total pregnancies for each woman for correlation with the data on anemia. The more pregnancies a woman has, the more likely she is to become anemic.

. As can be expected, total number of pregnancies increases with age.

. There was a high proportion of teenage girls (15-19 years old) having one or two babies particularly in Pohnpei and Yap (10.4% in Kosrae, 19.3% in Pohnpei, 9.2% in Truk and 17.2% in Yap).

. There were no differences in rate of teenage pregnancies between zones, although the inland main island areas had a slightly higher rate.

. There was a high percentage of women with more than 3 children in every state and zone.

. Many young women 20 - 29 years had 3 or more children.

. There were also many women with 6 or more children in all states and zones. One woman in Pohnpei had had 22 pregnancies with 16 children still living.

g) Relationships between the incidence of anemia, dietary patterns and pregnancy history

. The potential causal relationship of factors such as diet, antenatal clinic attendance, vitamin and iron tablet intake and pregnancy history with the prevalence of anemia were investigated.

. The prevalence of anemia in pregnant women was the same whether or not the women was attending antenatal clinic, or whether or not she was taking iron tables.

. Anemia prevalence was not apparently affected by the number of pregnancies (full-term plus miscarriages) in all women, although numbers were too small for women of high parity, for reasonable analysis to be carried out. Teenage women who have had no children had a higher prevalence of mild and moderate anemia than older women with several children. This means today's teenage women may have an increased risk of becoming severely anemic in years to come.

. There was no significant correlation between types of food eaten and the prevalence of anemia for all groups of women. Dietary data shows that women had a low rate of consumption of greens and vegetables, which would be among their best iron sources. There was probably a moderate intake of iron from the high rate of staples and moderate rate of protein foods consumed. There were no differences in the rate of consumption of these iron sources between states to account for the high incidence of anemia in Kosrae.

. There was no correlation between whether women avoided certain foods during pregnancy or lactation and the prevalence of anemia for all groups of women.

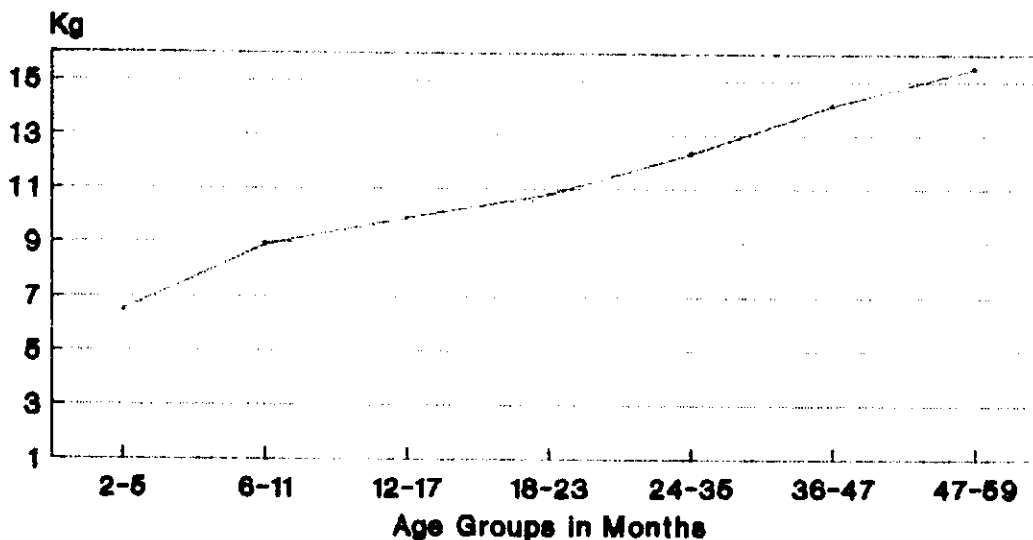
CHILDREN 'S NUTRITIONAL STATUS

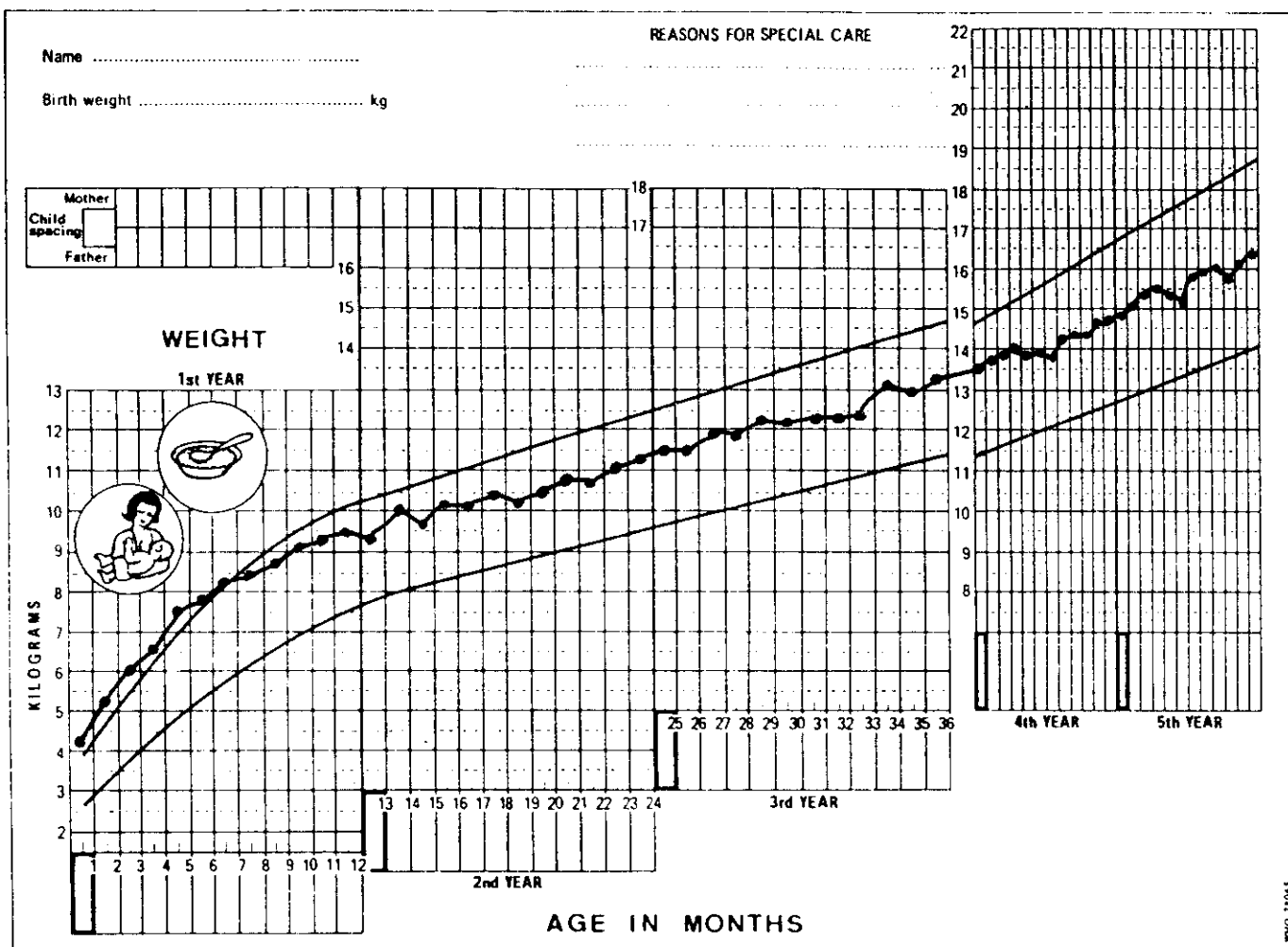
. For each age group there were no significant differences in mean weight for age, height for age or weight for height between zones and states.

. Children in the main island inland areas tended to be marginally shorter and gain weight at a lower rate than other zones.

. Weight for age increased with age as can be expected from normal growth of children.

MEAN WEIGHT (in kg.) BY AGE GROUP FOR CHILDREN 0-59 MONTHS FSM NATIONAL NUTRITION SURVEY 1987-88

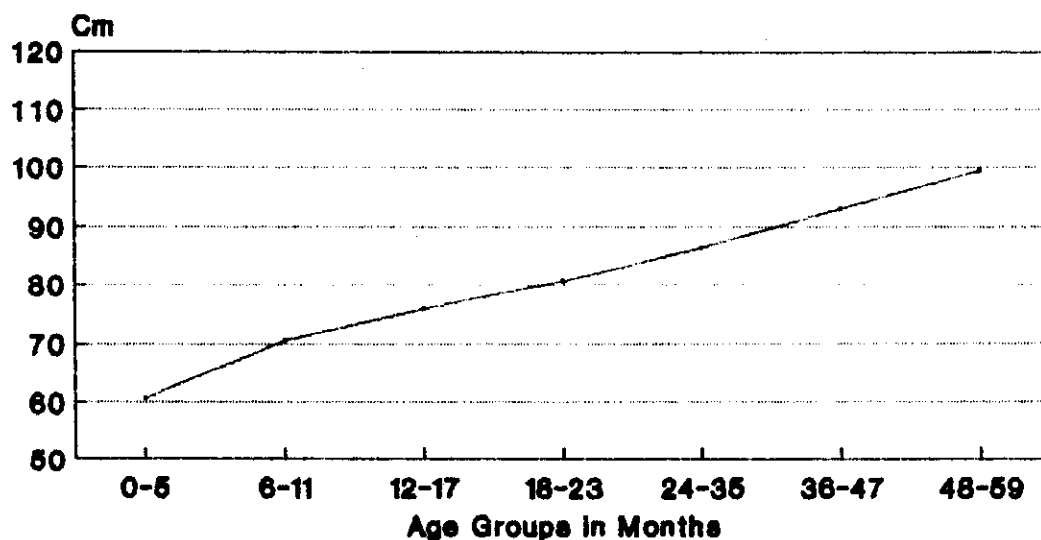




. The above graph shows mean weights for age plotted on the WHO growth chart.

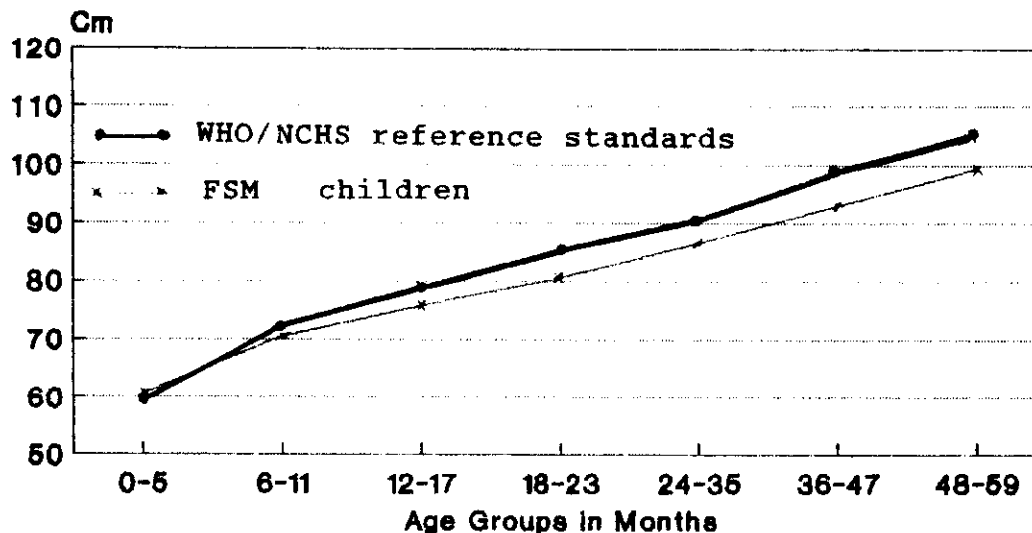
. Weights for age of FSM children follow the WHO growth standard for the first 6-7 months but then gradually fall off so that there is a slowing of growth until 19-24 months. Growth then continues steadily so that the FSM curve parallels the WHO standard. There is no 'catch up' growth and the children's mean weight does not reach the WHO standard even by 59 months.

**MEAN HEIGHT (in cm) BY AGE GROUP
FOR CHILDREN AGED 0-59 MONTHS
FSM NATIONAL NUTRITION SURVEY 1987-8**



. Height for age increased with age as can be expected from normal growth of children.

MEAN HEIGHT (in cm) BY AGE GROUP FOR CHILDREN AGED 0-59 MONTHS FSM NATIONAL NUTRITION SURVEY 1987-8

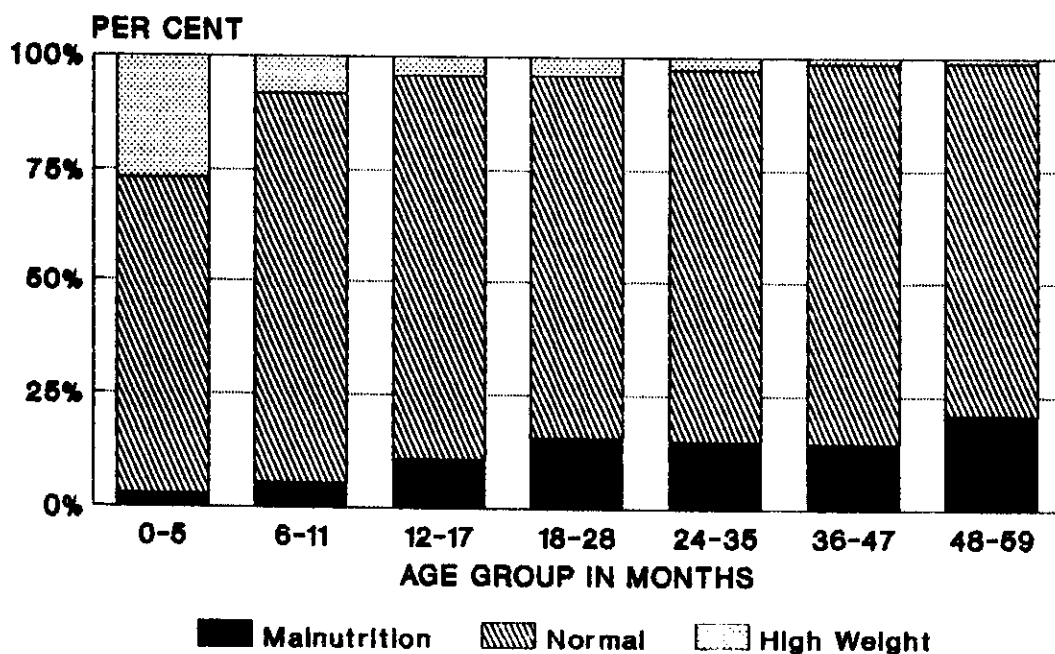


. The above graph plots mean heights for age for both sexes combined compared with WHO/NCHS standards for boys.

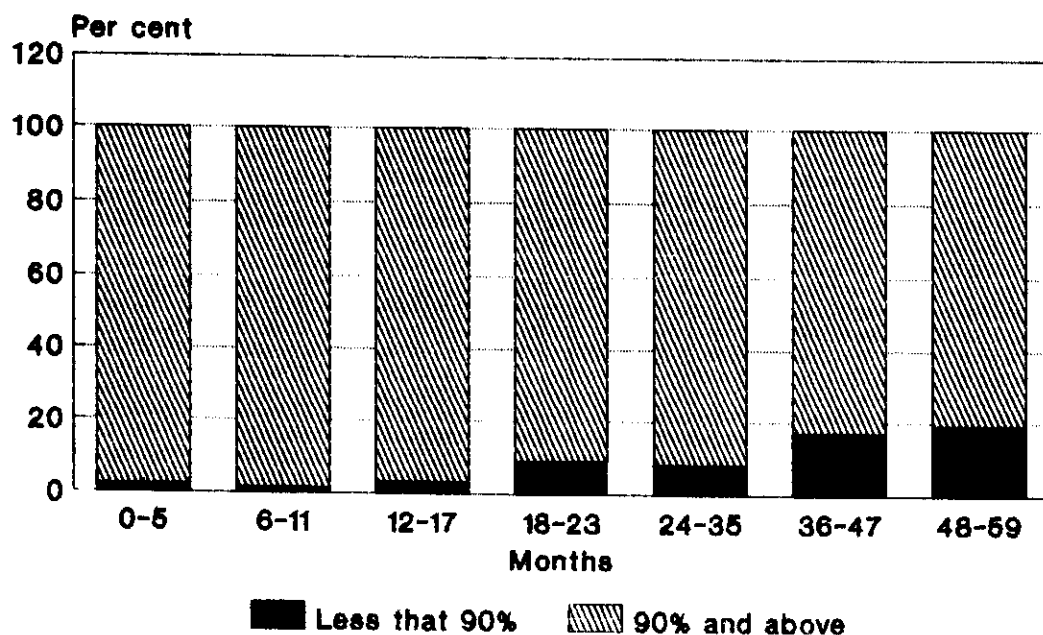
. There is an increase in height over the first 6 months of age and mean lengths of children at birth are the same as reference standards.

. Height growth begins to fall off steadily with respect to the reference standard after 6 months of age and is well below the standard by 59 months of age.

**PREVALENCE OF MALNUTRITION • IN CHILDREN
0-4 YRS, FOR WEIGHT FOR AGE BY AGE GROUP
FSM NATIONAL NUTRITION SURVEY 1987-88**



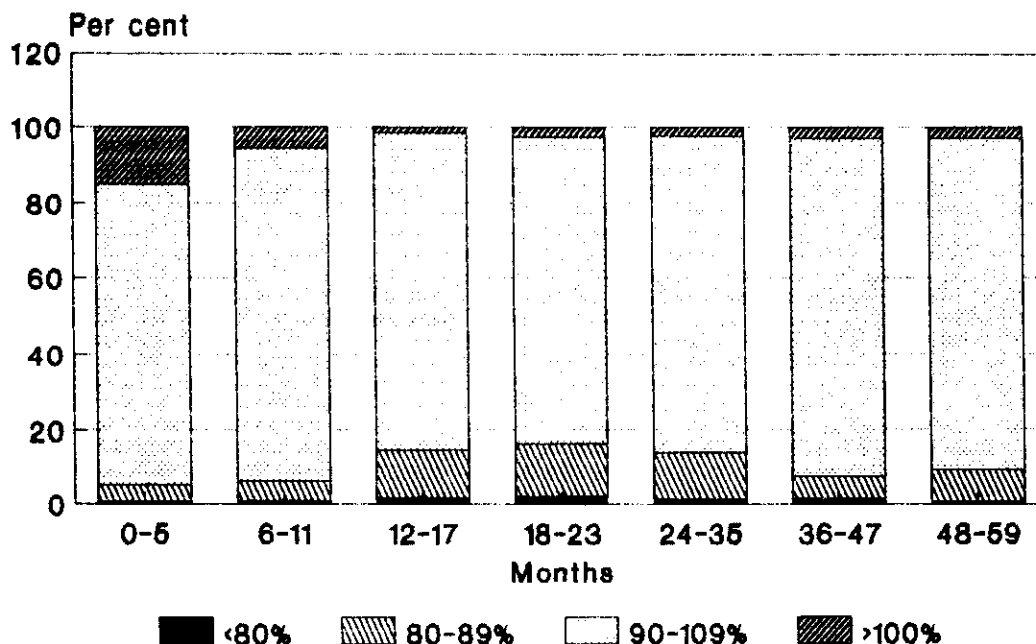
**PREVALENCE OF MALNUTRITION* IN CHILDREN
AGE 0-4 YEARS, FOR HEIGHT BY AGE GROUP
FSM NATIONAL NUTRITION SURVEY, 1988**



. In summary, for prevalence of malnutrition data, there were no cases of severe underweight (less than 60 weight for age) severe stunting and only a few cases severe or moderate wasting.

. There was a high prevalence rate of moderate malnutrition.

PREVALENCE OF MALNUTRITION* IN CHILDREN AGE 0-4 YRS, FOR WEIGHT FOR HEIGHT BY AGE GROUP FSM NATIONAL NUTRITION SURVEY, 1988



* See Annex 1 for definitions

. For all age groups there were 13.3% of children who were moderately underweight.

. Only 5.5% of children had very high weights.

. Underweight increased with age and the number of high weight cases decreased with age.

. Very high weights for age were particularly common in the first six months of life.

. Overall, 9.9% of children surveyed were moderately short or stunted for their age.

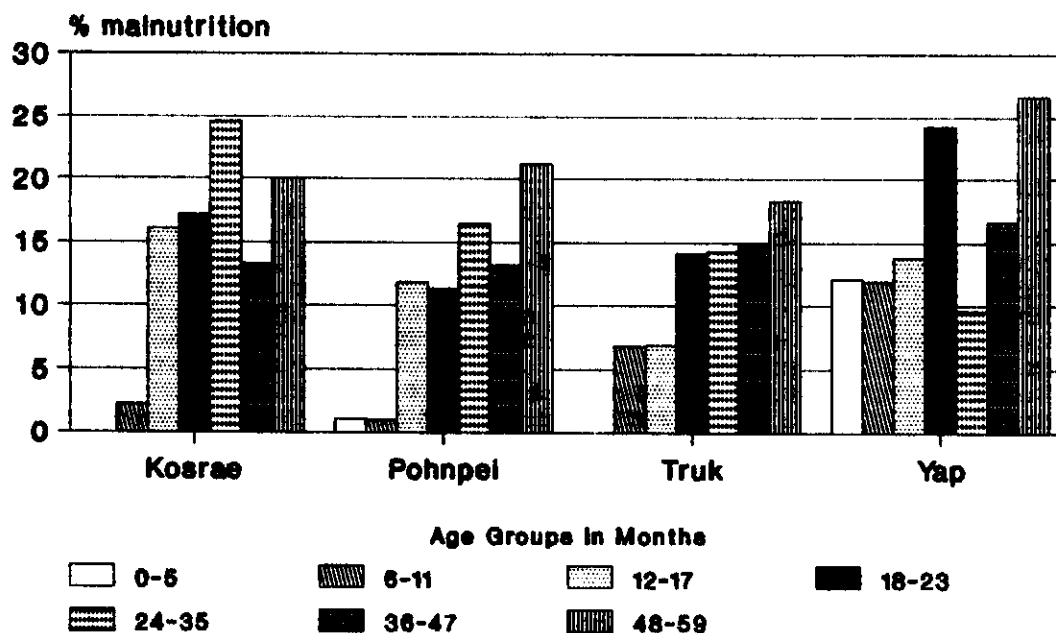
. The prevalence of stunting increased steadily with age in all states so that by 48-59 months of age 18.4% of children were stunted.

. Overall, 1.3% of children survey had a very low weight for height i.e. severe wasting and 9.2% were moderately wasted.

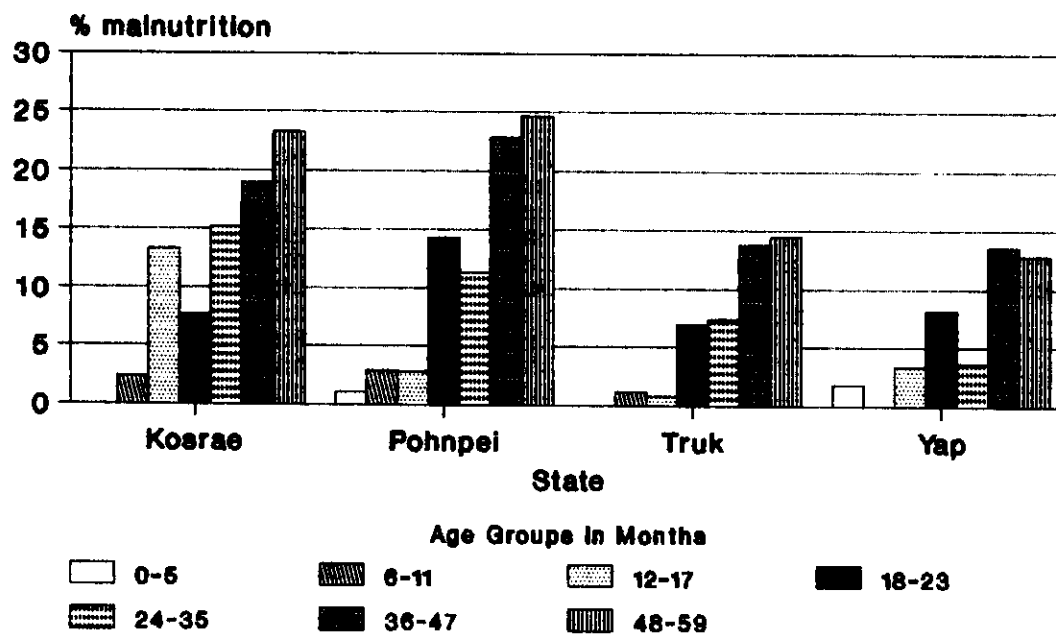
. The number of children who were moderately or severely wasted was greatest between ages 12 - 35 months.

. Only 4.4% of children had a weight for height above what is considered the normal range. High weight for height was more common in very young children and was rare in older children.

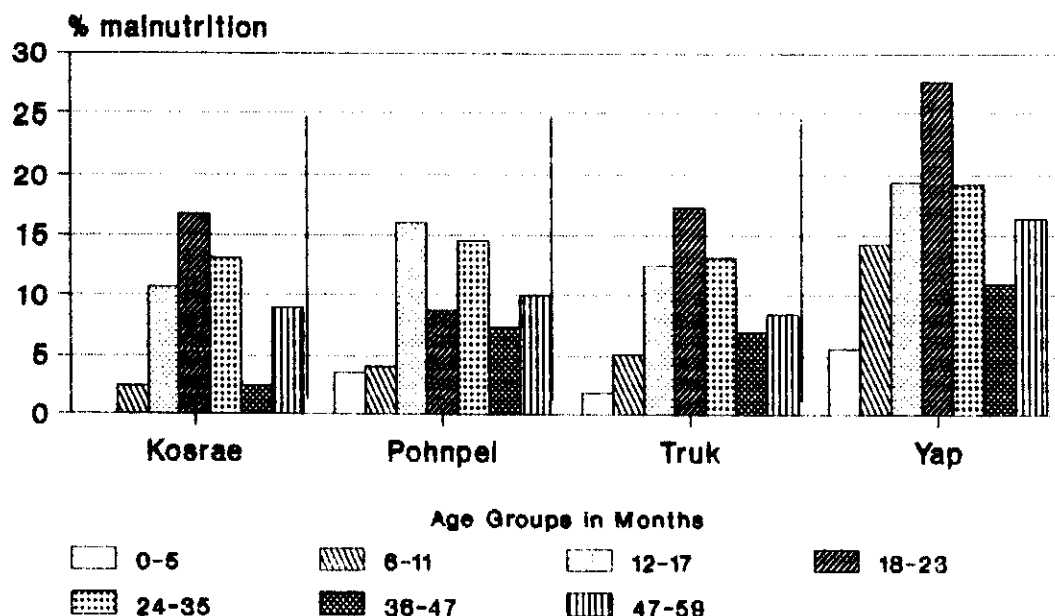
**PREVALENCE OF MALNUTRITION • IN CHILDREN
AGED 0-4 YRS, FOR WEIGHT FOR AGE, BY STATE AND AGE GROUP
FSM NATIONAL NUTRITION SURVEY, 1987-88**



**PREVALENCE OF MALNUTRITION • IN CHILDREN
AGED 0-4YRS, FOR HEIGHT FOR AGE, BY STATE AND AGE GROUP
FSM NATIONAL NUTRITION SURVEY, 1987-88**



PREVALENCE OF MALNUTRITION • IN CHILDREN FOR WEIGHT FOR HEIGHT, BY STATES AND AGE GROUP FSM NATIONAL NUTRITION SURVEY, 1988



• See Annex 1 for definitions

. There were few differences between states in overall prevalence of underweight and high weight children, but the age groups with most problems did vary between states.

. Underweight increased with age and peaked in the 24-35 month age group in Kosrae state and then declined slightly in 36-59 month old children.

. The prevalence of underweight increased steadily with age in Pohnpei and Truk state peaking in older children at 48-59 months.

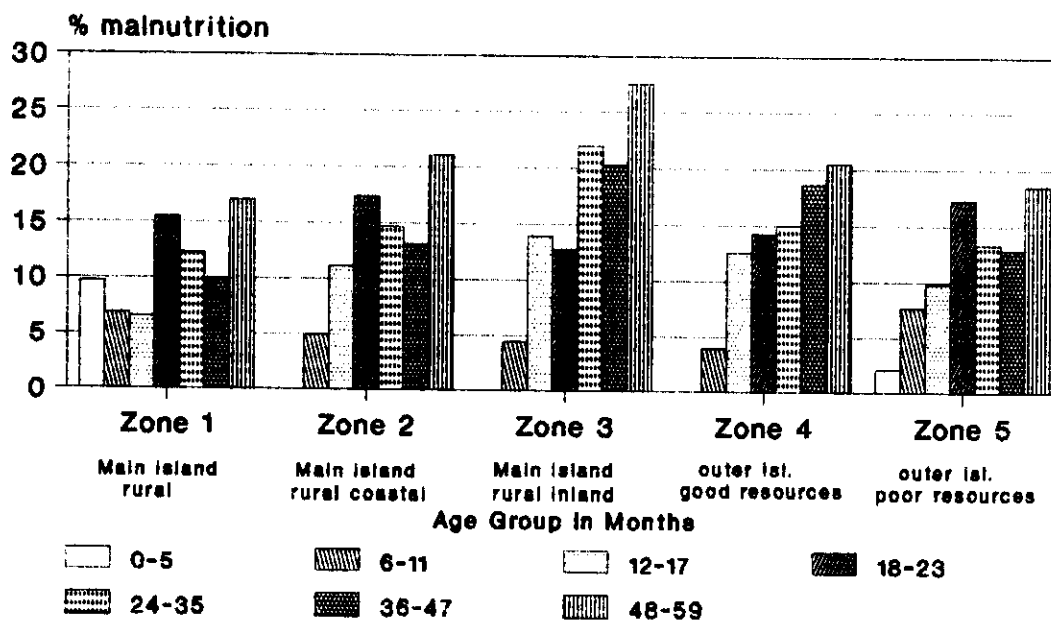
. In Yap, the prevalence of underweight in younger children was much higher than other states. Older children also had high rates of underweight peaking at 18-23 months.

. There was a lower prevalence of high weight for age in Yapese children than in other states and more high weight for age children in Pohnpei.

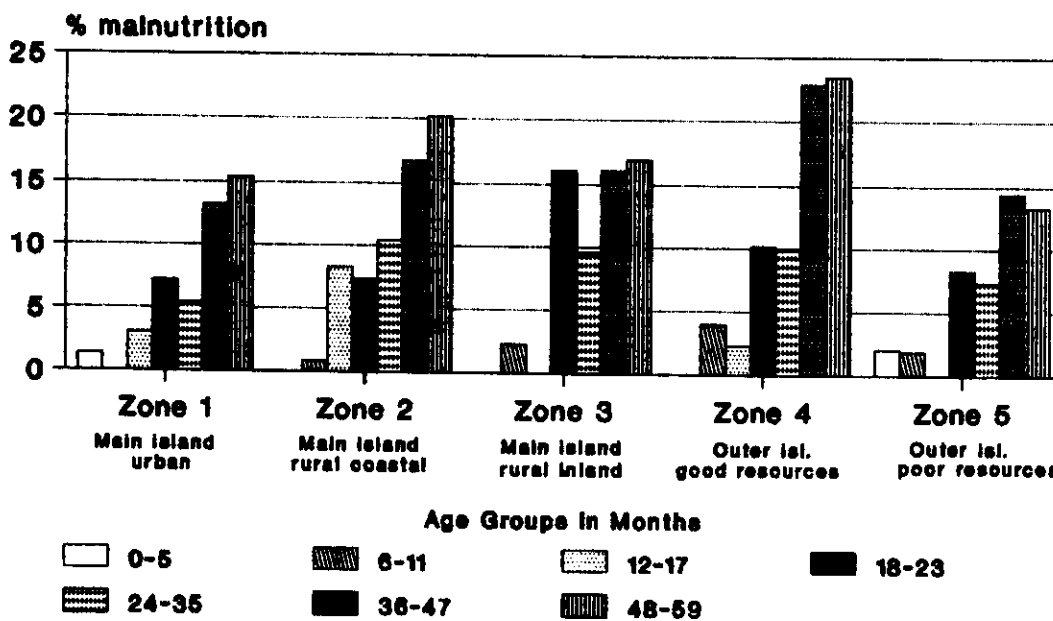
. The prevalence of stunting increased steadily with age in all states.

. There was more stunting in Kosraen and Pohnpeian children between ages 12 - 59 months than in Trukese and Yapese children.

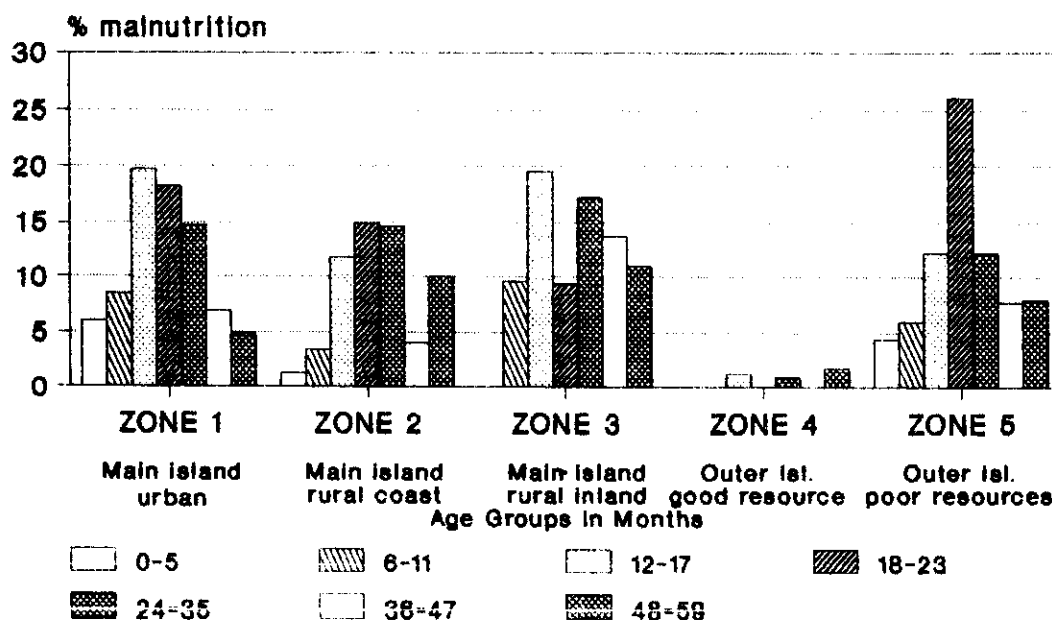
**PREVALENCE OF MALNUTRITION * IN CHILDREN
0-4 YRS, FOR WEIGHT FOR AGE, BY ZONE AND AGE GROUP
FSM NATIONAL NUTRITION SURVEY 1987-88**



**PREVALENCE OF MALNUTRITION * IN CHILDREN
0-4 YRS, FOR HEIGHT FOR AGE, BY ZONE AND AGE GROUP
FSM NATIONAL NUTRITION SURVEY 1987-88**



**PREVALENCE OF MALNUTRITION • IN CHILDREN
0-4 YRS, FOR WEIGHT FOR HEIGHT BY AGE GROUP & ZONE
FSM NATIONAL NUTRITION SURVEY, 1987-88**



• See Annex 1 for definitions

. The prevalence of underweight also increased with age when analysed by zone with the highest prevalence of underweight occurring in older children 24 - 59 months, in all zones.

. There was a higher rate of underweight in young infants 0 - 5 months in main island urban areas compared to other zones.

. There was no underweight in this age group in inland areas of main islands. However there was a much higher prevalence of underweight in 24 - 59 months children in inland areas than in all other zones.

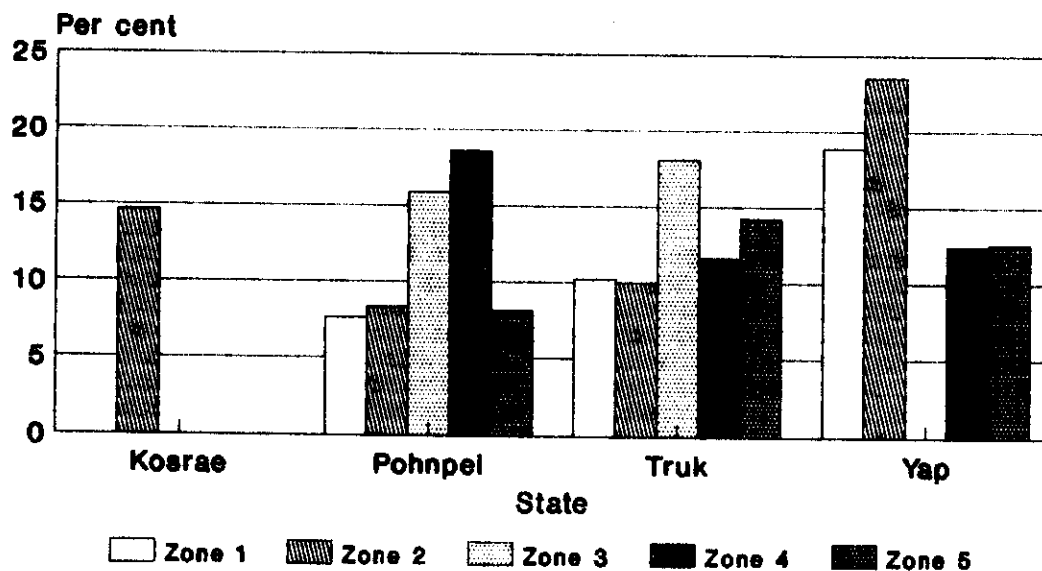
. Most stunting occurred in outer island good resource areas.

. High weight for age decreased with age in all zones.

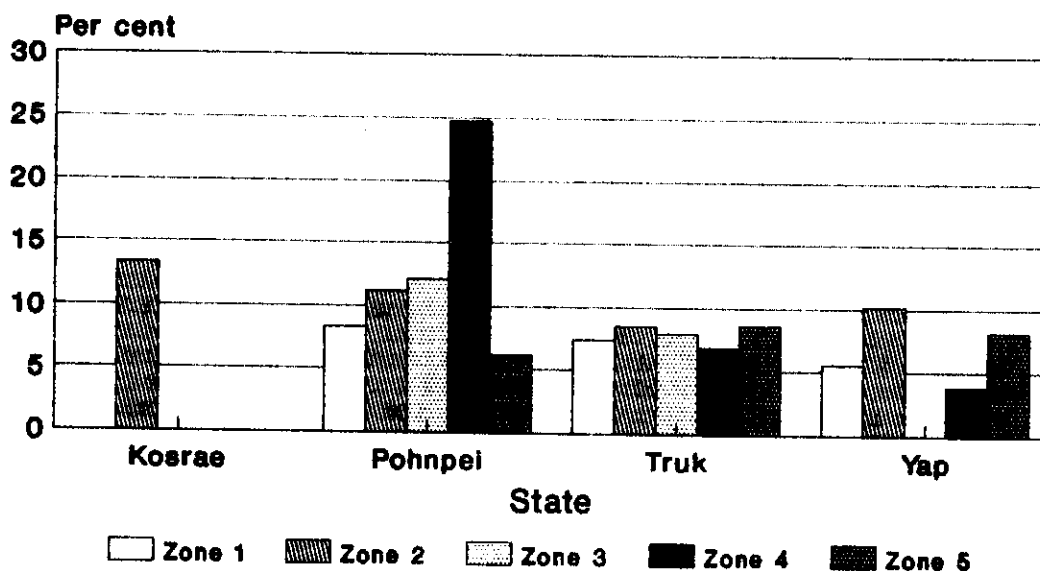
. There was slightly more high weight for age children in the urban area than all the rural and outer island areas.

. The highest rates of low weight for height occurred in the main island inland areas, urban areas and outer island poor resources areas.

**PREVALENCE OF MALNUTRITION • IN CHILDREN
0-4 YRS, FOR WEIGHT FOR AGE BY STATE AND ZONE
FSM NATIONAL NUTRITION SURVEY, 1987-88**



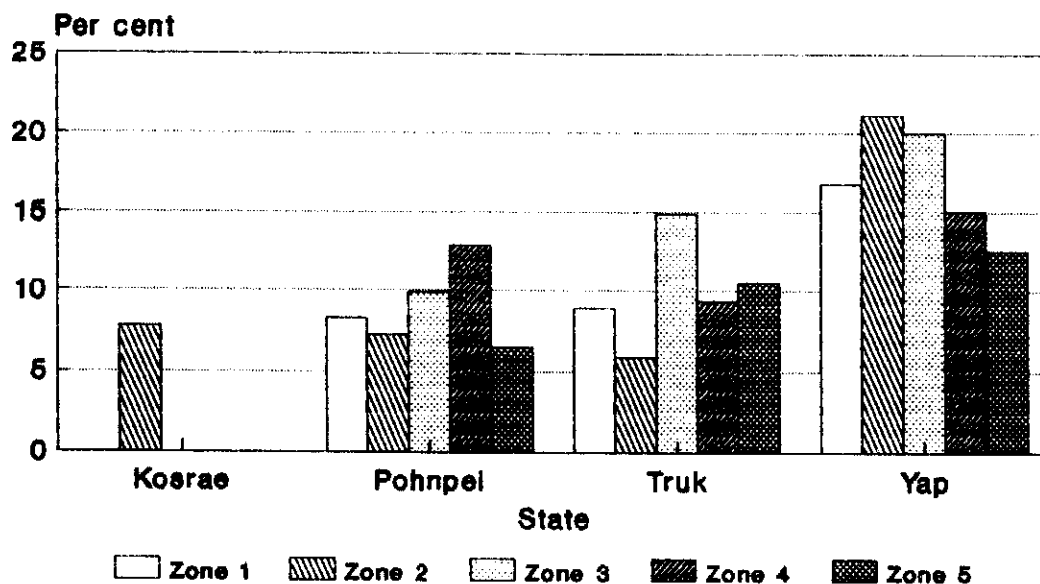
**PREVALENCE OF MALNUTRITION • IN CHILDREN
0-4 YRS, FOR HEIGHT FOR AGE BY STATE AND ZONE
FSM NATIONAL NUTRITION SURVEY, 1987-88**



Zone 1: Main island urban
 Zone 2: Main isl. rural coastal
 Zone 3: Main isl. rural inland

Zone 4: Outer isl. good resources
 Zone 5: Outer isl. poor resources

**PREVALENCE OF MALNUTRITION * IN CHILDREN
0-4 YRS, FOR WEIGHT FOR HEIGHT BY STATE AND ZONE
FSM NATIONAL NUTRITION SURVEY 1987-88**



Zone 1: Main island urban
Zone 2: Main isl. rural coastal
Zone 3: Main isl. rural inland

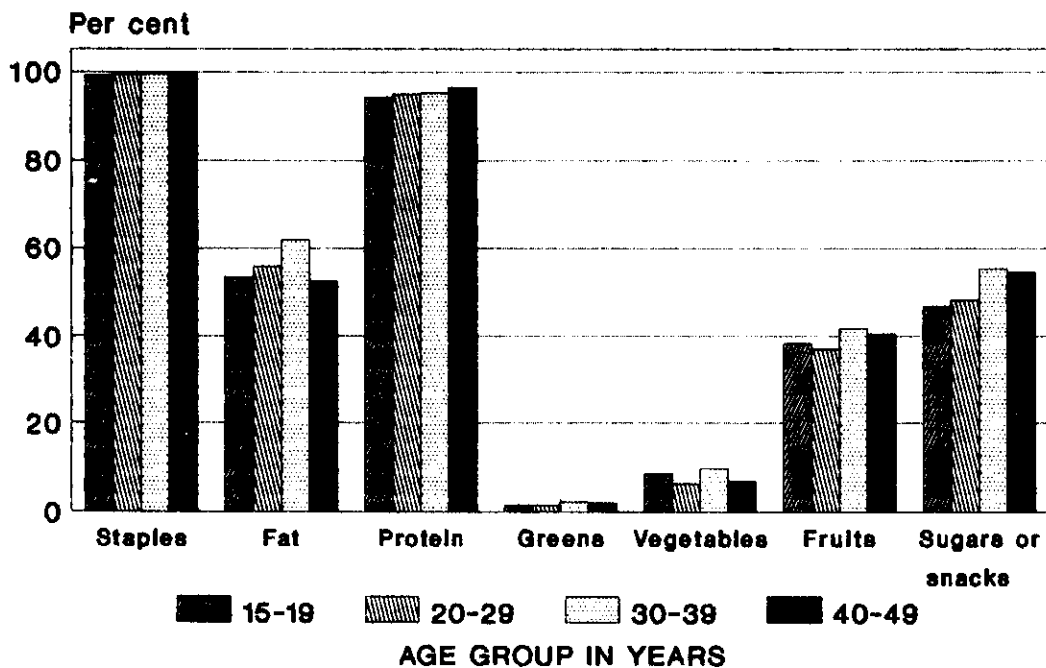
• See Annex 1 for definitions

- . There was considerable variation in the incidence of underweight and high weight for age and zone for each state.
- . In Yap, most of the underweight was occurring in main island areas.
- . In Truk and Pohnpei the rural inland and the outer island zones had more underweight than the main island areas.
- . Kosrae only comprised one zone and so all underweight occurred in this zone (main island rural coastal).
- . There was no consistent pattern for high weight for age by state and zone although the prevalence was particularly high in Pohnpei outer island poor resource areas.
- . The high rate of stunting in the outer island good resource zone occurred mostly in Pohnpei state and was not evident in this zone in Yap and Truk states.
- . Patterns of malnutrition as defined by weight for height were similar to the patterns for weight for age.

WOMEN AND CHILDREN'S DIETARY PATTERNS

a) General overview

PERCENTAGE OF WOMEN 15-49 YRS OLD WHO ATE VARIOUS FOOD TYPES BY AGE GROUP FSM NATIONAL NUTRITION SURVEY, 1987-88



. Most women ate some kind of staple (FSM or imported) at least 2 or 3 times a day and there were no significant differences between age groups states and zones.

. Women in Kosrae ate some kind of fat more often than women in other states. Fat consumption was slightly lower in outer island poor food resource areas than all other zones.

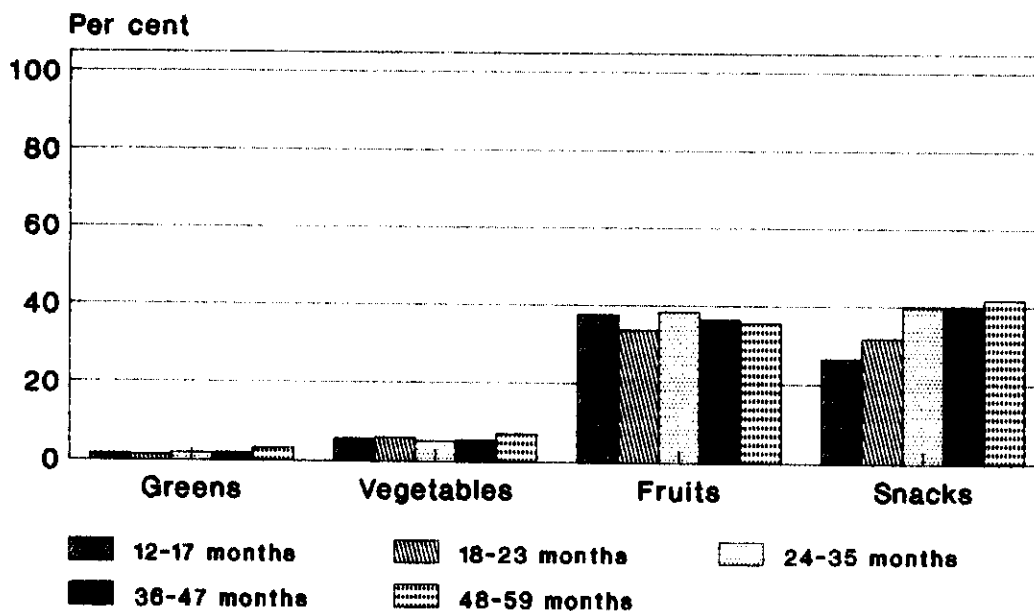
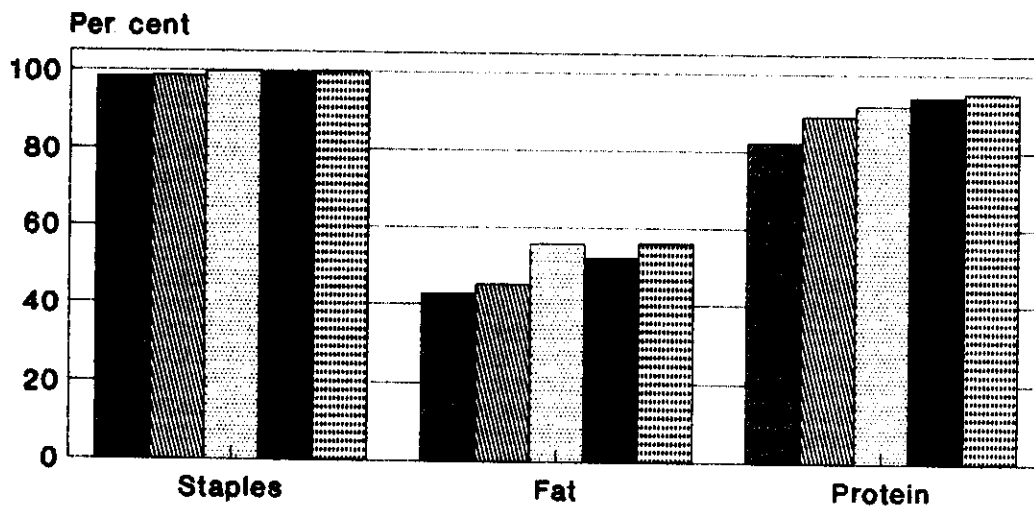
. Protein consumption was moderate in all age groups states and zones with no significant differences between each variable. Most women ate protein foods at least once a day and commonly ate them two or more times a day.

. The number of women who consumed greens and all vegetables - both imported and local was extremely low. These foods were almost non-existent in the diet. The number of women consuming fruit and fruit juice was also very low at every meal. Most fruit consumed was local fruit and most of the imported fruits that were eaten, were consumed by women on the main islands. Women in Yap ate slightly more fruit than other states and women in Pohnpei ate fruit the least often.

. The consumption of sugar was moderate. There were no significant age differences. More women in Kosrae ate sugar than in other states, at every meal period. Sugar consumption was much higher in the urban and main island coastal areas than the main island inland and outer island zones especially in the mornings. The number of women consuming other snacks was very low in all groups, states and zones and at all meal periods.

. The number of women consuming alcohol was also low and in Kosrae alcohol was not consumed by women at all. Only women in Pohnpei drank sakau (kava) and only in the evenings.

**PERCENTAGE OF CHILDREN 12-59 MONTHS OLD*
WHO ATE VARIOUS FOOD TYPES BY AGE GROUP
FSM NATIONAL NUTRITION SURVEY, 1987-88**



* Children on solids only

. Most children ate some kind of staple (FSM or imported) three or more times a day in all age groups and zones but fewer children ate staples 3 times a day in Yap than in the other states.

. Fat consumption was moderate in all age groups although it increased slightly with age. Fat consumption was much higher in Kosrae and Pohnpei than Truk and Yap. Children in the outer island poor food resources zone ate the least fat and the outer island good resources zone ate the most fat of any food supply zone.

. Protein consumption increased with age. Protein consumption was fairly consistent between states although more children in Yap and Truk respectively ate no protein in a day compared to Kosrae and Pohnpei. Protein consumption was slightly lower in main island inland and both outer island zones than in main island urban and coastal areas.

. The consumption of greens and vegetables was very low in all age groups, zones and states. Fruit consumption was also low in all age groups. Fruit consumption was much higher in Yap and to some extent Kosrae compared to Pohnpei and Truk. Children in all main island zones ate less fruit than children on the outer islands.

. Sugar and snack consumption increased steadily with age. Sugar and snack consumption was especially high in Kosrae and Pohnpei. Main island urban and rural coastal children ate more sugar and snacks than other zones.

. Consumption levels of store baby food were very low in all age groups states and zones. No store baby food was eaten on the outer islands.

b) Imported and local food consumption

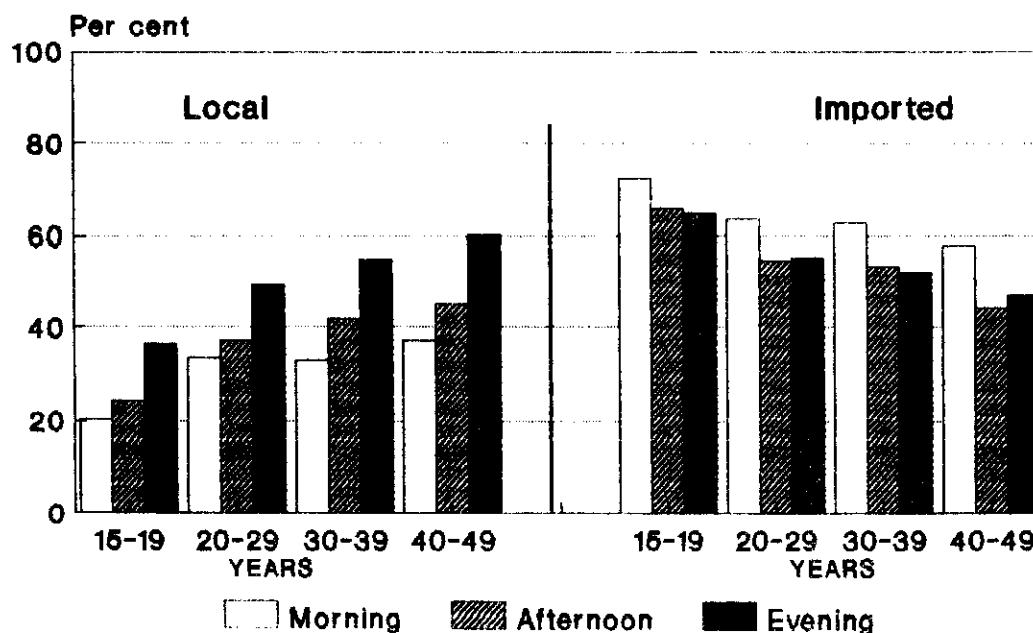
. Most women ate some food through the day with no differences between state and food supply zones.

. Imported staples were more commonly eaten in the morning than in the afternoon or evening. The level of imported staple consumption decreased with age for each meal. The consumption of imported staples for each meal was highest in Kosrae and Pohnpei. This compared with Truk and an even lower level of consumption in Yap. Outer island zones had a lower level of consumption of imported staples than all main island zones for each meal. For all age groups, states and zones the consumption of local staples was much lower than imported staples especially in the mornings. Local staple consumption was higher in the evening for all age groups, states and zones. However, younger age groups ate less local staple than older age groups at every meal. The consumption level of local staple was lower in the urban area than in all other zones for each meal.

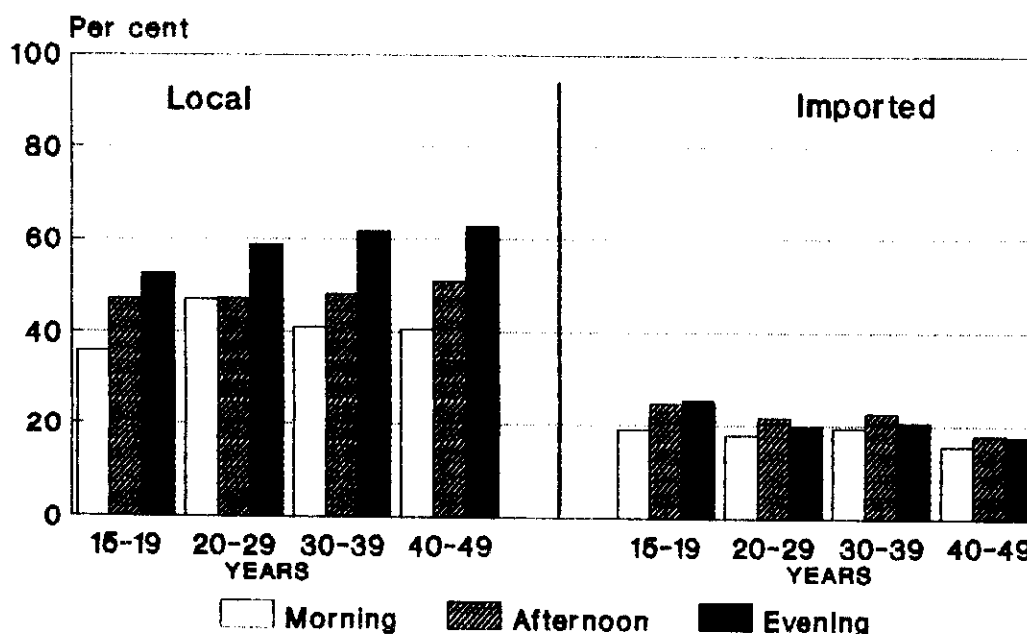
. Consumption levels of imported and local fats were very moderate throughout the day. Younger age groups tended to eat more imported fat than older age groups and older age groups ate more local fats. This pattern was consistent for every meal, but overall, more local fat was consumed in the evenings. More imported fat was consumed in Kosrae particularly in the afternoons and evenings. In Truk, women ate much more local fat than imported fat at every meal and imported fat consumption was very low. On the other hand, women in Yap ate more imported fats than local fats, but intakes were moderate at all meals. By zones, the main island urban and coastal areas tend to use much more imported fat than local fat compared to the main island inland and the two outer island zones. Consumption of imported fat was very low in the outer island areas, particularly those with poor resources. These trends were consistent for every meal.

. Intakes of protein were moderately good at every meal, with more protein being consumed in the evenings. Most of the protein eaten came from local sources at each meal. There were few age differences, although younger people ate slightly more imported protein and less local protein than older age groups especially in the evening. Consumption patterns for protein in all states were similar to national trends at all meals. The two outer island zones ate more local protein foods than all main island zones at every meal. The main island zones tended to rely more on imported protein sources than the outer islands. The main island inland area ate less local protein than main island urban and rural coastal areas.

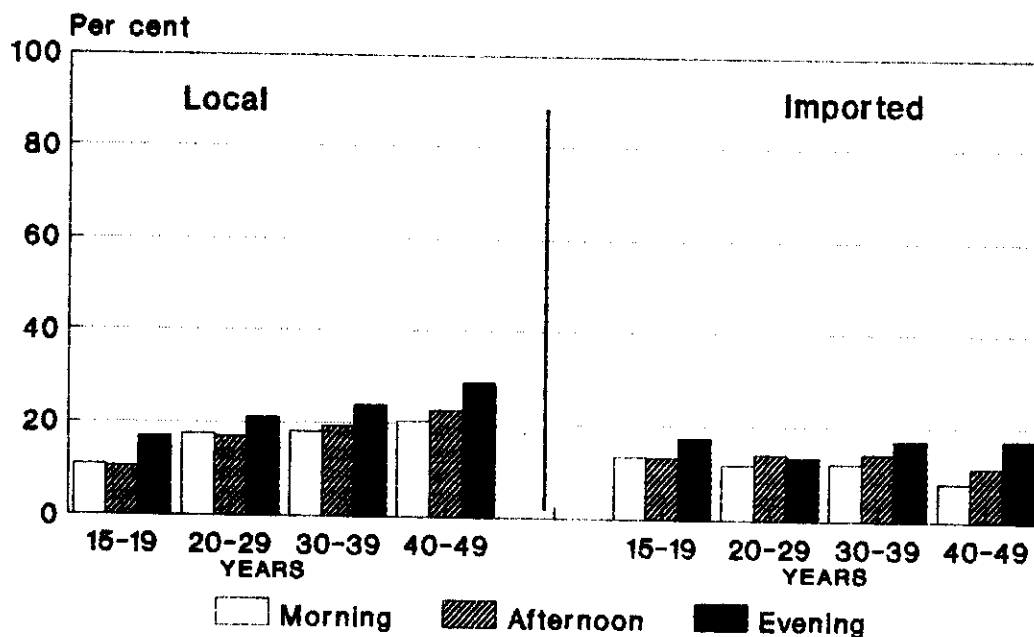
**PERCENTAGE OF ADULT FEMALES 15-49 YRS
WHO ATE STAPLES, BY AGE GROUP
FSM NATIONAL NUTRITION SURVEY 1987-88**



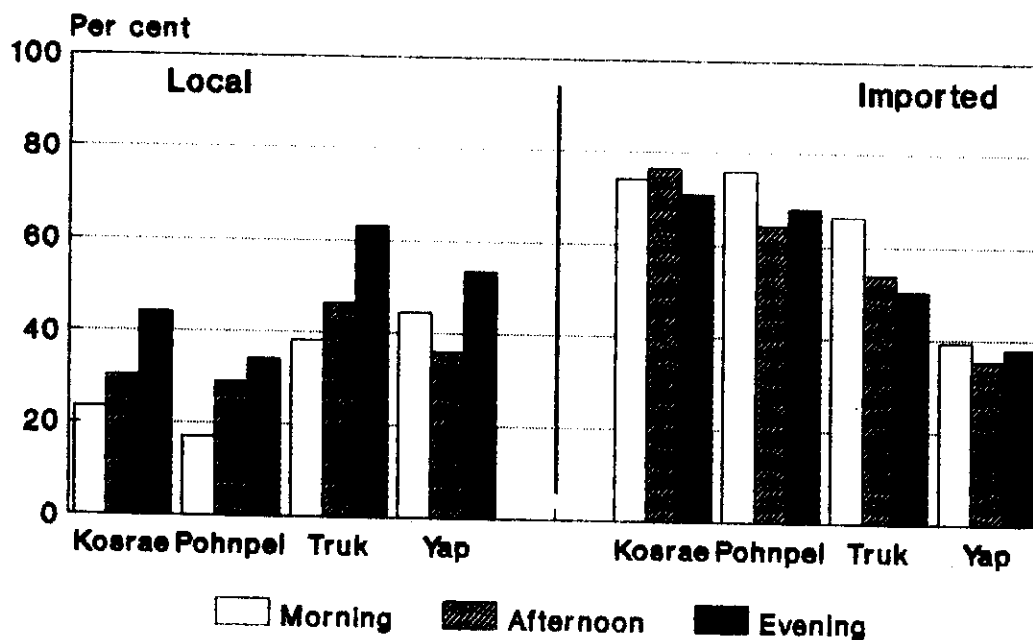
**PERCENTAGE OF ADULT FEMALES 15-49 YRS
WHO ATE PROTEINS, BY AGE GROUP
FSM NATIONAL NUTRITION SURVEY 1987-88**



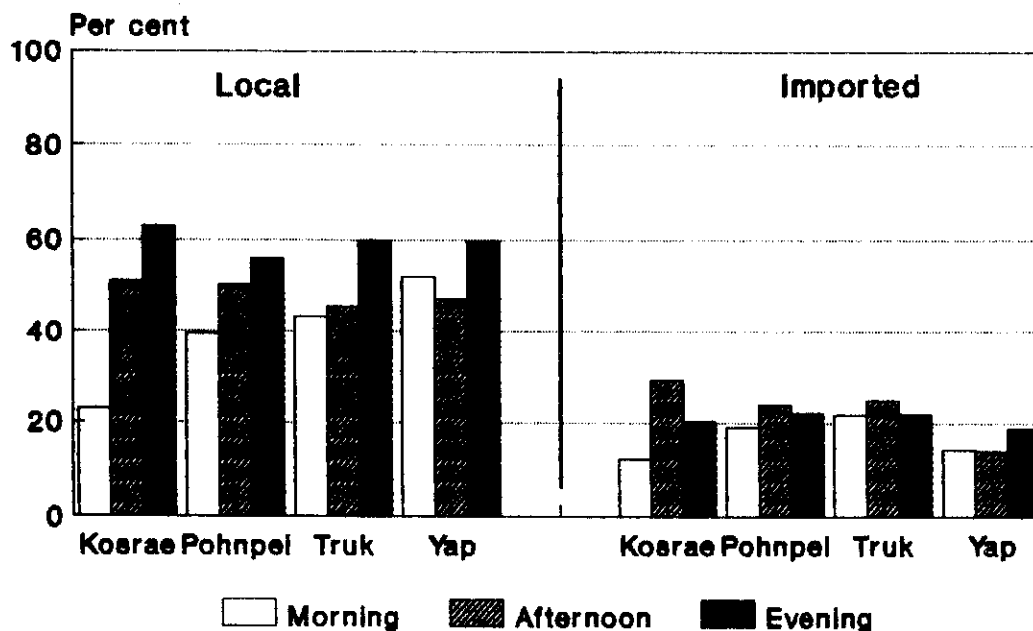
**PERCENTAGE OF ADULT FEMALES 15-49 YRS
WHO ATE FAT, BY AGE GROUP
FSM NATIONAL NUTRITION SURVEY 1987-88**



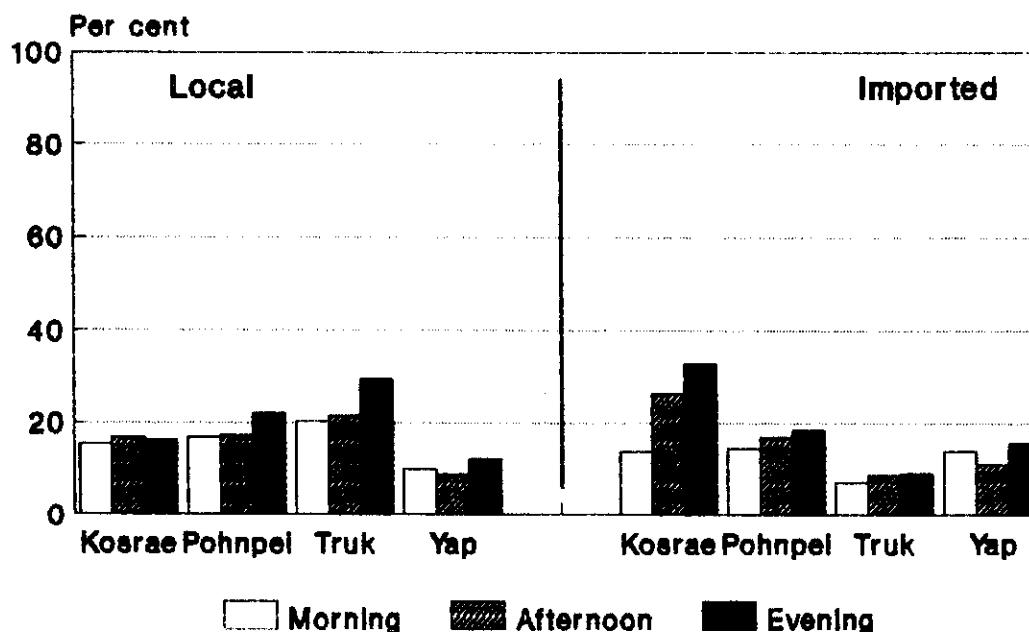
**PERCENTAGE OF ADULT FEMALES 15-49 YRS
WHO ATE STAPLES, BY STATE
FSM NATIONAL NUTRITION SURVEY 1987-88**



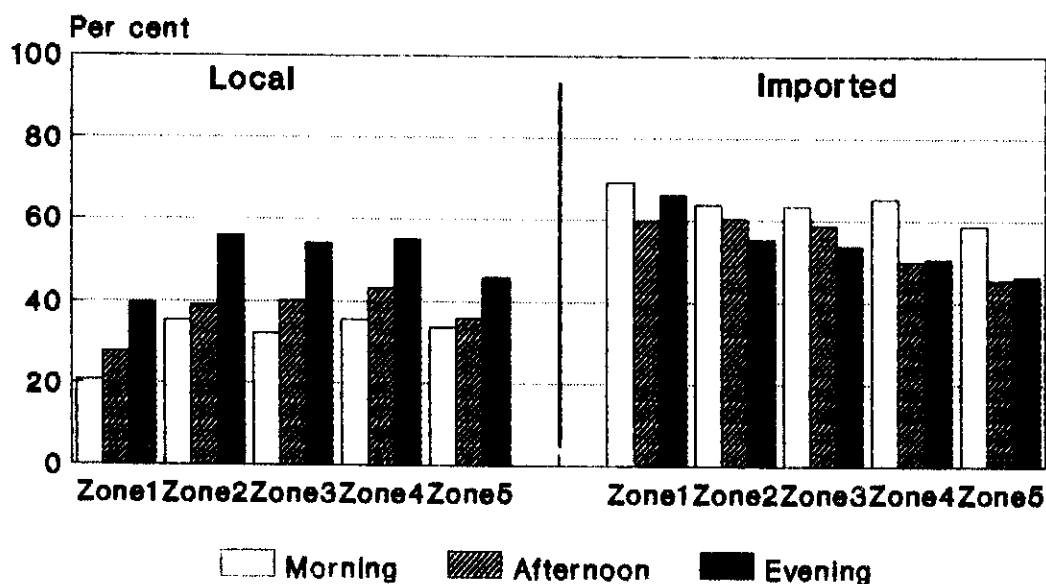
**PERCENTAGE OF ADULT FEMALES 15-49 YRS
WHO ATE PROTEINS, BY STATE
FSM NATIONAL NUTRITION SURVEY 1987-88**



**PERCENTAGE OF ADULT FEMALES 15-49 YRS
WHO ATE FAT, BY STATE
FSM NATIONAL NUTRITION SURVEY 1987-88**



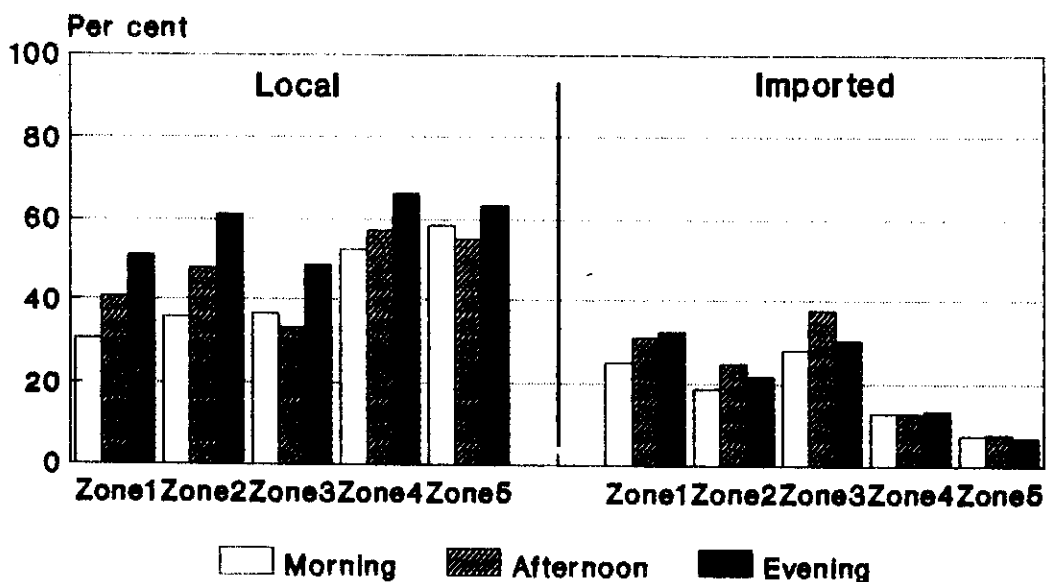
**PERCENTAGE OF ADULT FEMALES 15-49 YRS
WHO ATE STAPLES, BY ZONE
FSM NATIONAL NUTRITION SURVEY 1987-88**



Zone 1: Main island urban
Zone 2: Main island rural coastal
Zone 3: Main island rural inland

Zone 4: Outer island good resources
Zone 5: Outer island poor resources

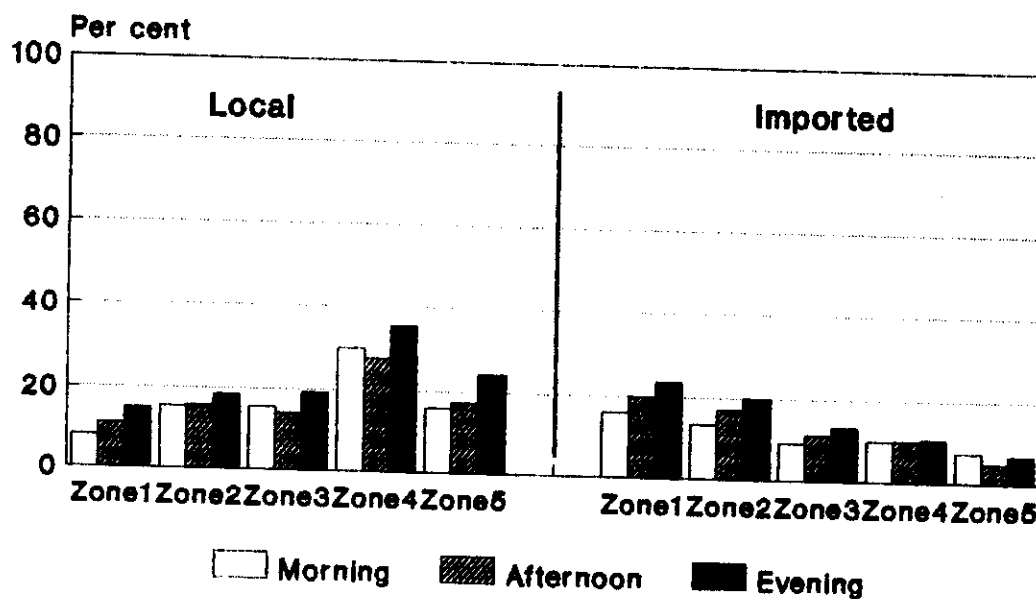
**PERCENTAGE OF ADULT FEMALES 15-49 YRS
WHO ATE PROTEINS, BY ZONE
FSM NATIONAL NUTRITION SURVEY 1987-88**



Zone 1: Main island urban
Zone 2: Main island rural coastal
Zone 3: Main island rural inland

Zone 4: Outer island good resources
Zone 5: Outer island poor resources

**PERCENTAGE OF ADULT FEMALES 15-49 YRS
WHO ATE FAT, BY ZONE
FSM NATIONAL NUTRITION SURVEY 1987-88**



Zone 1: Main island urban
 Zone 2: Main isl rural coastal
 Zone 3: Main isl rural inland

Zone 4: Outer isl good resources
 Zone 5: Outer isl poor resources

. Most children ate some food, some time in the morning, afternoons and evening.

. Food consumption patterns for children 12 - 59 months were similar for each of the three time periods in the day and were very similar to those adult women.

. Imported staples and local protein were the most common food items consumed in the morning. Imported protein was also commonly consumed at this time.

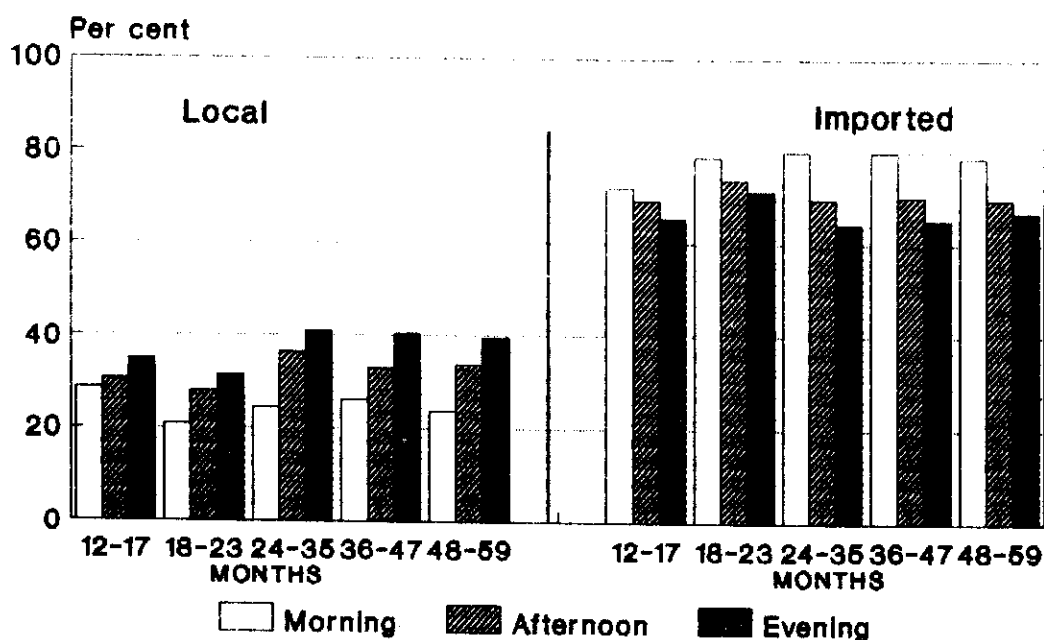
. Imported staples were also more commonly consumed than local staples in the afternoons and evenings for children of all age groups. Local protein and fat consumption (imported and local) was moderately low at all times.

. Yapese children ate considerably more local staple foods and less imported staples than children from states for each time period.

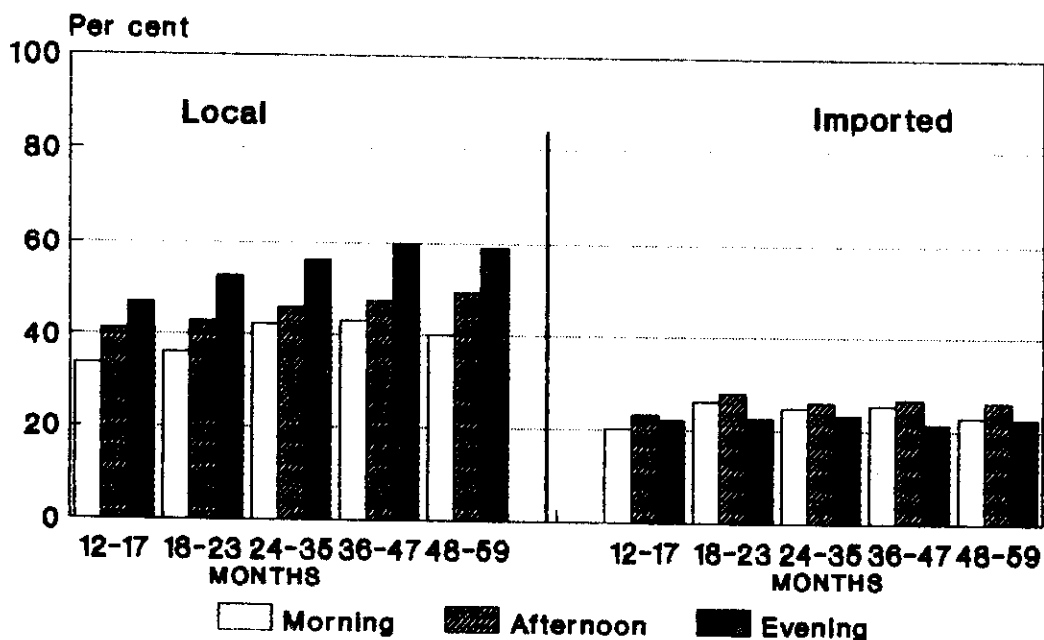
. Fat consumption, from local and imported sources, was higher in Kosrae than other states at all times but especially in the evenings.

. Between zones, consumption of local staples was much higher in the more remote areas i.e. outer islands and main island inland areas, compared to main island urban and coastal areas. However, the consumption of imported staples was high in all zones at all meal periods.

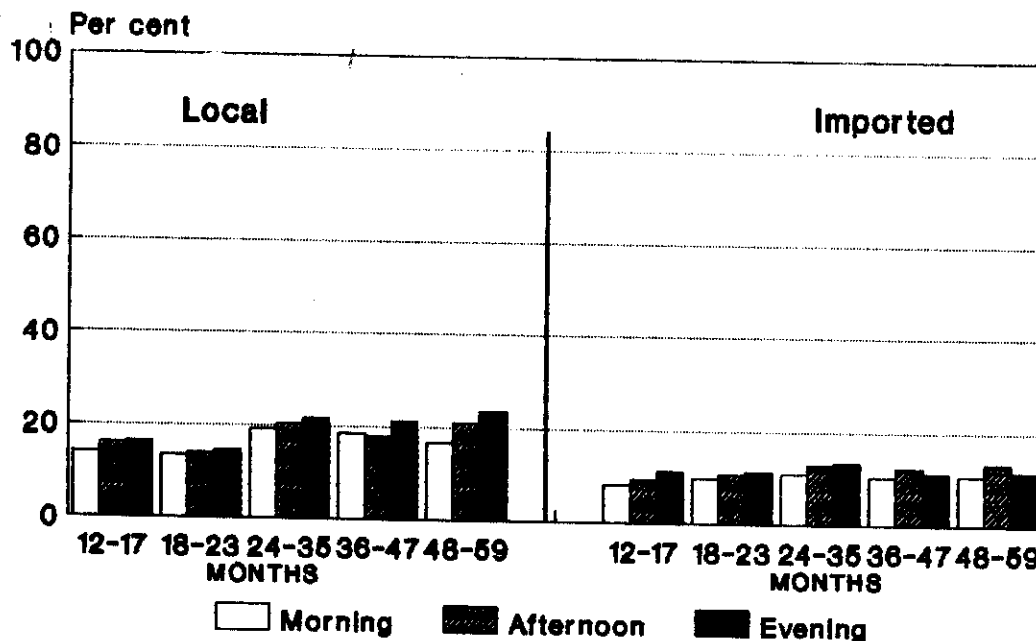
**PERCENTAGE OF CHILDREN 12-59 MONTHS OLD
WHO ATE STAPLES, BY AGE GROUP
FSM NATIONAL NUTRITION SURVEY 1987-88**



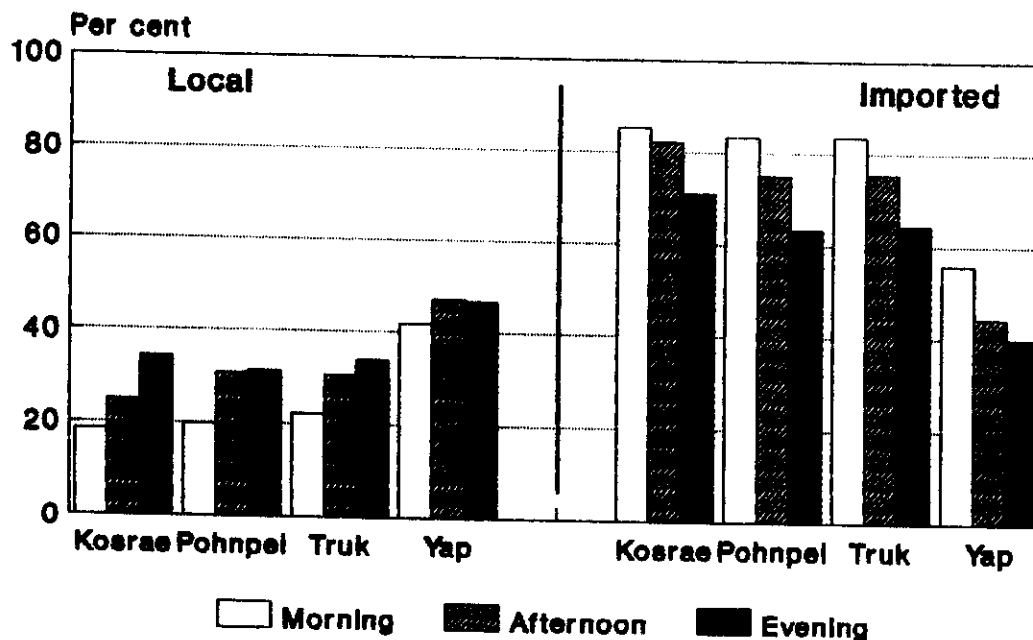
**PERCENTAGE OF CHILDREN 12-59 MONTHS OLD
WHO ATE PROTEINS, BY AGE GROUP
FSM NATIONAL NUTRITION SURVEY 1987-88**



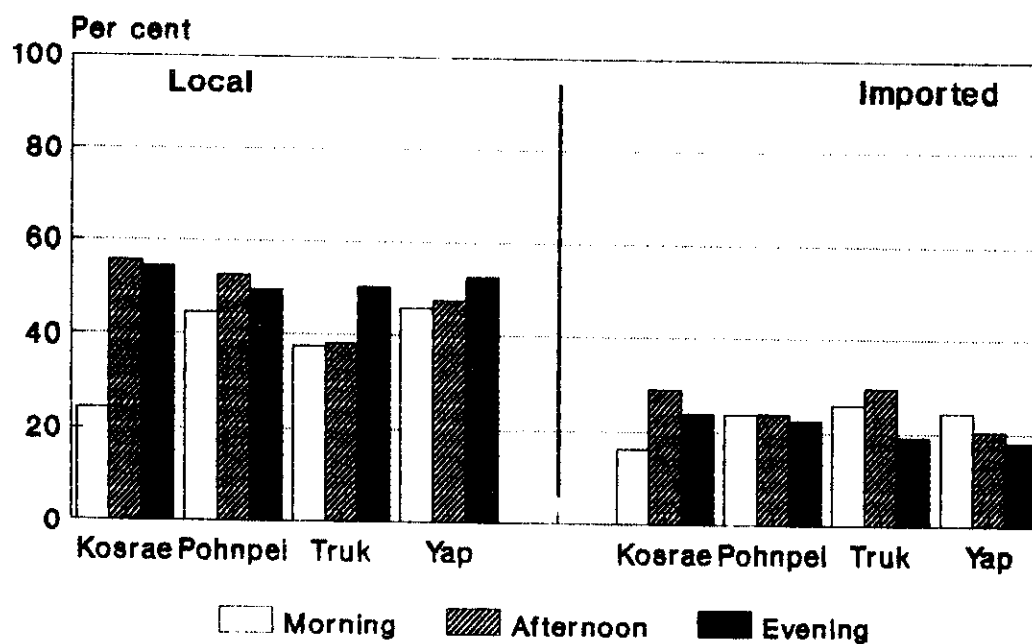
**PERCENTAGE OF CHILDREN 12-59 MONTHS OLD
WHO ATE FAT, BY AGE GROUP
FSM NATIONAL NUTRITION SURVEY 1987-88**



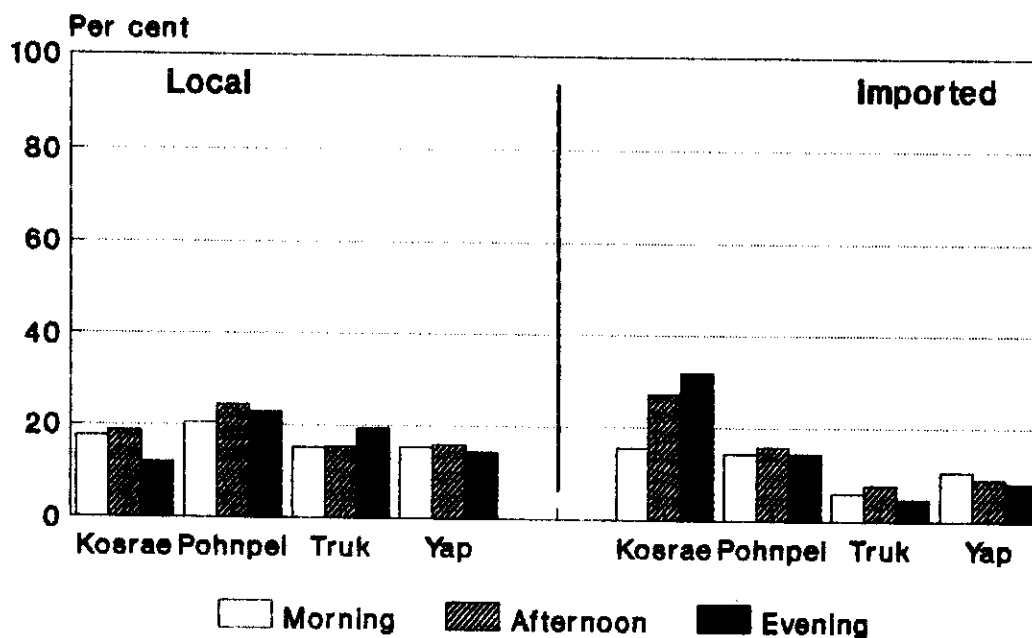
**PERCENTAGE OF CHILDREN 12-59 MONTHS OLD
WHO ATE STAPLES, BY STATE
FSM NATIONAL NUTRITION SURVEY 1987-88**



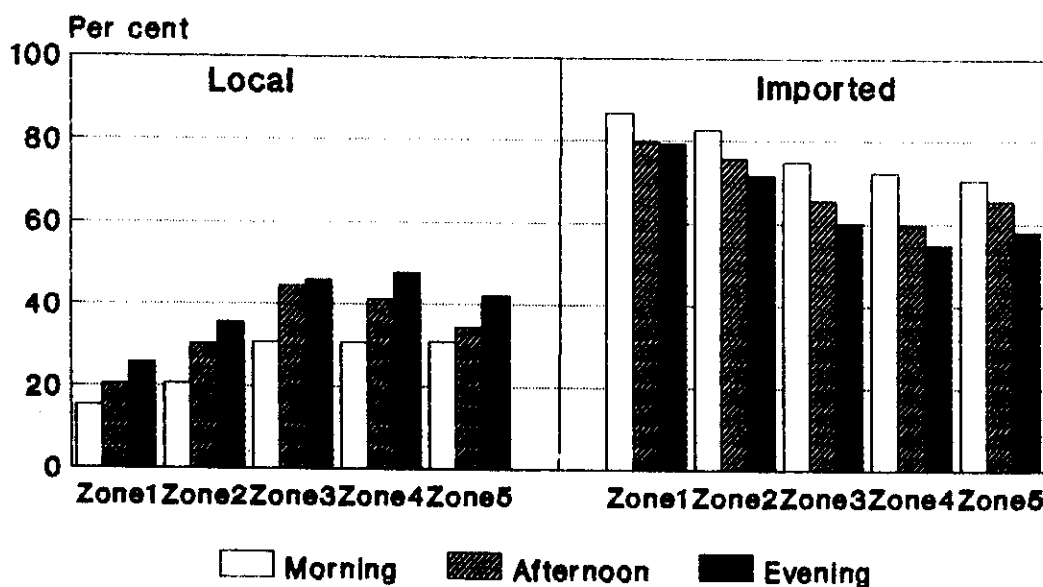
**PERCENTAGE OF CHILDREN 12-59 MONTHS OLD
WHO ATE PROTEINS, BY STATE
FSM NATIONAL NUTRITION SURVEY 1987-88**



**PERCENTAGE OF CHILDREN 12-59 MONTHS OLD
WHO ATE FAT, BY STATE
FSM NATIONAL NUTRITION SURVEY 1987-88**



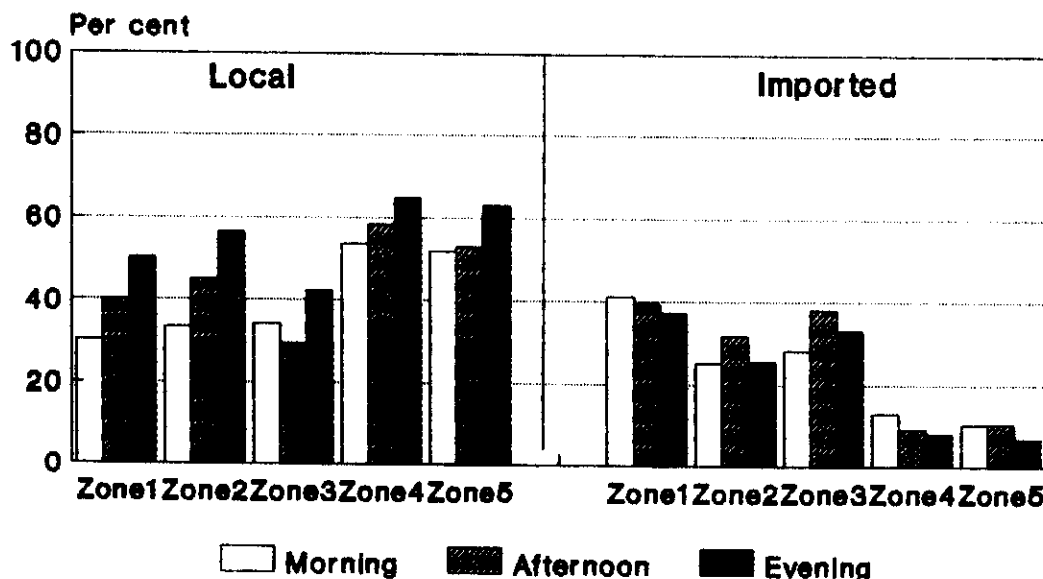
**PERCENTAGE OF CHILDREN 12-59 MONTHS OLD
WHO ATE STAPLES, BY ZONE
FSM NATIONAL NUTRITION SURVEY 1987-88**



Zone 1: Main island urban
Zone 2: Main island rural coastal
Zone 3: Main island rural inland

Zone 4: Outer island good resources
Zone 5: Outer island poor resources

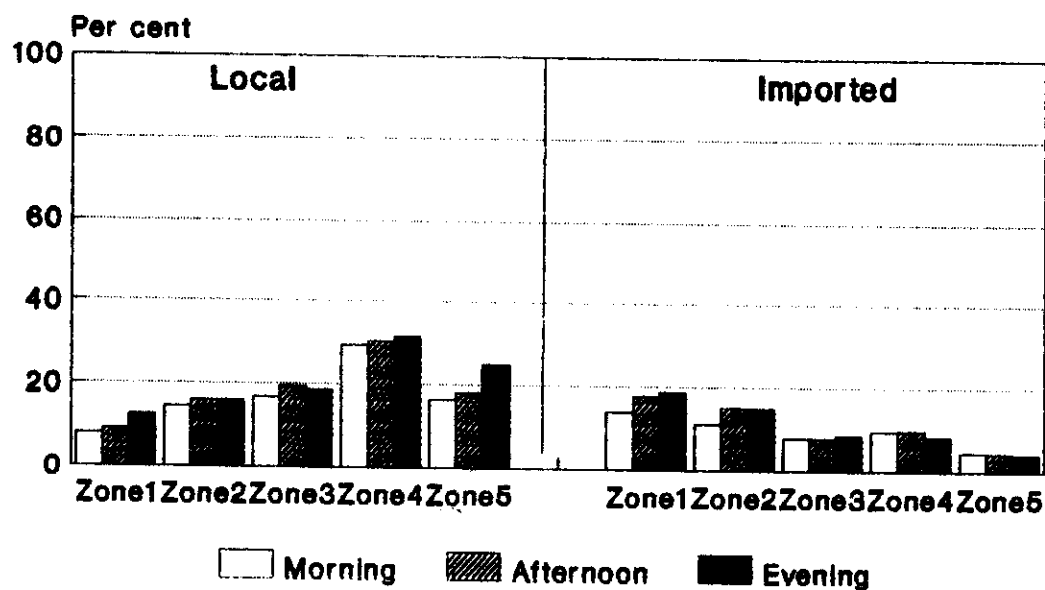
**PERCENTAGE OF CHILDREN 12-59 MONTHS OLD
WHO ATE PROTEINS, BY ZONE
FSM NATIONAL NUTRITION SURVEY 1987-88**



Zone 1: Main island urban
Zone 2: Main island rural coastal
Zone 3: Main island rural inland

Zone 4: Outer island good resources
Zone 5: Outer island poor resources

**PERCENTAGE OF CHILDREN 12-59 MONTHS OLD
WHO ATE FAT, BY ZONE
FSM NATIONAL NUTRITION SURVEY 1987-88**



Zone 1: Main island urban
 Zone 2: Main isl rural coastal
 Zone 3: Main isl rural inland

Zone 4: Outer isl good resources
 Zone 5: Outer isl poor resources

INFANT FEEDING PATTERNS

a) Overview of infant feeding patterns

. In the first 3 months of age 95.2% of infants were being breastfed. Of these, 14.6% were receiving bottle milk as well as breastmilk. The remaining 4.9% of infants were being fed with bottlemilk or bottlemilk plus solids. No children were on solids only, but 3.5% of children were receiving some solids with milk.

. By 3-5 months, there was still a high percentage of women breastfeeding (88.8%) but many children were receiving solids in addition to breastmilk. By this age, 38.5% of children were on solids with breast or bottle milk. No child was on solids alone.

. Bottlefeeding had increased by age 3-5 months to 18.4% of children, but this was generally in combination with breast milk and/or solids. Only 3.5% of 0-2 months children and 5.0% of 3-5 months old children were being totally bottlefed.

. By 6-8 months of age, 83.7% of children were receiving solids and 7.1% of these children were on solids only i.e. were receiving no milk from the breast or bottle. By now 24% of children were being given bottlemilk but 81.2% were still receiving some breast milk. There were 11.2% of children still being totally breastfed, 2.0% of children still being totally bottlefed and 3.1% being breast and bottlefed i.e. solids had not been introduced to 16.3% of children aged 6-11 months.

. By 9-11 months, 4.9% of children were still not receiving solids and 17.5% had been totally weaned from breast or bottle milk. Breastfeeding had declined to 68.0%.

. By 12-17 months, most children had been introduced to solid foods and breastfeeding had declined to 49.2%. Many children (43.5%) were now on solids only.

. Breastfeeding continued until 2-4 years of age for a few children, but most children had been weaned from the breast by 18-23 months. Many children were weaned as early as 6-12 months.

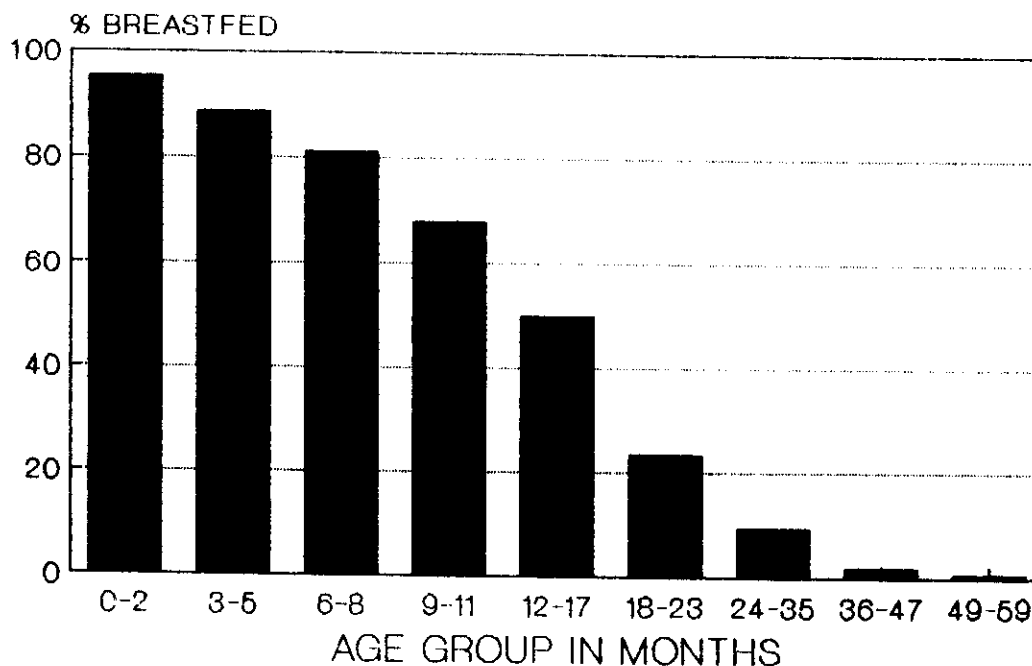
b) Time of giving breast

. Almost 49% of mothers were giving the breast immediately after birth, 34.6% were giving the breast sometime in the first day, 8.1% of infants were not receiving breastmilk until sometime in the second day, and 3.8% were not receiving breastmilk until after the second day.

. There were 63 children (1.8%) who were never breastfed.

. There were fewer women in Kosrae giving the breast immediately after birth than in other states so there were 22.9% of babies not receiving breastmilk until the second day or later.

**AGE OF STOPPING BREAST FEEDING(1) FOR
CHILDREN 0-59 MONTHS OF AGE.
FSM NATIONAL NUTRITION SURVEY, 1987-88**



(1) Children on breast only; breast & bottle; breast, bottle & solids; & breast & solids

c) Use of bottles for food and drink other than milk

. Overall approximately 50% of mothers were giving some kind of nourishment other than milk in a bottle.

. Using a bottle for other food and drink was particularly common in Pohnpei and Truk.

. Water, juice, tea and coconut water were commonly given in a bottle.

. Soft food was given in a bottle by some mothers.

d) Bottlefeeding with milk

. Most bottle-fed babies were from the main island - urban and rural coastal zones.

. The main reasons for bottlefeeding were "not enough breast milk" and "mother working".

. "Mother's choice" and "adopted babies" were other common reasons for bottlefeeding.

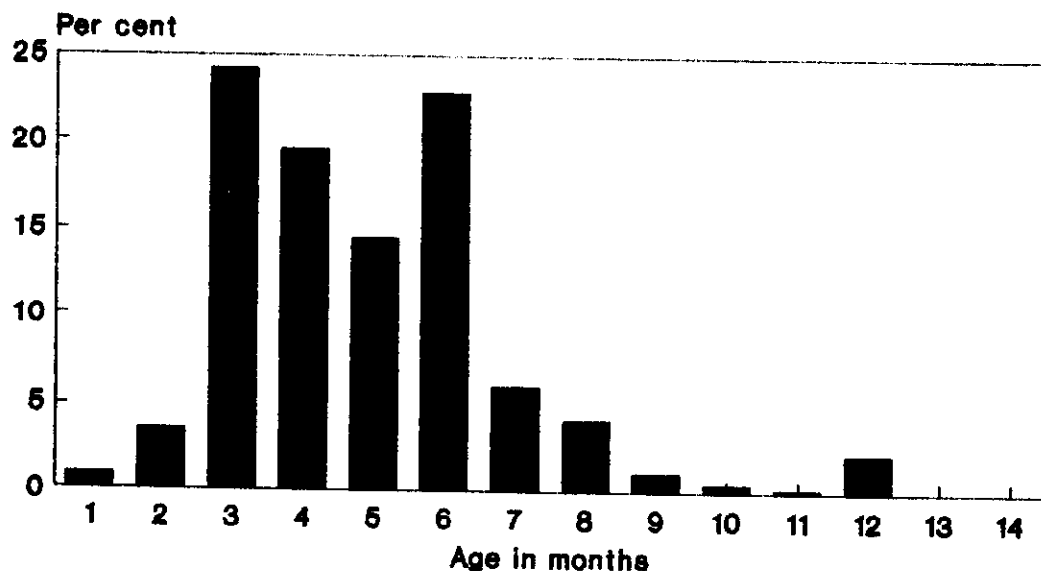
. There were no differences between states and zones for the reasons given for bottlefeeding.

. Most bottle-fed children were given infant formula milk with only 7 isolated cases in Kosrae and Pohnpei of using low fat milk powder or evaporated milk.

. Morinaga was the most commonly used infant formula, particularly in Kosrae and Yap.

. Enfamil was also used widely. Pohnpei had the greatest variety of formulas used which is probably a reflection of availability.

**AGE OF INTRODUCTION TO SOLID FOODS FOR
CHILDREN 0-59 MONTHS OLD (1)
FSM NATIONAL NUTRITION SURVEY 1987-88**



(1) Children on solids only

e) Introduction of solid food

. The introduction of solids was early for some children with 4.4% of children having been offered solids in the first two months, rising to 29.1% by the age of 3 months. By four months of age 48.4% of children had been introduced to solid foods.

. There were few differences between states and zones for age of introduction of solids, although introduction was slightly more delayed in outer island poor resource areas and main island rural inland areas.

. There was a total of 84.8% of children who had been given solids by the age of 6 months.

. Of the remaining 15.2% of children who had solids introduced late, some children did not receive them until 12 months of age.

. This was particularly common in Pohnpei and Truk.

. Local staples were the most commonly given first food with 66.0% of infants being offered them. This was particularly common in Pohnpei and Truk.

. Fruit and fruit juice was also a common first solid food, particularly in Kosrae and Yap.

. Some children were given imported staples and local protein foods (mainly rice and fresh fish).

. There were 14.2% of children who were given commercial baby food from the store as a first food, particularly in Kosrae and Pohnpei and in the urban rural main island zones.

. Fat was rarely offered as a first food, nor were greens or other vegetables, imported fruit, sugar and other snacks.

MATERNAL AND CHILD HEALTH CARE

. Attendance by pregnant women at prenatal clinic was good in all states with 80% of women attending clinic at least once. However many women did not attend clinic until the second (43.6%) or even the 3rd trimester (23.8%)

. Only 40% of women attending clinic were taking their vitamin and iron tablets regularly.

. Attendance of children at well baby clinic at least once was good in all states particularly in Yap (94.6%) and Kosrae (93.4%). Clinic attendance in Pohnpei and Truk was 82.0% and 77.2% respectively.

INTERRELATIONSHIPS BETWEEN OBESITY IN WOMEN AND DIETARY PATTERNS

. Overall for women 15-49 years old, there were no significant correlations between food consumption patterns and body mass index.

INTERRELATIONSHIPS BETWEEN INFANTS NUTRITIONAL STATUS, FEEDING AND DIETARY PATTERNS

. Overall for children 0-59 months nutritional status was not directly related to infant feeding pattern particularly at an early age.

. There was no significant correlation between age of introduction of solids and nutritional status.

. The nutritional status of bottle-fed children and breastfed children was the same.

. Malnutrition was not any higher in children who were given a bottle with food and drink other than milk, than those who were never given a bottle.

. Children who were weaned off breast and bottle milk early were more likely to have malnutrition (low weight for age) but there were no significant differences in the prevalence of malnutrition between those who were and were not weaned early.

. Prevalence of malnutrition was not affected by whether or not a mother stayed at home all day or went to work and left the child in the care of a relative or babysitter.

. Teenage mothers were no more likely to have malnourished than older women.

. The types of solid food eaten and the frequency of eating different types of food did not have a direct effect on malnutritional status with respect to growth. It is likely the quantity of food eaten is more important (not studied here).

. The combination of a high consumption of imported staples, low consumption of local staples, fat, greens and vegetables was most likely contributing to the high prevalence of Vitamin A currently reported in F.S.M.

D I S C U S S I O N

4. DISCUSSION

The FSM is heavily dependent on imported foods despite abundant fertile soils and a surplus of labour. It is well documented in the Pacific, (Coyne, Badcock and Taylor), that diets based on imported foods means an increased consumption of refined sugar, salt, animal fats, energy (calories) and decreased dietary fiber. Traditionally Pacific diets tended to be at best, only marginally adequate in protective foods (fruits and vegetables) and reliance on imported foods tends to exacerbate this leading to vitamin and mineral deficiency. The end result of these dietary changes for adults is obesity, hypertension, gout and renal disorders, cardiovascular diseases and general poor health. For children, the result can be protein - energy malnutrition and general increased illnesses associated with vitamin and mineral deficiencies. It is evident from this survey that many of these dietary problems are prevalent in the Federated States of Micronesia.

4.1 Women's Nutritional Status and Dietary Patterns

There was strong evidence from the body mass index data that overweight and obesity were major nutritional problems in the Federated States of Micronesia, among women of child bearing age (15- 49 years). The problems became more critical as the women became older, and by middle age the majority of women were overweight and obese. Patterns of obesity were different between states and food supply zones. Some of these patterns and differences were accountable by differences in food consumption patterns, energy expenditures and lifestyle factors.

Dietary pattern trends were as expected in that outer island women and to some extent main island rural women, tended to consume more local produce and the consumption of imported foods was highest among urban and coastal main island women who had easy access to shops and trade stores. None-the-less consumption of imported foods was quite significant in some of the less accessible areas (inland and outer island areas). A number of other Pacific studies have shown that people consuming more imported foods (which are often more energy dense than local fresh foods) and leading a sedentary lifestyle, tend to have more obesity than people consuming predominantly local produce and leading more active lifestyles (Coyne, Badcock, Taylor, 1984). It was interesting to note therefore, that in the Federated States of Micronesia, outer island women tended to be heavier and slightly more overweight and obese than main island women. The reasons for this probably vary from state to state and are discussed in relation to dietary patterns and other lifestyle factors applicable to each state and zone.

There was more obesity among women of child-bearing age in Kosrae than in any other state. Food patterns are slightly different in Kosrae compared with other states. More fried food is eaten e.g. pancakes and fried bananas for breakfast instead of plain (no butter) bread; there is more baking of cookies and cakes and sugar consumption was two to three times higher among women from Kosrae than other states. Women from Kosrae are not generally involved in much gardening activity. Most villages have easy access to the road and to public or private transport, and so people do not walk very much. Kosraen women are engaged in a lot of church and social gathering activities and in making handicrafts all of which are low energy level activities.

In Pohnpei the level of obesity was high in all areas but particularly high in the outer island poor resources zones and lower in the rural inland areas. The outer island poor resources, comprised the Polynesian island groups of Kapingamarangi and Nukuoro. Although this is not apparent from the method of data analysis used to provide the results, women in Kapingamarangi are visibly much larger than women in Nukuoro with respect to body build and weight. Polynesians are commonly reputed to be of larger build and frame than many other races including other Pacific Islanders from Micronesia and Melanesia (except Fiji) and discussion as to the validity of using Caucasian standards for overweight and obesity is common place. The report from the Nutrition Survey in the Kingdom of Tonga in 1986 (Maclean, Badcock and Bach, 1987) has suggested that Polynesians classed as moderately overweight by Caucasian standards may in fact be a normal or healthy weight for their body build. The large body build of the Kapingamarangi women may therefore account for the apparent high prevalence rate of overweight and obesity in this poor resource outer island zone of Pohnpei. Certainly with respect to diet, this group are consuming mainly local produce particularly fresh fish and taro and imported food supplies are limited and irregular because of infrequent shipping services. Consumption of fat particularly from coconut cream was moderate but higher than in main island areas. At the same time, women in both islands of this zones are fairly active. They are responsible for taro patches which are time consuming and hard work and they walk a lot. It is interesting to note at this point that Kapinga women living in Pohnrakiet on Pohnpei main island (urban zone) are also large and overweight. Whether they are more active than their outer island counterparts was not analysed as part of this report.

The reason why rural inland women in Pohnpei were less overweight may be due to activity levels since they have to do more walking up and down mountains to reach their villages from the road or their gardens. They ate more local staples than women in other main island zones but ate more canned meat and fish which contain a lot of fat, because of poor access to seafoods and fish.

It was of interest that there was no particularly high level of obesity in the urban area as might have been expected from the fact that more people are consuming imported food. However, there are more younger women, who were shown to have less obesity than older women, living in the urban area and this may be biasing the data slightly. Activity levels may also account for the lower than expected incidence of obesity in the urban area, where extra-curricular energy consuming activities such as jogging, walking and sports and associated training as well as disco dancing are increasingly common place. These activities may be helping to compensate for the changing, more energy dense diets. A greater awareness of the need for a healthier lifestyle, particularly among young people in the urban areas, may also be a factor.

In Truk, the patterns of obesity across the zones are very similar to those seen in Pohnpei. Again urban area obesity levels were high but not excessively higher than other zones as might have been expected and inland areas had lower prevalence rates of obesity and overweight. The outer island poor resource areas have the highest prevalence of obesity, but the reasons for this are less easily explained than for Pohnpei.

It is important to perhaps raise the question again at this point, as to whether obesity and overweight (as defined by excess body weight for height) carry the same health risks under different environmental and lifestyle situations. A similar question was raised in the National Nutrition Survey of the Kingdom of Tonga, where obesity was also shown to be prevalent in more remote rural areas and was often in excess of the obesity seen in urban areas. The hypothesis is that activity levels are also very important to general health status and that given a very active lifestyle, obesity or overweight may carry less of a health risk for developing diabetes, heart disease etc. than obesity or overweight associated with a sedentary or other health risk lifestyle such as for smokers and high alcohol consumers.

The occurrence of diseases such as diabetes, high blood pressure and heart disease is certainly much lower in the more remote areas of Federated States of Micronesia, particularly the outer islands as seen from hospital and other health statistics. This supports the hypothesis that overweight and obese outer islanders may be protected from getting diseases such as diabetes, by their high activity levels and possibly because of the kinds of foods they eat i.e., high fiber and low sugar and refined starches such as flour and rice. This compares with groups having a more sedentary lifestyle particularly in the main island urban areas where these non - communicable diseases like diabetes and heart disease are increasingly prevalent.

The prevalence of obesity in Yap was comparatively low in main island areas relative to the other states but was high in the outer islands especially in the good food supply areas. The main island Yapese women are visibly slimmer than outer island Yapese women and this is most probably related to activity levels as well as dietary patterns. Main island women are involved with taro patch production and other gardening activities whereas women on outer islands do less gardening. There is also a significant availability of USDA foods in the outer islands because of disaster relief programs. Food and cooking patterns are also different on the outer islands and the consumption of fat, particularly as coconut cream is much higher in outer islands than the main islands. It is harder to account for the difference in obesity and overweight prevalence between good and poor resource outer islands other than knowing that there is a lower level of food production in the poor resource areas and that less fat (a high energy food) is eaten in poor resource zones than in good resource zones.

One other factor for discussion with respect to Yap is the knowledge that people from the main islands chew more betel nut, than people from all the outer islands mostly because of availability. Some researchers have postulated that betel nut suppresses appetite although this has never been proven. It is thus possible that main island women in Yap consume less food in total than outer island women, which helps them maintain a lower body weight. Nicotine which is chewed in the form of tobacco with betel nut is also known to reduce appetite and there may also be some overall satisfaction to appetite by the continuous chewing of betel nut.

So far we have discussed patterns of obesity by state and zone. The fact there are major problems of overweight and obesity is further evident from the data presented by age group. It is of concern that adult women, even at a younger age tend to be somewhat overweight i.e., there is some moderate overweight even if there is not much obesity. The prevalence of obesity tends to increase with age worldwide and because many FSM women start adulthood with a high weight there is already an increased risk of them becoming obese overtime. Many younger people were eating more imported food than older people. We have already speculated that diet may not be the only major contributory factor in obesity, since in some instances outer island people consuming mostly FSM foods are more obese than urban people consuming imported foods. However, in light of evidence from other studies in the Pacific that an increase in imported food consumption often leads to an increase in obesity, if young people continue to consume more imported foods they may carry an increased risk of becoming obese as they grow older. Urban leanness may be being maintained by positive lifestyle factors as discussed previously, however, these need to be maintained. They also need to be extended to rural areas to prevent obesity.

There will be a danger of a further increase in obesity or a switch from "healthy" obesity to "unhealthy" obesity associated with high risk of non-communicable disease, in outer island communities if these positive lifestyle factors are not maintained and if the consumption of imported food increases.

It might be tempting to conclude from this study that provided high activity levels are maintained a switch from traditional diet to a more convenient diet based on imported foods, need not have an adverse effect on body weight. However, it should be stressed that there are other disadvantages associated with such a switch. A diet based on local foods tends to be more nutritious with respect to a higher fiber, vitamin, mineral content and should therefore be encouraged in preference to imported foods. This is particularly relevant with respect to traditional staple foods like taro and breadfruit, etc., compared with imported staples like rice and flour. On the one hand of course many people really like rice and flour and prefer to eat it. They are readily available and easily stored and require little preparation and cooking time. It is therefore not necessarily appropriate to stop people choosing to eat these foods. What is more appropriate and absolutely necessary however, is encouraging people to eat more vegetables and fruits to go with these imported staples. The reasons for this are, that local fresh staples contain vitamins and minerals - albeit at very low levels - but they can provide marginally adequate amounts even if people consume no fruit and vegetables because of the large quantity that would be eaten. Imported staples contain no vitamins and minerals unless specially enriched and this is not the case in FSM. So, unless dietary patterns are changed to accommodate this loss of source of vitamins and minerals by adding fruits and vegetables, serious mineral and vitamin deficiency problems can occur. These can result in anemia, skin problems and increased risk of other illnesses. Also, the traditional FSM dietary pattern of eating large quantities of local staples, although causing some obesity because of high energy intakes did help ensure enough vitamins and minerals were provided in the diet. This is not the case for imported staples which contain few vitamins and minerals plus they contain much more energy (calories) than local staples. There is therefore no justification for consuming large volumes of imported staple. Of course, this study only looked quantitatively not qualitatively at dietary patterns and so it is only possible to comment subjectively on the importance of the quantity of food eaten from a nutritional perspective.

While questions related to dietary recall asked only quantitative information, and no quantitative data was collected, results do indicate patterns evolving for particular foods in each time period throughout the day in each state and in each zone.

Staples either local or imported were commonly consumed in all areas because all islands would have access to bread - either purchased from the store or home - made. Outer island and rural areas also tended to eat left- over staples from the night before. In Yap, women have to leave the house early to get to their taro patches and so often prepare ramen for breakfast. Ramen was also a common breakfast food in other states and on the main islands. In Kosrae pancakes and fried bananas are common breakfast foods. If bread is eaten it is usually served alone with no butter or margarine and with coffee or tea containing milk or sugar. The frying of bananas and pancakes in Kosrae probably contributed to the high fat and sugar content of the diet. Kosraens also drink a lot of lime juice with added sugar (throughout the day as well as at breakfast). Tea and coffee also always have added sugar and usually milk powder.

Lunch would usually comprise rice or ramen with chicken or fish from local sources, or tinned meat or fish from stores. Turkey tails are also frequently included but these are classified in this study as imported fat, not protein because they are mostly fat. Town people especially workers eat "fast foods" or "take-aways" like hamburgers and fried chicken and fish for lunch and it is probably these foods plus the turkey tails that contribute to the higher imported fat consumption seen on the main islands in the afternoon and evening periods. Outer island diets for lunch and dinner would mainly consist of fish, and staple cooked in coconut cream (coconut cream was the main fat source for outer islanders). Some coconut cream was eaten on the main islands but it is not as readily available as on the outer islands. Similarly fresh fish and seafoods were much less available on the main islands so that more canned fish and meat were consumed. This was particularly true for the inland areas where there is very limited access to the sea.

Canned meat and fish are perfectly adequate substitutes for fresh fish and meat with respect to protein content but do contain a lot of fat and salt which makes them less nutritionally desirable. Turkey tails which are often eaten as a meat or fish substitute are little more than fat and skin.

Overall however, fat consumption seemed fairly low to moderate this was surprising considering fats contain a lot of energy and are normally a major contributing factor to obesity. However, fat consumption is probably much higher than is at first apparent particularly in main island areas because of the high canned meat and canned fish consumption which was not counted in the fat intake assessment of this study. Peanut butter, another high protein but also high fat content food is also often eaten on bread for breakfast on the main islands. In Kosrae it is common to add coconut cream to a soup to eat with the meal especially on Sundays which may again be a causal factor in high obesity levels in Kosrae.

Evening meal patterns are generally similar to lunch patterns although more local staples are eaten because there is more time to prepare and cook them. However, there is a general trend that rice and ramen would always be served as well, whether there was local staple or not. Many people were therefore consuming two or more kinds of staples in one meal which could be another contributing factor towards obesity.

Imported foods generally were more commonly consumed in main island areas where they had easy access to stores, than they were in rural area. However imported foods were also reasonably available on outer islands especially in poor resource areas because of the supply of USDA disaster relief foods. Consumption of sugar and sugar snack foods were moderately high, particularly in Kosrae and in the main island areas. A lot of this represented sugar in coffee and tea but also included sugar snack foods, such as soft drinks, ice cream and candies. In the light of high obesity prevalence and the known relationship with dental caries, education on the importance of reducing sugar intake is required.

Greens and vegetables were rarely consumed in any meal in any area despite a reasonable availability in some areas. Supplies on the whole though are generally poor, particularly in the town areas and on poor resource outer islands. As already discussed this low consumption may not have been significant in the past when local staples together with fruit supplied sufficient intakes of vitamins and fish and meat would have provided some iron (- although it is not known if this would have been adequate or not). Today, the low consumption of greens and vegetables is critical in the changing dietary pattern and needs to be increased dramatically.

Fruit consumption was also fairly low in this study and fruits were generally eaten as snacks and not included as part of meal. Education aimed at an increase in the consumption of fresh fruit and vegetables needs to be emphasised. This could be from a twofold aspect in that fruits and vegetables are low in energy value and are good for weight control and also that fruit and vegetables should comprise part of a normal healthy balanced diet in order to provide essential vitamins and minerals and prevent infections. More emphasis is required on the promotion of simple gardening to grow vegetables at home or in a market garden situation to supply town markets and on education on how to very simply include vegetables in the diet-particularly the "modern" rice and ramen and bread based diet.

Morning meals in every area and state tended to be the least balanced of all meals throughout the day. However, overall, meals were not well balanced and appropriate education is needed on the importance of eating a variety of foods throughout the day. This could be easily coupled with education on weight control.

Actual prevalence rates for obesity have not been previously reported for comparison with this survey. The problem is probably not a new one. However, it is likely that many more people are very obese and heavier than has previously been noted. That obesity has perhaps always existed can also be linked with the fact that this study shows a high incidence even in outer island areas where lifestyle and food consumption patterns are more "traditional". The study in 1948-50 in the whole of TTPI carried out by the Medical Statistics Division, reported an average weight for females ranging from 51-52 kilograms. Mean weights of women in 1987/88 in FSM are 67.9 kgs which represents a considerable increase. Average height has remained the same and so the net result has been an increase in BMI and overweight.

The increasing incidence of non-communicable diseases in FSM also suggests the problem of obesity is more serious and widespread from a health viewpoint than previously reported. Non-communicable diseases are closely linked with dietary changes such as increased sugar, salt and animal fat consumption and with lack of exercise as well as obesity itself. The current trends in dietary patterns among adult women in FSM, in particular in the main island areas and the outer island poor resource areas, towards a higher imported and animal fat, high sugar and salt and low fibre diet gives cause for concern. From observing health trends elsewhere in the Pacific, there are compelling health reasons for obese Micronesian women to reduce their weight.

This study did not include men in the survey sample for time and cost reasons but it is important to note here that subjective observation and hospital data on the prevalence of non-communicable diseases among men, does suggest that overweight and obesity is probably as serious a problem among Micronesian men as among women. Dietary patterns are probably similar to those of women although more alcohol and thus more energy would be consumed by men.

Maternal health and incidence of anemia

There are several types of the condition called anemia - or weak blood - but the most common type, and the one investigated here is anemia caused by iron deficiency. Iron is a mineral, found in many foods, which is needed to make a special substance in blood called hemoglobin. Hemoglobin is needed to carry oxygen around the body to keep it healthy. Without an adequate supply of hemoglobin a person can become weak, pale and get sick very easily. Iron deficiency anemia can be caused a) by not eating sufficient iron from food (or tablets given as supplements) b) blood loss from injury, child birth, menstruation and gut parasites like hookworm, c) a combination of a) and b). Women are especially 'at risk' of becoming anemic because of the blood loss associated with childbirth and menstruation and the need to make extra blood for a growing baby during pregnancy. An anemic woman who is pregnant is 'at risk' of giving birth to a low birth weight anemic baby. An anemic woman who is breastfeeding will not have enough iron and may be too weak to adequately feed her child. Anemia is a serious public health problem.

The results from the national nutrition survey indicated that anemia is a common problem in the Federated States of Micronesia. While there was little severe anemia, moderate and mild anemia were very common especially in Kosrae and especially among pregnant women in all states and zones. The field method to assess blood hemoglobin levels tends to err towards under-estimation of the problem (see Section 3.2.2 of the technical report) and so the problem may be even more serious than is reported here.

It was not possible to find any direct causal relationship between the prevalence of anemia and diet and other factors associated with maternal health such as parity, age and health clinic attendance. However, although sample numbers were low, it is quite likely that women with many children, especially those with more than 5 or 6 children, are at greater risk of becoming anemic.

Age of a woman at the time of the survey did not apparently affect their hemoglobin status. However, under normal circumstances, it could be expected that young women are less likely to be anemic because they have had fewer or no children, compared to older women, and young women would not have been menstruating for very long. However, in the Federated States of Micronesia, young women and teenagers have the same high prevalence of mild and moderate anemia as older women. This could be interpreted to indicate that the prevalence of anemia is on the increase and that today's young women are at very high risk of becoming severely anemic in the future especially when they start having children.

Iron in the diet is mainly found in protein foods especially dark red meat and fish and in foods like green leafy vegetables. Iron is most readily absorbed into the body if eaten with some

vitamin C containing foods like fresh fruits and vegetables. Protein intakes of women in the Federated States of Micronesia were moderately good and would mainly be fish, but intakes of greens were negligible. Fruit and other vegetable intakes were also low. It is very likely that poor diet is a major causative factor in the anemia seen in women in the Federated States of Micronesia. It is also very likely that the low intake of greens from an early age of infancy is also causing anemia in children (which would continue into adulthood) but this was not investigated.

There were not many women avoiding particular foods during pregnancy and lactation anywhere in the Federated States of Micronesia. Cultural reasons were generally given to explain why certain foods (fresh fish and other seafoods were most common) were avoided but these practices are clearly dying out. Since most women who did have food taboos were only avoiding one or two foods, it is unlikely that any health or dietary risk was being imposed and they were therefore not at any more risk of becoming anemic than women who had no food taboos.

Attendance at pre-natal clinic at least once during pregnancy was very good although there was a proportion of women who did not attend clinic until after the third month or sometimes even later. Iron and vitamin tablets are routinely given to women at pre-natal clinic to help prevent iron deficiency and other anemias. Less than half the women attending clinic said they were taking them, and of those who did take them there was not an apparent reduction of risk of becoming anemic. This may have been because they were not taking them regularly enough, or it is possible to speculate that the anemia problem among pregnant women may have been even more severe if some women were not taking these tablets. While more cost effective preventative measures such as encouraging a good diet high in iron is preferable to giving iron in tablet form, distribution should be continued until the hemoglobin status of women is improved. Every effort should be made to ensure women take these tablets regularly during pregnancy and lactation.

The greater prevalence of anemia in pregnant women is explained by the high prevalence of anemia even in non-pregnant women. It is likely many non-pregnant women had only marginally normal hemoglobin levels and low iron stores. Pregnancy imposes an extra stress on iron and blood stores and so a woman is more likely to become anemic. If she starts pregnancy with a low iron store then she will most certainly become anemic if her diet is low in iron.

While clearly a rigorous campaign to improve the diets of women so that they contain more iron and vitamin C rich foods such as meat, fish, eggs, greens and fruits would greatly improve their hemoglobin status, diet is not the only factor involved. Anecdotal information, hospital data and previous studies have suggested there is a high incidence of hookworm and other worms in

the Federated States of Micronesia. This is very likely a major cause of the anemia seen in women today. Young children are often infected with hookworm and the blood loss associated with the worm attaching itself to the stomach lining, combined with the food the worms themselves eat denying them to the infected person, can contribute to anemia. If young children slowly lose their iron stores they may enter adulthood mildly anemic. For women this means they start their child-bearing years with anemia already and this may partly account for the high prevalence in teenagers and young women.

Neither diet or hookworm infection apparently explain why there is more anemia in Kosrae than in other states. Hospital information does not indicate that hookworm infestation is any higher in Kosrae but this may need further investigation. Other factors such as parity and clinic attendance etc. did not explain this difference either. It is possible that soils and therefore fresh food, in Kosrae contain less iron than other states, but as fresh food consumption was low anyway, plus the renowned good vegetable growth seen in Kosrae indicative of good quality soil, this unlikely.

The problem of anemia needs further investigation and a routine monitoring program for anemia should be established especially in Kosrae.

Infant's nutritional status and dietary patterns

In order to interpret and discuss the results for nutritional status of children, it is first of all important to understand some of the anthropometric measurements and terms used. In nutritional status assessments, it is important to be able to distinguish between deficits in weight-for-height and in height for age. The term 'wasting' is commonly used to describe children with low weight-for-height and the term 'stunting' to describe a low height for age. 'Wasting' indicates a deficit in tissue and fat mass with the amount expected in a child of the same height or length, and may result either from failure to gain weight or from actual weight loss. 'Wasting' can be caused by many factors including a precipitation by an infection, limited family food supply or low food intake of children. One important feature of wasting is that it can develop very rapidly and under the right conditions can be corrected rapidly. 'Stunting' on the other hand, indicates a slowing in skeletal growth i.e. slowness in growing taller. Growth rate may be reduced from birth, and then if this continues, the effects of this retarded growth slowly accumulate. This means that stunting is a much longer term effect of malnutrition and the effects of the accumulated retarded growth may not be evident for several years. There are some notable differences between stunting and wasting. Firstly, one can fail to gain height, but one cannot lose it, whereas one can gain or lose weight fairly rapidly. Secondly, growth in height is a slower process than growth in body mass i.e. putting on weight. A child should treble its weight in the first year,

but only double its height; this means that any significant amount of stunting takes longer to be established. Thirdly, although catch-up in height can occur, it takes a long time compared to catch-up in weight. (WHO, 1987)

In a given population, wasting and stunting can be expected to show different patterns at different ages. The prevalence of wasting is commonly greatest between 12 and 24 months when dietary deficiencies are common and diarrhoeal diseases more frequent, and tends to decrease later on. By contrast, the prevalence of stunting increases over time up to the age of 24 or 36 months and then often shows a tendency to level off. It is also important to recognise that when the prevalence of stunting in a population of children is greater at 4 years than at 2 years, this is simply because the process of retardation has been going on for a longer time and does not mean that more 4 year-old children are malnourished. (WHO, 1986)

Children who are malnourished are at a greater risk of becoming sick and they will develop much more slowly. Mental as well as physical growth and development is affected by malnutrition. Children who are malnourished at an early age will not do so well at school and may never realize their fullest potential of achievement.

There was strong evidence from weight for age, height for age and weight for height data that there are nutritional problems existing among infants 0-59 months in FSM. Despite current hospital records and reports which showed that clinical malnutrition i.e. very serious malnutrition is being seen, the survey did not reveal any significant cases in the severe category. However, a high prevalence of moderate malnutrition was demonstrated in the survey which would preclude that episodes of severe malnutrition can be expected to occur periodically. What this means in real terms is that there is a high percentage of children in the community with border-line severe malnutrition. It is a well known fact that if children become sick, they do not eat well and they will tend to lose weight. If a child is of a healthy weight and well-nourished, then one short period of not eating really does not matter because they have enough body weight reserved to allow this weight loss. However if a child already has a marginal low weight, the moment he/she becomes ill and stops eating he/she will lose weight and cross the point of being classified as severely malnourished. It will then only take a few days for clinical signs of malnutrition to appear.

It is of particular concern that the malnutrition that exists in FSM appears to be of a long term or chronic type. This is evident from the fact that while many children are moderately underweight many of them are also short for their age i.e. are stunted. This degree of being short for age increases with age which is indicative of a long term or 'chronic' problem. Weight does steadily increase to keep up with some of the increasing length, but there is obviously a continuous imbalance or lack of

milk can easily be given with a cup and spoon which are much easier to keep clean.

The good growth of children up to the age of six months is probably due to the high rate of breastfeeding but the slowing of growth seen in both weight and height for age data at 6 months may be partly due to the high use of bottles for giving milk or other foods and drinks because a higher risk of getting an infection is introduced. The importance of infections in causing malnutrition will be discussed below.

The age of introduction of solids was on the whole good. Some mothers gave them too early and some too late (4-6 months is the recommended time for introduction of solids to babies) and continued education through public health clinics is needed to encourage 4-6 months as an ideal time. Early introduction is unnecessary as breastmilk is sufficient up to 6 months and solid food can be another potential source of infection if not kept very clean. Late introduction should be discouraged because breastmilk is no longer adequate after 6 months - a child then needs breast milk plus food.

The good early infant feeding patterns linked with the nutritional status pattern where growth falters at 6 months suggests the main nutritional problems lie in feeding patterns after 6 months ie. when a child is on solid food. Weaning from the breast or bottlemilk is very early. The majority of children are on solids alone with no milk supplement by 12 months and many are weaned even earlier - as early as 7-9 months. Milk is an essential protein and energy supplement to solid food. Plenty of protein and energy is required by very young children because they grow so fast. If insufficient solid food is given so that the contribution of milk is not replaced, children's growth may slow. Similarly, even if a child is on milk as well as solids, if not enough or the wrong kinds of foods are given growth will slow. Most children were eating some protein food in the day and some energy food so it is surprising that growth falters, particularly as there was no apparent relationship between nutritional status and whether a child was eating food from local or imported sources. It is likely therefore that the amount of food from whichever source is an important factor rather than the type of food and this needs further clarification. It is possible too that the low to moderate intake of fat by children means their energy intake is low. Children who are growing need to eat a lot of energy food such as staples and fats. Children's stomachs are only small and they need to eat both fat and staples to get enough energy for their growth needs. Fat has twice as much energy as staple foods and children can eat more energy with less feeling of being full-up when they eat same fat.

This study did not investigate how much food a child eats. This is difficult to do, but quantitative food intake may require extra investigation and discussion to help determine its effect on nutritional status.

As well as dietary and feeding patterns, another important influence on malnutrition is the rate of infection and infestation with worms. Recent morbidity data from hospital in-patient and out-patient records indicate that diarrhoea, acute respiratory infections and parasites are common among young children. When children are sick they lose their appetites and stop eating and if they have diarrhoea they are losing important fluids and food from their bodies. If a child is well-nourished and he only gets sick very occasionally, nutritional status and growth pattern are not likely to be affected. However, if a child gets repeated infections and especially with diarrhoea and worms, he/she may not be eating enough food and growth will falter. This starts a vicious cycle. A child who is not growing well is more likely to get another infection and a child who is not eating well and who then gets sick is in danger of becoming malnourished.

Infections in children are common at 6 months when solids are introduced if the food and food utensils are not clean, and are also common in bottle-fed children. Growth in children in FSM does falter at 6 months, and repeated infections coupled with a poor diet would explain the low weight for height or acute malnutrition which develops with increasing age and peaks at 18-23 months. Repeated infections would also explain the stunting found in young children after 6 months of age and which continues because of a constantly marginal intake of food which does not allow 'catch up growth in length and in fact exacerbates the problem. With a slowing of growth in height, body weight does have a chance to catch up relative to height and so weights for height do appear to improve with age of the child. Growth in height and weight then continues at a reasonable rate but the maximum height potential of the child is never attained.

This study did not investigate the effects of infections on malnutrition but it is likely that poor sanitation and hygiene practices leading to infections which are reported in many areas of FSM (and observed by the survey teams) are a major causative factor in malnutrition.

It is interesting to note that the average height of adults in FSM is less than the average height found in other Pacific Island populations and in Caucasians (mean weights of adult women in FSM in 1987/88 were 154.6 - 155.6 cm and in Tonga in 1986 were 164.2 - 165.0 cm). It is possible to argue that this is genetic but it is also likely it is a reflection of a long-term malnutrition problem in FSM such that today's adults were only marginally nourished as children and they too never attained their maximum growth potential. Previous studies as far back as the early fifties have certainly indicated that malnutrition has always existed. It is important to note however, that the severity of the problem has undoubtedly increased, prevalence rates are higher and clinical malnutrition is much more commonly seen today than it was in previous studies. The pattern of malnutrition has changed but so too have infant feeding patterns with an improvement in breastfeeding pattern such that it is now the poor

dietary pattern of children 6 months and over and early weaning off the breast that is contributing to the malnutrition problem. The high rates of undernutrition noted in the 1985 school survey further indicate that malnutrition has been an ongoing problem for some while. Today's malnourished infants could become tomorrow's malnourished school children if an effort to break the trend is not made.

Immunisation levels tend to be low in the least accessible areas particularly in the outer islands and inland villages. Immunisation rates are also low in Truk state. With the exception of Yap, these low rates of immunisation which help protect against infection, co-occur with areas where malnutrition was most common and this may be an important causal factor. Sanitation and water supply is also generally poorer in these areas. Food patterns of children were not apparently greatly affected by food supply and availability factors but children on outer islands were consuming more local foods. It is likely therefore that children on outer islands become malnourished because of infection first and possibly because of low quantitative food intakes and that children in urban and main island areas were becoming malnourished because of the switch to less nutritious imported foodstuffs coupled with low quantitative intakes and some infections. Children in urban and main island coastal areas would have better access to health care, water supply and sanitation so that while infections remain a problem, they contributed less to the malnutrition problem than in the outer islands.

The reason for high prevalence of malnutrition in the inland areas of Pohnpei and Truk may be due to poor accessibility to health care and also to regular protein (ie. fish and seafoods) and local fats (ie. coconut cream) than other zones. The high prevalence of malnutrition in the outer island good resource area of Pohnpei co-occurs with the findings by Hargreaves (1984) that children's diets were nutritionally inadequate and undernutrition was common on the island of Pingelap. Outer island good resources zone corresponded to island with regular boat or air access from the main islands and/or good soil and therefore agricultural potential. Many of the outer islands of Pohnpei grouped in the good food supply zone including Pingelap have regular air and shipping access so that imported foods are readily available and despite good agricultural potential these are often eaten in preference to local foods. There is also a high availability of imported foods through USDA food programs on outer islands and this switch to include these nutritionally poor foods in the diet may be contributing to the malnutrition seen. This does not of course explain why malnutrition is seen in both poor and good supply areas and it may be that so many factors play a part in these remote areas that the good and poor differentiation is irrelevant and it is sufficient to say malnutrition is a problem in all outer islands.

That malnutrition is particularly prevalent in Yap main island urban and coastal areas is surprising considering their excellent

primary health care programs, immunization coverage and clinic attendance records. The urban sample data is possibly a reflection of the Madrich area where overcrowding, poor sanitation, hygiene and water supply plus low income and no access to land and therefore food gardens leads to a high rate of infection in children and poor food supply. The reasons for a high prevalence of malnutrition in the main island coastal area of Yap is unclear. Most of the malnutrition on Yap was of the 'acute' kind ie low weight for age which suggests problems of repeated infections and early or abrupt weaning from the breast. Stunting or poor growth in height was less of a problem in Yapese main island children than other states suggesting their diets may have been better. Certainly more local food is consumed in Yap than all other states.

So far, the discussion has focused on protein and energy intakes for children but another important factor is the extraordinarily low intake of greens and vegetables and only moderate intake of fruits. Fresh fruits and vegetables help protect children from infections and so their absence from the diet will contribute to a high infection rate. In addition, green and yellow fruits and vegetables are vital for supplying vitamin A in the diet especially if protein and fatty food consumption is low to moderate and also if imported staples are eaten in preference to fresh, local staples. Local staples contain some vitamins but imported staples contain no Vitamin A or at all. A diet of rice or ramen alone or rice and small quantities of fish will not provide sufficient Vitamin A or Vitamin C for a growing child's needs. Vitamin deficiency diseases and increased infections will result and there is ample evidence today of clinical Vitamin A deficiency (nightblindness and xerophthalmia) and skin sores and infections caused by low Vitamin C intakes. Severe Vitamin A deficiency causes blindness and it is vital that this problem be urgently and seriously addressed. Simple inclusion in the diet of greens cooked in coconut cream (fat helps increase absorption of Vitamin A) will resolve this problem. The coconut cream would also increase the energy intakes of children so that there may be a secondary effect on growth patterns.

C O N C L U S I O N S
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CONCLUSIONS

1. The prevalence of obesity and overweight in adult women was very high especially in older age groups. Obesity is a primary casual factor in other diseases such as diabetes, hypertension and heart disease and its treatment and prevention should be accorded priority for future public health action programmes.
2. The prevalence of obesity was to overweight particularly high in Kosrae State. There were some differences in prevalence of obesity by food supply zone for each state, providing some evidence that prevalence of obesity was related to the type of food consumed. However, this was not conclusive since overweight and obesity was common in both traditional living outer island communities and in more urbanized communities or groups with easy access to urban centers and imported foods. Other causes of obesity were postulated as being related to quantities of food, exercise and activity levels and other related lifestyle factors. These require further study to successfully detail and address the obesity problem.
3. Food and dietary patterns for men are likely to be similar to those of women and it is probable that overweight and obesity is also a major public health problem among Micronesian men.
4. Prevalence of mild to moderate anemia was high in all states for non-pregnant, non lactating and lactating women but especially in Kosrae. Anemia was also a serious problem among pregnant women and the prevalence of severe anemia was again particularly high in Kosrae. Parity, food taboos and dietary patterns were not apparently causal factors to explain the extra problems for Kosrae. Low intakes of greens and moderate intake of protein foods may be general causal factors but again do not explain why Kosrae has a higher prevalence of anemia than other states. A possible causes of anemia which was not investigated is the high infestation of worms especially hookworms frequently found in FSM. This nutritional deficiency disease requires further investigation and aggressive education programs to the reverse problem especially as many young women and teenagers have anemia even before they have any children.
5. The nutritional status of many infants and young children in the Federated States of Micronesia was poor. There was no evidence of severe or clinical protein-energy malnutrition in the survey but hospital admissions for clinical conditions such as kwashiorkor and marasmus are frequently reported. The prevalence of sub-clinical malnutrition among infants is moderately high. There is a serious problem of 'stunting' i.e. poor growth with respect to height caused by a long term inadequate diet. There is also a high prevalence of 'wasting' or poor weight gain among children 12 -36 months of age which it is postulated is likely due to high rates of infections, parasite and worm infestations associated with poor hygiene, water supply and sanitation condi-

tions as well as poor nutritional quality diets. Bottlefeeding was not common and was not an obvious direct or isolated cause of malnutrition in infants in FSM as has been previously speculated. The current prevalence of malnutrition in young children is higher than reported in previous studies and needs rigorous and carefully planned food and nutrition policies and programs to be established to reverse the current trends.

6. Breastfeeding rates were high for the first few months of an infants life. However, duration of breastfeeding was not adequate. Many children were weaned after 6-9 months and an even greater number by 12-15 months. Age of introduction of solids was good and was between 3-6 months on average. However, there were some children who had solids introduced as early as 1 month and some children who had a delayed introduction up to 12 months.

7. Women and children on the main islands of each state were consuming more imported foods more often than outer island women. This is probably due to a combination of factors such as more availability, taste preferences or inconsistent supply of local foods, convenience with respect to preparation and cooking time and lower costs of imported foods with respect to staples and some protein foods. Imported foods were available in the outer islands, often through USDA food programs or through stores.

8. Greens and vegetables consumption was so low as to be almost non-existent. Some but inadequate amounts of fruit were consumed as snacks. There is a potential for vitamin and mineral deficiencies to occur among groups replacing local fresh foods with processed imported foods, especially staples. Clinical signs of vitamin A deficiency are already being reported in children in some communities especially in Truk and Pohnpei. Vitamin A deficiency leads to blindness and its prevention should be given priority in public health programming.

9. No assessment was made of dental health but consumption of sugar and sugar snacks was high, particularly for older children, and in women and children in Kosrae which could be detrimental to dental health.

10. Maternal and child clinic attendance was fairly good and probably contributes to the high rate of breastfeeding observed. Maternal and child care clinics are potentially a good mode for education to improve the prevention of obesity and anemia among women and malnutrition in young children. Food taboos were not significant and were not affecting the health and nutritional status of pregnant and lactating women.

R E C O M M E N D A T I O N S

RECOMMENDATIONS

1. To formulate State Food and Nutrition Policies to be submitted to the Governor of each state, and if there is an expressed need to have one at the National level to be submitted to the FSM President. The Policies should aim to improve nutritional status.

Targets will need to be set such as:

a) Improving the current nutritional status of infants and young children and infant feeding practices. Goals need to be set e.g. reducing the prevalence of underweight by 10% in 5 years.

b) Improving adult nutritional status by minimizing the number of adults in the obese classification.

c) Increasing consumption of local foods, particularly local staples, fruits and vegetables and ensuring there is at least no further increase in the consumption of soft drinks, sugar, store baby foods, snacks foods and turkey tails.

To achieve these targets:

- Programs should be aimed at increasing production and marketing of fresh produce with particular emphasis on improving availability in all areas;

- Controls on the importation of unnecessary foods and/or non-food items affecting poor health in FSM could be developed;

- Nutrition education programs should give priority to improve child and adult nutritional status through nutrition education programs. Guidelines for nutrition education programs need to be developed based on information provided from this survey and to be directed at specific target groups. This may be readily achievable by developing a series of dietary and health guidelines such as:

- . control weight;
- . use less sugar;
- . use less fat, particularly turkey tails, and animal fats;
- . eat a variety of fresh foods;
- . eat at least one serving of greens, vegetables or fruit each day;
- . limit alcohol intake;
- . increase exercise;
- . promote breast feeding;
- . promote family planning;
- . promote immunization and good sanitation and hygiene;
- . promote deworming programs.

Key target groups for education would include all age groups and sexes but in particular:

- a) adults (both sexes on weight control)
- b) school children (with a view to preventing obesity and dental caries in adults of the next generation).
- c) women of child - bearing years (with particular emphasis in the first instance in Kosrae), on the prevention of anemia and also all women on the importance of prolonged breast feeding and enough good food for growing children to prevent malnutrition.
- d) Total population (on need to balance imported food consumption, especially of staples such as rice and ramen, with adequate consumption of greens, vegetables and fruits to prevent Vitamin A deficiency).

- Particular attention should be paid to establishing an appropriate data base and a nutritional monitoring program in the future. This includes ongoing monitoring of adult nutritional status and prevalence of diet-related diseases and growth monitoring of children, as well as monitoring of availability of food in urban, main island and outer island areas. Food imports should also be monitored particularly imports of poor nutritional value.

- To encourage state and national governments to have an inter-departmental food and nutrition council which will coordinate nutrition education programs and activities and be the implementing body for food and nutrition policy initiatives.

2. Carry out a small quantitative diet survey to further describe the causes of obesity and malnutrition which were found to be prevalent in FSM.

3. There should be further discussion and investigation on establishing ideal weights and heights for Micronesian adults.

4. Birth weight data currently in Maternal and Child Health records should be reviewed and an average FSM birth weight and possible length be established. This should be followed by discussion and appraisal of the appropriateness of current weight for age charts used within the Federated States of Micronesia. Meanwhile current WHO/NCHS weight for age charts are considered very appropriate.

ANNEXES
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Annex 1 CLASSIFICATIONS & DEFINITIONS USED:

a) Women-nutritional status

Expressed as prevalence of normal weight, overweight and obesity using international classifications of Body Mass Index (BMI). BMI is calculated as : weight (kg) / height (m) in women:

- BMI of < 25 is considered normal or 'desirable'
- BMI of ≥ 25 and weight <30 is considered moderately overweight
- BMI of ≥ 30 is considered obese.

b) Anemia

Anemia was characterised by the level of blood hemoglobin (Hb) using WHO definitions.

- For non-pregnant and non-lactating and lactating women:

- Normal : Hb = $\geq 12.0\text{g/dl}$
- Mild anemia : Hb = 10.0 - 11.9g/dl
- Moderate anemia : Hb = 8.0 - 9.9g/dl
- Severe anemia : Hb = $< 8.0\text{g/dl}$

- For pregnant women:

- Normal : Hb = $\geq 11\text{g/dl}$
- Moderate anemia : Hb = 9.0 - 10.9g/dl
- Severe anemia : Hb = $< 9.0\text{g/dl}$

c) Children - nutritional status

Expressed as prevalence of malnutrition according to weight for age, height for age and weight for height after comparison with commonly used international standards i.e. WHO/NCHS standards. Results in this report have been expressed as percent of the median of the reference standard.

- Weight for age:

- normal weight = $\geq 80\%$ (normal but high weight is $\geq 120\%$)
- moderately malnourished (underweight) = 60 - 79%
- severely malnourished = $< 60\%$

- Height or length for age : (Height for children 0-23 months was measured as length and was compared to WHO/NCHS standards for length).

- normal height = $\geq 90\%$
- moderately stunted = 85 - 89%
- severely stunted = $< 85\%$

. Weight for height or length:

normal & well - nourished = \geq 90%
mildly wasted = 80 - 89%
moderately wasted = 70 - 79%
severely wasted = $<$ 70%

d) Dietary recall

Dietary recall patterns were categorised into foods eaten at given time periods throughout the day which were:

- from rising until mid-day = morning
- from mid-day until 5 p.m. = afternoon
- from 5 p.m. until retiring = evening

'FSM' as a prefix refers to local produce. Imported as a prefix refers to all imported foods including those processed locally from imported raw materials (e.g. bread from flour). Detailed classification of foods for the dietary recall are given in Annex 2.

Data for dietary recall was qualitative information only and is expressed as the percentage of women or children who were eating a particular type of food at one of the given time periods in the last 24 hours.

ANNEX 2 : CLASSIFICATION OF FOODS FOR DIETARY RECALL

FSM STAPLES (STARCH)

Yam
Taro (Hard & soft & sweet)
Breadfruit
Tapioca (cassava)
Sweet potatoes
Cooked pandanus
Cooking bananas
Chestnuts

FSM PROTEIN

Fish (reef and ocean)
Sea shells/clams
Water eels (fresh water & sea)
Octopus
Crabs
Eggs
Pork
Chicken
Dog meat
Deer meat

FSM GREENS

Taro leaves
Tapioca leaves
Kang Kong
Fern tips
Pumpkin tips
Sweet potato tops
Pepper leaves
Okra

OTHER LOCAL VEGETABLES

Corn
Pumpkin
Cucumber
Squash
Chinese cabbage
Lettuce
Eggplant
Avocado
Banana blossoms
Green papaya
Tomato

IMPORTED STARCH

Bread (any kind)
Rice
Noodles
Cereals
Ramen
Potato (white)
Biscuit (tin/packed)
Crackers
Oatmeals

IMPORTED PROTEIN

Canned fish
Canned pork
Canned meat
Canned beef
Milk
Cheese
Hot dogs
Peanut butter
Ham
Sausages
Dry beans

IMPORTED VEGETABLES

Corns
Carrots
Canned corn
Canned beans
Canned peas
Canned mixed vegetables
Tomato (canned)

IMPORTED FRUIT

Apple
Pear
Oranges
Canned (pears, peaches, fruit
cocktail, pineapple)

FSM FRUITS AND FRUIT JUICE

Ripe papaya
Mango
Guava
Orange
Tangerine
Watermelon
Sugarcane
Coconut Embryo
Pandanus
Ripe bananas
Mountain apple
Soursop
Pineapple
Coconut
Tuba (toddy)

SUGAR SNACKS

Lollipops
Ice cream
Soft drinks
Fruit drinks
Cookies
Biscuits
Chewing gum
Pudding

ALCOHOL

Beer
Wine
Spirits

FSM FATS

Coconut cream
Coconut oil
Fats from local pigs and cows

IMPORTED FRUIT JUICE

Pineapple juice
Orange juice
Grape fruit juice
Guava juice

OTHER SNACKS

Peanuts
Chips
Nuts
Cheeseballs

SAKAU

Sakau en Pohnpei

IMPORTED FATS

Crisco (liquid & hard)
Turkey tail
Mayonnaise
Butter/margarine

NOTE:

1. For mixed dishes separate ingredients were coded.
2. Coffee, tea, cocoa, milk in tea or water were not coded.