APRIL 1975

CENTER FOR DISEASE CONTROL

NUTRITION SURVEILLANCE

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U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

PREFACE

This report summarizes information, including selected indices of nutrition status, received from four of the five participating States which comprise the initial group of contributors to a developing program of nutrition surveillance in the United States. We will consider adding other indices as their utility and availability become evident. To the extent possible, tabulations in subsequent issues will be presented in the same format unless experience indicates a change is appropriate.

The data presented in these tabulations come from a variety of sources including health department clinics, Headstart programs, and other health care situations. Because of the lack of uniformity of data sources, as well as methodology, direct comparisons among States should be made with caution.

Contributions to the Nutrition Surveillance Report are welcome. Please submit to:

Center for Disease Control
Attention: Preventable Diseases and
Nutrition Activity
Atlanta, Georgia 30333

Center for Disease Control . . . . . David J. Sencer, M. D.
Director

NUTRITION INDICES

Data presented in Tables 1-6 are based upon children examined during the third and fourth quarters of 1974. Only those examined on their initial clinic visit are included.

Tables 1 and 2 show that the percentages of children with low hemoglobin and hematocrit values are high, as they were for the first two quarters, particularly in Arizona and Kentucky. In most cases, with the exception of the data from Arizona, hemoglobin and hematocrit data are derived from different individuals.

The same disproportionately high percentage of children with low height for age is seen, as during the first two quarters. In Arizona the percentage has grown somewhat larger. In weight for height, the percentage with low values continues to be at about the expected 5% level, but those with high values are two to three times greater than expected, as was the case during the first two quarters. These data continue to suggest less of a problem with acute undernutrition than with overnutrition, represented by a high prevalence of overweight.

Tables 3 and 4 show little indication of significant or consistent ethnic differences, except that relatively high percentages of Spanish Americans and American Indians have high weight for height values, as before. In height for age, the American Indian children do not show disproportionately high percentages of low values, as appeared to be the case during the first two quarters.

Tables 5 and 6 show consistent age trends in low values for hemoglobin and hematocrit. The percentages with low values are the highest in the age group 6-9 years, for both sexes. The prevalence in children less than 6 years of age, and older than 9, is approximately half that of the prevalence in the 6-9 year old age group. To what extent this age trend may be due to true biological differences, or to the arbitrary age-specific criteria for low values, is being investigated at the present time. Adjustment in the levels used to tabulate low values will be reconsidered based on the nutrition surveillance experience. This issue will be the subject of a discussion in a future Bulletin.

Through mathematical error, the prevalence of low hemoglobin levels for the first two quarters of 1974, as shown in tables 1-6 of the January issue of Nutrition Surveillance, was incorrect. Tables 7-9 show corrected values for the percentages of children with low hemoglobin values for these two quarters, using the present age-specific criteria, and including only children on their first clinic visits.

Table 1

Nutrition Indices by State, July-September 1974
Persons Less than 18 Years of Age

State	Hemoglobin		Hematocrit		Height For Age		Weight For Age		Weight For Height		
	No. Exam.	% Low	No. Exam.	% Low	No. Exam.	% Low	No. Exam.	% Low	No. Exam.	% Low	% High
Arizona	1,393	22.3	915	13.0	2,352	19.7	2,344	11.6	2,336	7.5	18.8
Kentucky	1,805	20.0	1,416	27.3	4,009	15.4	4,002	8.4	4,114	6.8	12.5
Tennessee	204	14.7	5,044	22.0	5,078	11.1	5,138	5.9	5,027	4.7	9.2
Washington	413	10.4	2,797	11.6	3,801	12.3	3,804	6.8	3,861	3.9	11.1
Total*	3,815	19.5	10,172	19.1	15,240	13.9	15,288	7.7	15,338	5.5	12.0

*Includes unknown sex, ethnic group and age.

Table 2

Nutrition Indices by State, October-December 1974
Persons Less than 18 Years of Age

State	Hemoglobin		Hematocrit		Height For Age		Weight For Age		Weight For Height		
	No. Exam.	% Low	No. Exam.	% Low	No. Exam.	% Low	No. Exam.	% Low	No. Exam.	% Low	% High
Arizona	1,629	15.0	1,456	10.9	2,317	16.2	2,318	9.9	2,301	6.2	15.1
Kentucky	1,058	17.6	708	20.5	2,293	12.2	2,295	8.5	2,434	6.3	9.8
Tennessee	529	7.8	4,456	19.0	5,697	11.0	5,902	5.9	6,016	4.5	10.7
Washington	198	10.1	1,721	9.4	2,314	12.9	2,314	6.1	2,360	2.8	12.3
Total*	3,414	14.4	8,341	15.7	12,621	12.5	12,829	7.1	13,111	4.8	11.6

*Includes unknown sex, ethnic group and age.

Table 3

Nutrition Indices by Sex and Ethnic Group, July-September 1974
Persons Less than 18 Years of Age

Sex and Ethnic Group	Hemoglobin No. Exam.	Hemoglobin % Low	Hematocrit No. Exam.	Hematocrit % Low	Height For Age No. Exam.	Height For Age % Low	Weight For Age No. Exam.	Weight For Age % Low	Weight For Height No. Exam.	Weight For Height % Low	Weight For Height % High
Male											
Black	309	22.2	677	29.4	1,191	19.6	1,185	8.9	1,194	3.4	14.2
White	1,071	16.4	3,936	20.6	5,335	12.6	5,360	7.8	5,402	6.2	10.5
Sp. American	416	26.4	385	9.9	880	19.7	884	10.1	883	7.2	17.0
Am. Indian	71	8.5	265	10.9	347	13.8	346	6.6	340	2.9	17.4
Oriental	3	0.0	9	0.0	16	18.8	16	18.8	17	0.0	11.8
Other	3	0.0	7	0.0	15	26.7	15	20.0	17	5.9	29.4
Unknown	40	12.5	154	9.1	178	11.8	182	5.5	179	5.0	8.4
Total	1,913	19.1	5,433	20.1	7,962	14.5	7,988	8.1	8,032	5.7	12.0
Female											
Black	317	20.8	676	24.0	1,237	14.8	1,227	9.2	1,218	5.4	13.1
White	1,068	18.1	3,297	17.4	4,686	11.7	4,723	6.0	4,723	5.2	10.2
Sp. American	411	25.8	315	18.7	823	19.3	815	10.4	829	7.6	19.2
Am. Indian	55	14.5	250	14.0	327	10.7	328	6.1	331	0.9	14.5
Oriental	5	0.0	11	0.0	15	20.0	15	6.7	16	0.0	12.5
Other	5	0.0	20	15.0	28	3.6	28	7.1	27	0.0	3.7
Unknown	36	13.9	130	9.2	162	14.2	164	6.7	161	4.3	17.4
Total	1,897	19.9	4,699	18.0	7,278	13.1	7,300	7.1	7,306	5.3	12.0

Table 4

Nutrition Indices by Sex and Ethnic Group, October-December 1974
Persons Less than 18 Years of Age

Sex and Ethnic Group	Hemoglobin No. Exam.	Hemoglobin % Low	Hematocrit No. Exam.	Hematocrit % Low	Height For Age No. Exam.	Height For Age % Low	Weight For Age No. Exam.	Weight For Age % Low	Weight For Height No. Exam.	Weight For Height % Low	Weight For Height % High
Male											
Black	339	13.6	543	16.0	1,134	13.8	1,145	9.8	1,155	5.2	12.4
White	830	12.3	2,677	17.0	3,961	12.0	4,046	6.7	4,195	5.6	10.4
Sp. American	454	19.6	501	14.0	774	19.1	776	9.4	782	6.0	16.2
Am. Indian	75	6.7	236	4.7	299	14.4	299	10.4	299	4.3	15.4
Oriental	1	0.0	4	0.0	8	12.5	8	0.0	8	0.0	12.5
Other	4	0.0	9	11.1	9	0.0	10	10.0	10	10.0	0.0
Unknown	45	11.1	111	14.4	137	16.1	143	14.0	138	2.2	10.1
Total	1,748	14.1	4,081	15.7	6,322	13.4	6,427	7.9	6,587	5.4	11.7
Female											
Black	333	12.3	576	17.0	1,190	12.0	1,195	7.1	1,213	3.9	11.5
White	726	16.1	2,788	16.9	3,895	10.8	3,973	6.0	4,082	4.5	10.8
Sp. American	476	14.3	517	12.4	785	16.4	794	8.1	796	4.8	14.2
Am. Indian	70	12.9	204	6.9	269	10.0	270	3.3	273	2.6	16.1
Oriental	0	-	10	10.0	9	22.2	9	0.0	11	0.0	0.0
Other	2	0.0	11	18.2	12	16.7	13	7.7	13	7.7	15.4
Unknown	47	8.5	112	8.9	139	9.4	148	4.7	136	1.5	11.0
Total	1,654	14.4	4,218	15.6	6,299	11.7	6,402	6.3	6,524	4.3	11.5

Table 5

Nutrition Indices by Sex and Age, July-September 1974
Persons Less than 18 Years of Age

Sex and Age Group	Hemoglobin No. Exam.	Hemoglobin % Low	Hematocrit No. Exam.	Hematocrit % Low	Height For Age No. Exam.	Height For Age % Low	Weight For Age No. Exam.	Weight For Age % Low	Weight For Height No. Exam.	Weight For Height % Low	Weight For Height % High
Male											
<1	221	10.9	589	7.8	2,322	18.0	2,342	10.4	2,484	7.5	14.3
1	363	18.2	945	10.5	1,118	19.5	1,140	9.6	1,094	6.8	17.5
2-5	795	19.7	2,194	20.3	2,535	12.9	2,531	7.0	2,500	4.5	10.9
6-9	260	30.0	645	38.6	769	9.2	758	4.6	758	6.7	6.7
10-12	86	18.6	599	30.4	632	8.4	630	5.9	625	3.0	8.2
13-17	188	12.8	461	15.2	586	11.8	587	8.5	571	2.5	7.9
Total	1,913	19.1	5,433	20.1	7,962	14.5	7,988	8.1	8,032	5.7	12.0
Female											
<1	233	11.6	586	10.1	2,317	15.2	2,339	9.3	2,456	7.2	15.1
1	350	12.9	849	8.5	1,050	16.7	1,062	5.9	1,036	4.6	15.5
2-5	772	21.5	2,122	19.3	2,498	12.2	2,475	5.8	2,444	3.9	10.0
6-9	254	32.7	488	34.4	609	7.7	609	5.7	602	6.1	6.3
10-12	88	26.1	318	24.2	327	11.0	326	6.7	320	5.6	8.4
13-17	200	17.0	336	17.6	477	7.8	489	7.2	448	2.5	7.8
Total	1,897	19.9	4,699	18.0	7,278	13.1	7,300	7.1	7,306	5.3	12.0

Table 6

Nutrition Indices by Sex and Age, October-December 1974
Persons Less than 18 Years of Age

Sex and Age Group	Hemoglobin No. Exam.	Hemoglobin % Low	Hematocrit No. Exam.	Hematocrit % Low	Height For Age No. Exam.	Height For Age % Low	Weight For Age No. Exam.	Weight For Age % Low	Weight For Height No. Exam.	Weight For Height % Low	Weight For Height % High
Male											
<1	189	13.2	472	6.6	1,995	16.6	2,041	10.1	2,309	7.0	11.9
1	302	18.9	802	10.3	882	15.0	939	6.6	879	5.1	17.1
2-5	717	13.5	1,779	16.2	1,989	12.2	1,993	6.1	1,956	3.8	10.9
6-9	170	18.8	428	30.1	512	8.6	509	5.9	508	6.7	8.7
10-12	152	10.5	258	24.4	400	9.3	400	9.3	399	4.8	10.0
13-17	218	9.2	342	13.2	544	10.5	545	9.4	536	4.3	8.4
Total	1,748	14.1	4,081	15.7	6,322	13.4	6,427	7.9	6,587	5.4	11.7
Female											
<1	182	11.5	519	6.6	1,980	13.3	2,020	7.1	2,265	5.6	13.2
1	259	14.3	761	9.2	848	13.0	889	5.2	846	2.6	15.8
2-5	697	14.2	1,745	18.0	1,980	11.3	1,987	4.5	1,948	3.5	10.2
6-9	154	20.8	405	31.4	460	8.3	461	5.4	457	4.6	5.7
10-12	123	17.9	331	16.6	400	9.5	404	12.4	398	6.5	6.3
13-17	239	11.7	457	13.1	631	10.3	641	8.0	610	2.3	11.6
Total	1,654	14.4	4,218	15.6	6,299	11.7	6,402	6.3	6,524	4.3	11.5

Table 7

Corrected Hemoglobin Indices by State
January-March 1974 and April-June 1974
Persons Less than 18 Years of Age

State	January-March 1974		April-June 1974	
	No. Exam.	% Low	No. Exam.	% Low
Arizona	2,250	15.3	2,114	17.3
Kentucky	2,685	17.1	2,590	13.7
Tennessee	100	6.0	116	19.8
Washington	469	6.2	1,218	10.3
Total	5,504	15.2	6,038	14.4

Table 8

Corrected Hemoglobin Indices by Sex and Ethnic Group
January-March 1974 and April-June 1974
Persons Less than 18 Years of Age

Sex and Ethnic Group	January-March 1974		April-June 1974	
	No. Exam.	% Low	No. Exam.	% Low
Male				
Black	508	20.5	464	15.9
White	1,553	13.6	1,874	12.3
Sp. American	462	18.4	508	17.9
Am. Indian	220	8.6	66	18.2
Oriental	7	14.3	7	0
Other	6	0	14	7.1
Unknown	51	7.8	117	10.3
Total	2,807	15.1	3,050	13.8
Female				
Black	542	19.4	456	19.1
White	1,414	13.8	1,732	12.9
Sp. American	487	18.9	564	19.5
Am. Indian	197	6.6	95	10.5
Oriental	5	0	8	0
Other	5	20	6	16.7
Unknown	44	13.6	117	12.8
Total	2,694	15.3	2,978	15.0

Table 9

Corrected Hemoglobin Indices by Sex and Age
January-March 1974 and April-June 1974
Persons Less than 18 Years of Age

	January-March 1974		April-June 1974	
	No. Exam.	% Low	No. Exam.	% Low
Male				
<1	349	12.3	435	8.5
1	611	13.6	694	13.1
2-5	1,189	19.0	1,415	15.7
6-9	242	16.9	244	20.1
10-12	168	7.7	114	9.6
13-17	248	7.3	148	6.8
Total	2,807	15.1	3,050	13.8
Female				
<1	361	9.7	418	9.1
1	560	13.2	653	13.0
2-5	1,128	17.6	1,384	16.7
6-9	240	21.7	221	20.4
10-12	138	15.2	95	8.4
13-17	267	11.6	207	18.8
Total	2,694	15.3	2,978	15.0

CRITERIA FOR IDENTIFYING INDIVIDUALS WITH LOW OR HIGH VALUES

1. Low Hemoglobin and Low Hematocrit: Hemoglobin or hematocrit below the level specified in the following table for appropriate age and sex.

Age	Hgb.	Hct.
6-23 months	10 grams	31%
2-5 years	11 grams	34%
6-14 years	12 grams	37%
15 or more years (females)	12 grams	37%
15 or more years (males)	13 grams	40%

2. Low Height for Age: Height for age less than the 5th percentile of a person of the same sex and age in the reference population.

3. Low Weight for Age: Weight for age less than the 5th percentile of a person of the same sex and age in the reference population.

4. Low Weight for Height: Weight for height less than the 5th percentile of a person of the same sex and height in the reference population.

5. High Weight for Height: Weight for height greater than the 95th percentile of a person of the same sex and height in the reference population.

Reference Population: Smoothed distributions of percentiles of the following populations:

Age	Reference Population Data
Birth - 24 months	Fels Research Institute Growth Study
25 - 59 months	Preschool Nutrition Survey
60 - 143 months	National Health Examination Survey, Cycle II
144 - 215 months	National Health Examination Survey, Cycle III

Note: Growth percentiles represent heights and weights which have been standardized for sex and age, and sex and height (for weight for height). Therefore height and weight comparisons may be made between groups of individuals using percentiles without being concerned about the age and sex distributions of groups being compared. However, comparison of height and weight among groups with persons of diverse ethnic origins should be made with care because of genetic differences in growth potential. Differences observed between groups may be due to differences in the ethnic makeup of the groups rather than differences in nutritional status.

SPECIAL REPORTS

COMPARISON OF STUART-MEREDITH AND NATIONAL ACADEMY OF SCIENCES REFERENCE POPULATIONS

Until very recently the Stuart-Meredith (SM) growth curves have been the most widely used growth reference data in the United States. These curves were prepared from measurement of selected children in Iowa and Boston, followed longitudinally during the 1930's and 1940's. The children were exclusively white and generally middle class. The total number of children was small. Since there were very few of these children below the 10th and over the 90th centiles, the statistical precision of the outlying centiles is poor. While actual centile curves of height-for-age and weight-for-age were calculated, weight-for-height data had to be indirectly derived.

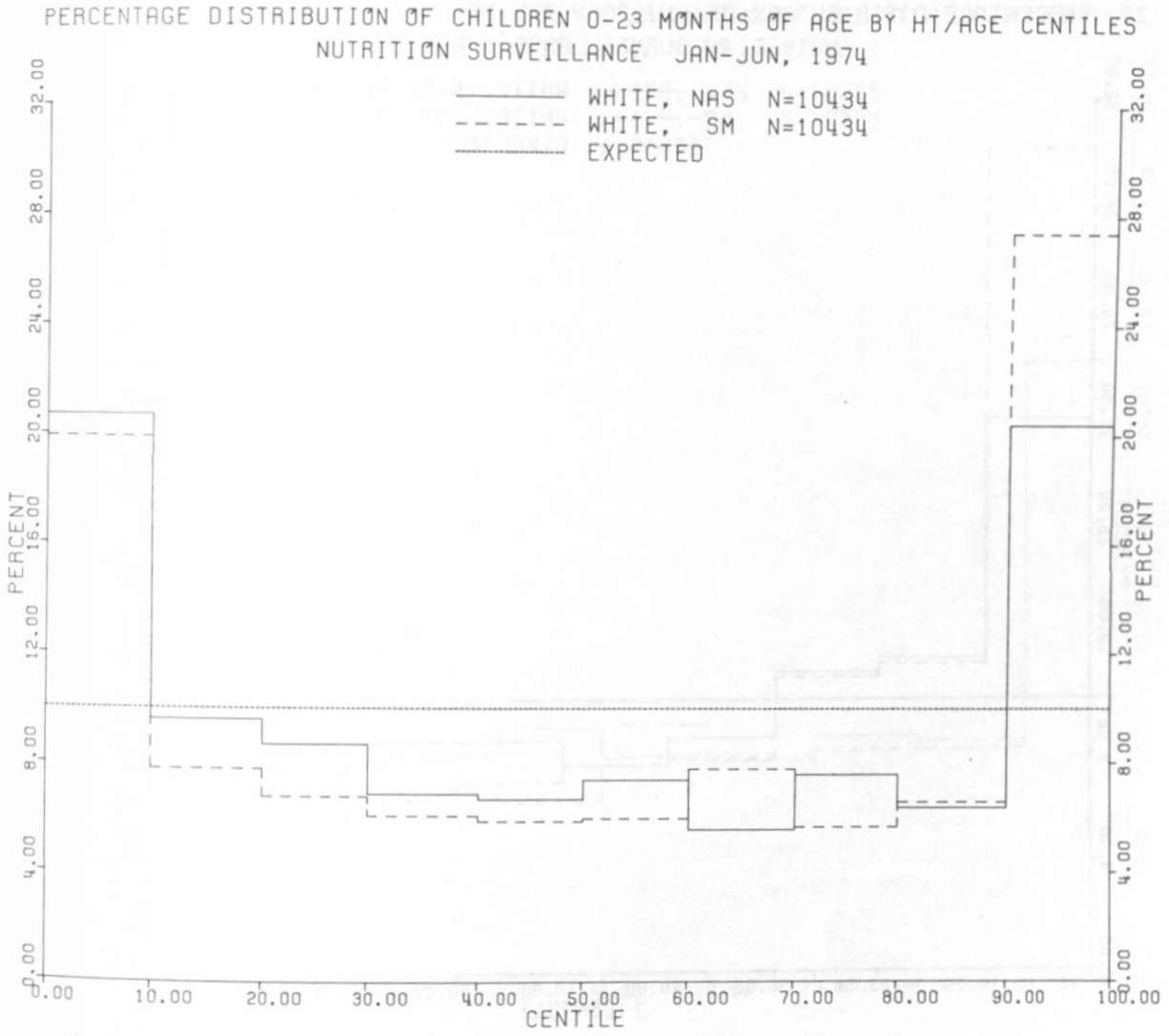
The recent availability of data from large-scale studies, representing more recent observations of a greater number of children, has enabled the re-calculation of growth behavior more representative of the U.S. population. These data form the basis for the recent recommendations for new reference populations by the Food and Nutrition Board, National Academy of Sciences (NAS).

The Preventable Diseases and Nutrition Activity of the Center for Disease Control has prepared growth curves based on the NAS reference populations and has developed computer subroutines to further their application. We shall make these available to interested groups as soon as they have been reviewed by the investigators who provided the data. As stated earlier, the NAS reference populations are more representative of the general U.S. demographic pattern, and therefore are more appropriate for population comparisons than those of Stuart-Meredith. The determination of weight-for-height is based on actual data, rather than on data derived from statistical manipulations of the medians for height-for-age and weight-for-age.

Figures I through VI have been prepared from 1974 surveillance data obtained in four of the five participating States. They are presented to compare the Stuart-Meredith and NAS reference populations when applied to the same data. These particular surveillance data, however, represent children of predominantly lower socio-economic background and should not be considered in any way representative of the general U.S. population. The following histograms show decile distributions for height-for-age, weight-for-age, and weight-for-height by age for white children 0-23 months and 2-5 years of age.

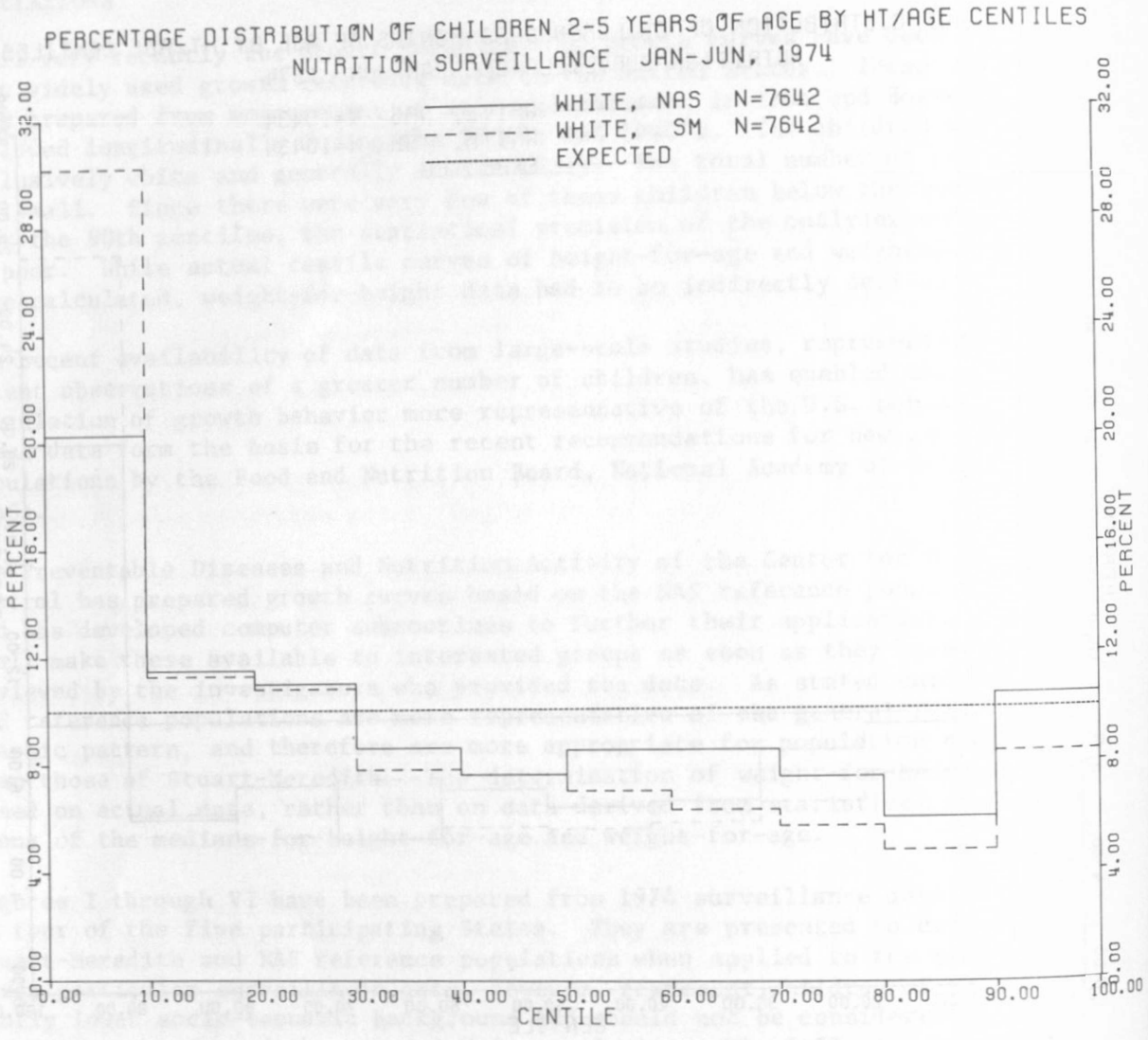
If a study population were exactly the same as the reference population, then 10 percent of the children would fall into each decile. For this reason, a line has been drawn on each chart to indicate the 10 percent level so that deviations from the expected are readily apparent.

Figure I



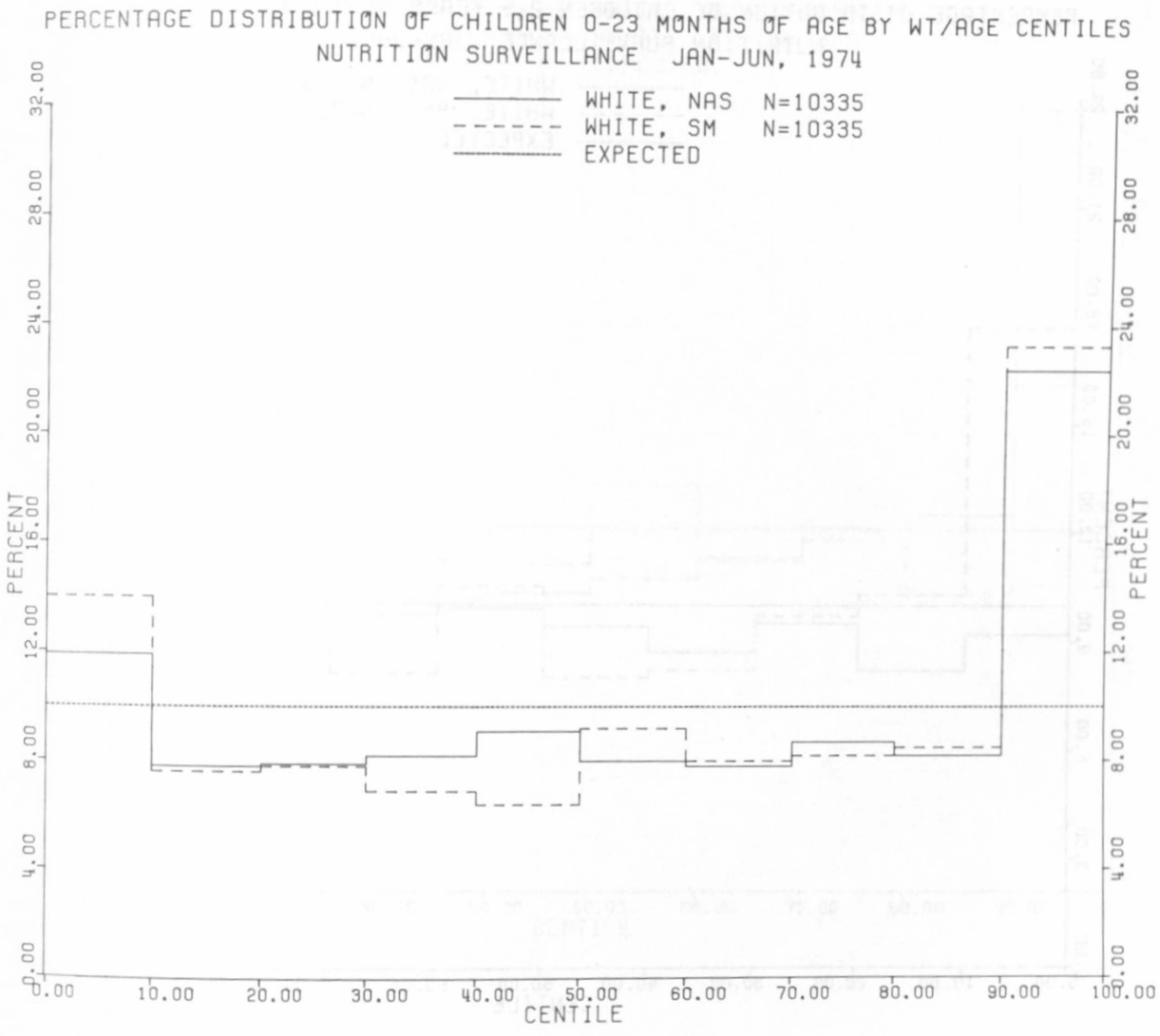
Height-for-age deciles for the 0-23 month age group are presented. The two reference populations provide nearly identical distributions in height-for-age in this age group, with a small difference appearing above the 90th centile where more children are considered exceptionally tall when compared with the Stuart-Meredith population than with the NAS reference population.

Figure II



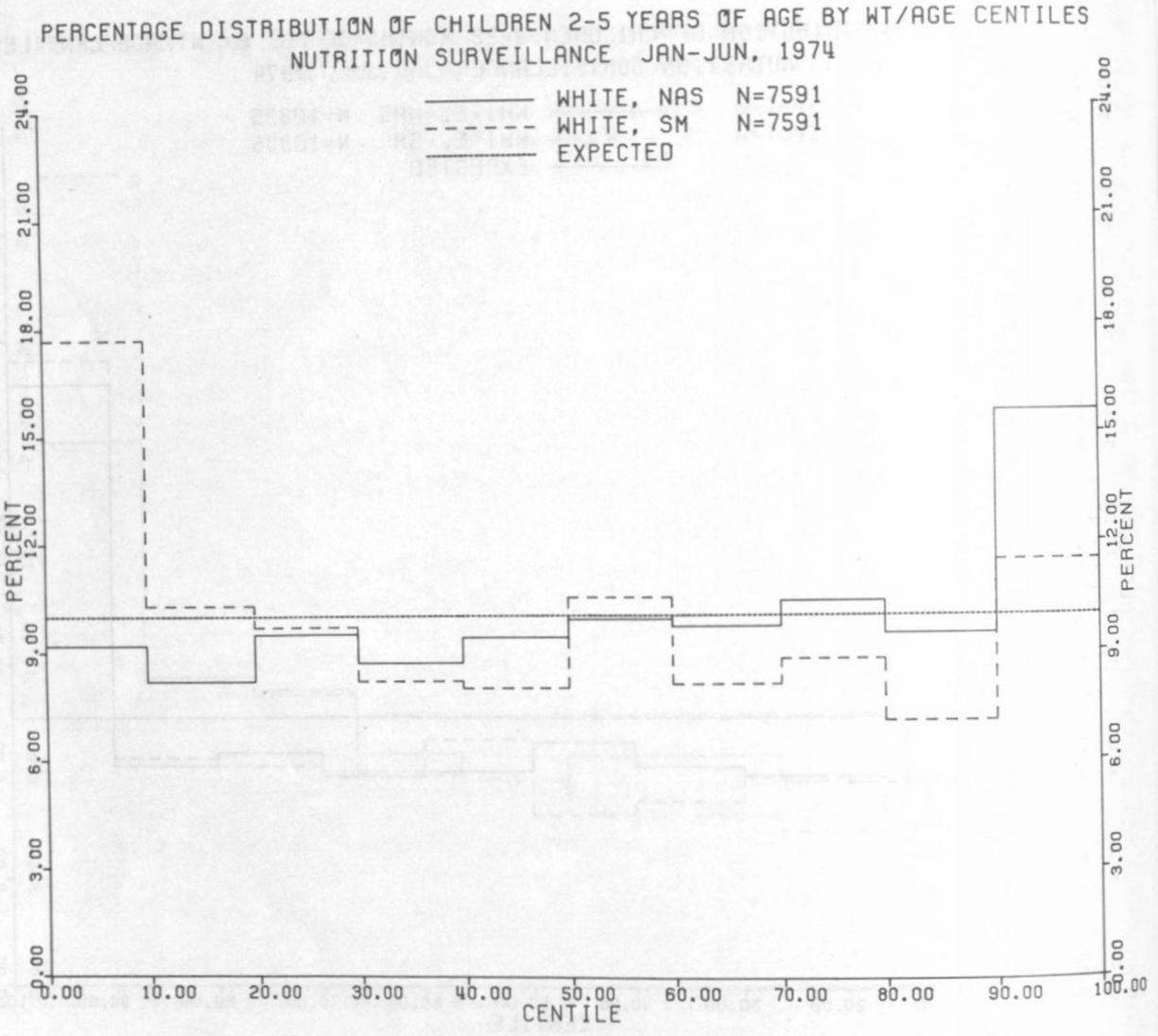
Height-for-age data for children in the 2-5 year age group are similar to that shown in Figure I for children in the 0-23 month age group except for the extremes. While there is close correspondence between the distributions based on the NAS and Stuart-Meredith reference populations in most centiles, by the Stuart-Meredith criteria 30 percent of the children under surveillance are considered to be short for their age (below the 10th centile) as compared to 20 percent by the NAS reference populations. While there is obviously poor growth in the surveillance population, we believe that use of the Stuart-Meredith data overdiagnoses stunting.

Figure III



Weight-for-age centile distributions for the 0-23 month age group are almost identical when using either the Stuart-Meredith or NAS populations.

Figure IV



Distributions based on the two reference populations show some differences in the 2-5 year age group in the weight-for-age centiles. Figure IV shows that many more children are considered underweight by Stuart-Meredith criteria than by the NAS criteria, and slightly more children are considered overweight by the NAS criteria than by the Stuart-Meredith.

Figure V

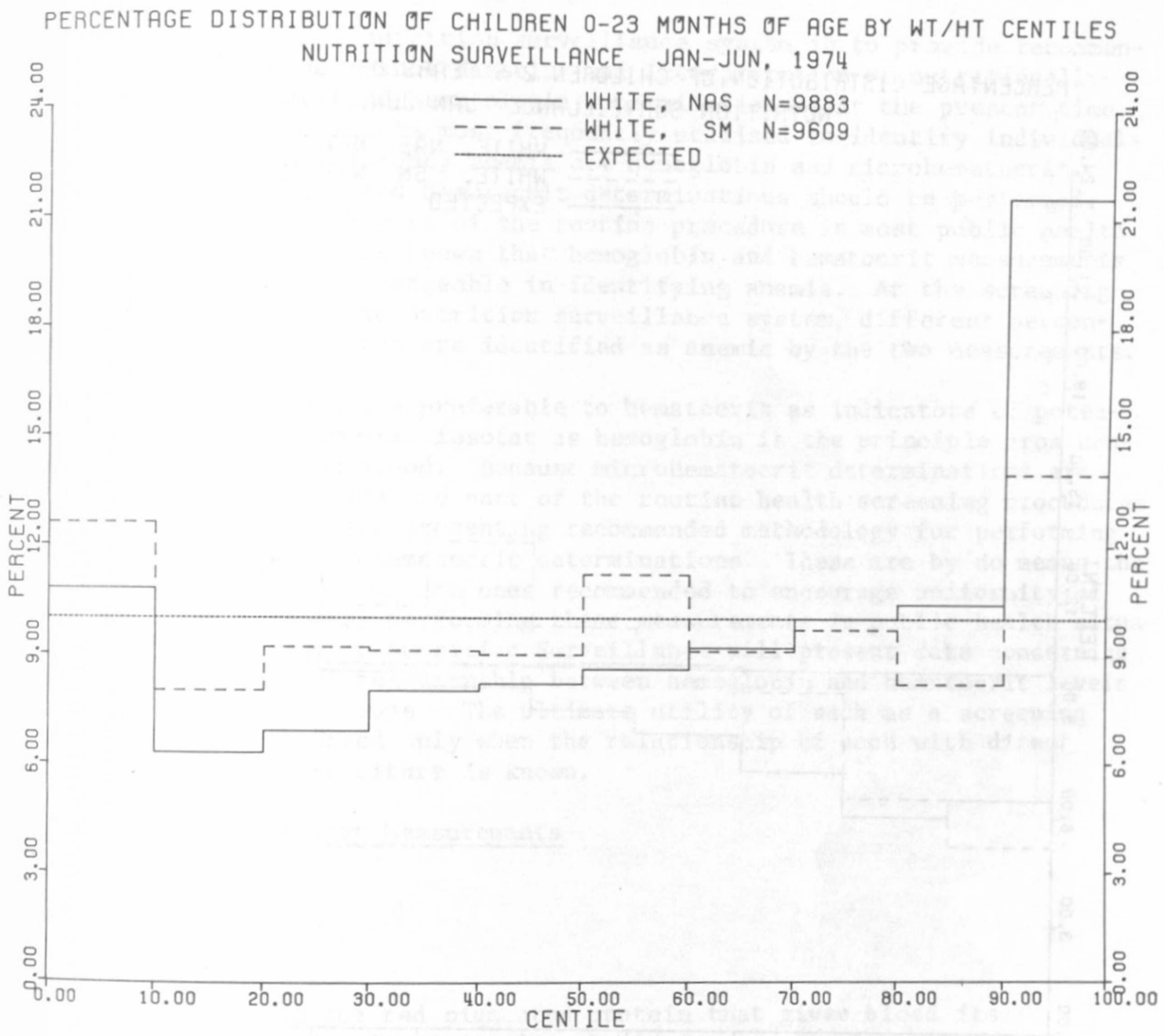
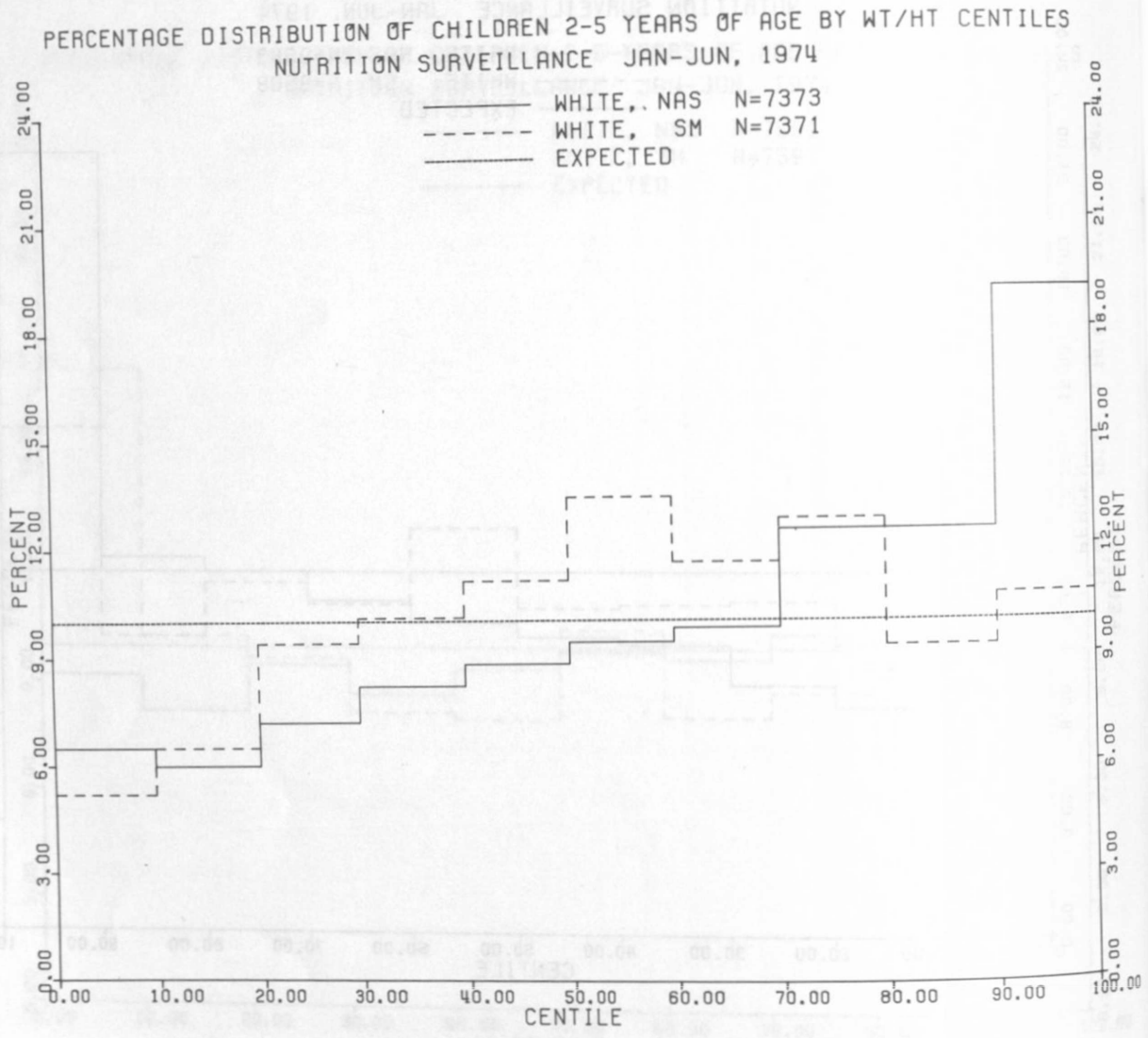


Figure V shows the distribution of 0-23 month old children in the surveillance program by weight-for-height centiles. There are very few children in the U.S. surveillance group who are undernourished as judged by excessive numbers below the 10th centile. The number of children judged to be acutely undernourished is slightly greater using the Stuart-Meredith reference as compared with the NAS reference. On the other hand, considerably more children are labeled overweight and potentially obese by the NAS reference population than by the Stuart-Meredith. The use of the NAS reference uncovers more overnutrition and labels a smaller percentage of the population as being underweight than does the Stuart-Meredith.

Figure VI



Weight-for-height centiles for the 2-5 year age group are shown in Figure VI. The distributions are essentially similar until one gets to the 90th centile. Here the NAS population again considers more children to be overweight, and therefore potentially obese, than does the Stuart-Meredith. By each of the reference populations, fewer children than expected are undernourished by the criteria of weight-for-height.

METHODOLOGY FOR PERFORMING HEMOGLOBIN AND HEMATOCRIT DETERMINATIONS

One of the goals of the nutrition surveillance system is to provide recommendations to improve the standardization and interpretation of nutritionally-related anthropometric and hematologic determinations. At the present time, the hematologic measurements most frequently utilized to identify individuals with potential iron deficiency anemia are hemoglobin and microhematocrit. Ideally both hemoglobin and hematocrit determinations should be performed, but only one of these is part of the routine procedure in most public health screening programs. It is known that hemoglobin and hematocrit measurements are not completely interchangeable in identifying anemia. At the screening levels recommended for the nutrition surveillance system, different percentages of groups of children are identified as anemic by the two measurements.

Hemoglobin measurements are preferable to hematocrit as indicators of potential iron deficiency anemia, insofar as hemoglobin is the principle iron containing compound in the blood. Because microhematocrit determinations are also useful indicators and are part of the routine health screening procedures in many situations, we are presenting recommended methodology for performing both hemoglobin and microhematocrit determinations. These are by no means the only acceptable methods but are ones recommended to encourage uniformity of technique among personnel performing these measurements in public health situations. A future issue of Nutrition Surveillance will present data concerning the complex statistical relationship between hemoglobin and hematocrit levels in various population groups. The ultimate utility of each as a screening indicator will be observed only when the relationship of each with direct measurements of iron nutriture is known.

Procedures for Hematology Measurements

A. Hemoglobin

1. Principle

Hemoglobin is the red pigmented protein that gives blood its characteristic red color. Hemoglobin is present almost entirely in the red blood cells and its main function in man is to transport oxygen from the lungs to the tissues.

The measurement of hemoglobin is important as an indicator of the presence or absence of potential iron deficiency anemia, one of the most prevalent nutritional problems in the United States. Iron deficiency anemia occurs when there is not enough iron for production of hemoglobin adequate for the needs of the body. It is seen most commonly in persons who have had chronic blood loss, multiple pregnancies, in children whose rate of growth outstrips their dietary iron, and in individuals of any age whose diets do not contain adequate amounts of absorbable iron.

2. Recommended Equipment*

a) Hemoglobin "Unopette" pipets, (e.g. Becton-Dickinson - 50 pipets and reservoirs, Scientific Products B4065-2).

b) Cyanmethemoglobin Standard - Hycel Cyanmethemoglobin Standard, equivalent to 20 gm/100 ml of blood (Scientific Products B4575).

c) Colorimeter, with cuvettes, preferably matched, (e.g. Spectronic 20 Spectrophotometer).

d) Graph paper, for standard curves.

e) Disposable plastic pipets, 5.0 ml (Scientific Products P4652).

f) Alcohol swabs.

g) Blood lancets, short and long points, (e.g. Becton-Dickinson, Scientific Products B2908-1 and B2908-3).

h) Cotton swabs.

i) Bandages, adhesive.

j) Marking pens for preprinted labels for specimen identification.

All of the above equipment and supplies are available from scientific equipment suppliers in addition to Scientific Products.

3. Obtaining blood samples

a) Fingerstick

(1) Clean middle finger or ring finger of patient's hand by rubbing with alcohol swab. Allow area to dry. Turn patient's hand palm upward.

(2) If you are right-handed, use the thumb and forefinger of your left hand to grip the patient's finger. Make a quick, but firm jab to the fleshy part of the fingertip. (Be prepared for a sudden, instinctive withdrawal movement by the patient.)

(3) If necessary use a gentle "milking" motion of your fingers to stimulate flow of blood. Be careful to avoid too much pressure, as this will cause tissue juices to be mixed with the blood and introduce error. If puncture is deep enough, adequate blood flow should result with minimum pressure or milking.

(4) Using a dry, gauze swab, wipe away the first two drops of blood.

(5) Remove the "Unopette" pipet from its shield. Use the shield to pierce the plastic cover of the bottle containing the diluting solution.

(6) Allow a drop of blood to form on the fingertip. Holding the pipet horizontally, touch the pipet to, but not into, this drop and allow the pipet to fill by capillary action.

(7) Contents of the pipet must be mixed thoroughly and quickly with the diluting solution to avoid clotting of the blood (and therefore loss of the sample). After the pipet is filled, wipe off any excess blood on the outside of the pipet, being careful not to touch the tip which would draw blood out.

(8) Loosely insert pipet into the opening of the "Unopette" bottle. While you gently squeeze and hold the side of the container, cover the opening of the pipet with your finger and push the pipet down into the neck until it clicks. Release the pressure and remove your finger from the pipet opening. The blood will thereby be drawn into the container. Rinse the pipet thoroughly by squeezing the container several times; be careful not to let the liquid overflow the neck.

(9) Place your finger over the opening in the top of the bottle (leaving pipet in container) and invert the bottle several times to mix the blood with the diluting solution. Let bottle stand for 15 minutes.

(10) Remove the pipet and squeeze contents of the bottle into a clean, dry cuvette for reading in the colorimeter and for measuring the hemoglobin.

(11) Be sure patient's finger is wiped off and bleeding has stopped. If desired, apply band-aid.

b) Foot Stick Procedure - exterior lower lateral side of sole of the heel. Foot sticks are essentially the same as fingersticks; the primary difference is the use of a longer point lancet. A rubbing motion from the toes to the heel on the bottom of the foot will help stimulate the blood flow especially if the baby's foot is cold. Babies may also be stuck in the big toe. Grasp the infant's foot firmly in your hand; babies can display great amounts of resistance and kick vigorously. Follow the same procedure for cleaning the puncture site and collecting the sample.

Always apply a band-aid when finished.

4. Routine Hemoglobin Measurement

a) Colorimeter - Turn on the colorimeter and allow it to warm up at least 15 minutes.

b) Blank - Pour the diluting solution from an opened unused "Unopette" into a clean, dry, cuvette. Set the colorimeter on 0.0 optical density at 540 nm. wavelength. This is your "blank" or zero gms/100 ml point.

c) Daily Checking Control - Using a commercial control (e.g. Hycel Hemoglobin Control, Scientific Products B4582-5*), fill the pipet with control from bottle just as if it were a patient's blood. Mix with the diluting solution, letting it stand for 15 minutes, then pour contents of the Unopette into a cuvette and read the optical density of the solution in the colorimeter. Compare this value to that provided by the manufacturer. Record your answers in a record book.

d) Standard Curve Preparation (Calibration) - The standard curve is used to determine the hemoglobin value from the optical density readings on the colorimeter. The higher the amount of hemoglobin in the blood, the darker the solution, and the higher the O.D. value.

The standard curve should be rechecked every time a new lot of Unopettes or a new hemoglobin control is used, and at least weekly. This will correct any slight variations in color which affect the hemoglobin determination.

Daily checks are made with the highest standard value (20 gms) and the blank (0 gms).

(1) Equipment Needed

(a) 3 Unopettes
(b) Hycel-Cyanmethemoglobin Standard
(c) 5 cuvettes and blank cuvette
(d) 5 ml serologic pipets

(2) Procedures

Mark 5 tubes B, 5, 10, 15, and 20. These will be equivalent to 0, 5, 10, 15, and 20 gms/100 ml hemoglobin. Make these dilutions as follows:

(a) In tube marked B place 6.0 ml of Unopette reagent.
(b) In tube marked 5 place 1.5 ml Standard Solution and 4.5 ml Unopette reagent.
(c) In tube marked 10 place 3.0 ml Standard Solution and 3.0 ml Unopette reagent.
(d) In tube marked 15 place 4.5 ml Standard Solution and 1.5 ml Unopette reagent.
(e) In tube marked 20 place 6.0 ml Standard Solution.

Mix all solutions well and transfer to cuvettes and read the optical density (O.D.). If one cuvette is used, rinse out well between readings.

e) Patient's Sample - Pour contents of mixed Unopette from patient's blood into a clean cuvette after letting it stand for 15 minutes. Read the optical density (O.D.) in the colorimeter. Find this O.D. reading on your standard curve (i.e., d above) and read the value of hemoglobin in grams/100 ml of blood from the calibration graph. The colorimeter should be rechecked periodically during the day with the cuvette to make sure the zero O.D. setting has not drifted significantly.

5. Precautions

a) Always allow 15 minutes warmup time for the colorimeter. This gives time for the tubes to reach a "steady" state. Allow Unopettes to stand 15 minutes after blood is added. After that they should remain stable for hours.

b) Be careful to regularly dispose of used lancets. Transmission of hepatitis is possible if you accidently stick yourself with a lancet used on an infected patient.

c) Treat cuvettes very gently. Any scratches or breaks will cause incorrect answers. Wash, rinse thoroughly, and dry cuvettes carefully after each use.

d) Blood must be mixed quickly with the diluting solution or clots will form making a reading impossible.

e) Remember that a bad fingerstick hurts as much as a good one, and probably will mean that you will have to stick the patient again. Be careful.

B. Hematocrit

1. Principle

The hematocrit is the volume of red blood cells expressed as a percentage of the volume of whole blood in a sample. It has approximately a 3:1 relationship to the hemoglobin concentration (Hematocrit = 3 X Hemoglobin + 1), and is frequently used as an indicator of potential iron deficiency anemia.

2. Equipment*

a) Capillary hematocrit tubes, glass, heparinized (Scientific Products, B4415-2A).

b) Clay sealant material for capillary tubes, (e.g. Seal-Ease or Crito-seal, Scientific Products B4425-S/P Critoseal or B4427 Seal-Ease).

c) Microhematocrit centrifuge, Adams (Scientific Products B4385).

d) Hematocrit reader, (Scientific Products B4397).

e) Fingerstick Equipment.

f) Capillary Tube Rack (Scientific Products B4435).

3. Procedure

a) Perform fingerstick as outlined for hemoglobin method, again wiping away first two drops of blood.

b) Touch the capillary tube to the drop of blood. Tilt the tube at an angle to help the flow of blood into the tube. Allow the tube to fill about 2/3 - 3/4 full of blood. Fill two capillary tubes in this manner.

c) Gently wipe off outside of tube, being careful not to touch the tip. Stick the dry end of the tube into clay sealer until a plug is formed.

d) Lay capillary tubes in rack (in correct order) while you finish the fingerstick procedure.

e) When ready to run the hematocrit determination, place capillary tube in centrifuge, keeping all specimens in order. Place tube with clay plugged end on the outside. If running only one determination, put extra tube on opposite side to balance centrifuge. Otherwise, balance according to number of specimens you are running.

f) Screw the locking plate down on centrifuge head. This protects the tubes. Close cover and lock in place. Turn timer to 5 minutes. Centrifuge will automatically gain speed, spin, and shut off.

g) When centrifuge stops, open lid, remove locking plate and set it aside. Take out capillary tube and place it in hematocrit reader so that the top of the plug line rests on the bottom of

the circular line. Adjust the top plate slightly by moving it using the finger hole to compensate for plug depth.

h) Turn the reader until the curved line rests on the top of the packed red cells (or the dividing line between red cells and plasma).

i) Read the value on the scale that is directly under the capillary tube. This is the hematocrit value.

4. Periodic Control

Using a commercially available red cell suspension (e.g. Curtin-Matheson Scientific 380-867 Coulter 4C*), sets of controls (both normal and abnormal) should be periodically added to the micro-hematocrit determination. They should be placed in the centrifuge together with other specimens and then read in the hematocrit reader. Values of the controls are compared with those provided by the manufacturer. If no commercial red cell controls are used, duplicate determinations should be performed about every tenth sample. (Note: This checks only the repeatability of the procedure, not the accuracy.)

The microhematocrit centrifuge should also be checked periodically, since wear and tear on the brushes prevents the centrifuge from obtaining the speed necessary to achieve optimum packing. The minimum speed is 8,500 r.p.m. while the optimum is 11,000 - 12,000 r.p.m.

5. Precautions

a) Always fill capillary tube at least 2/3 full. Too small a volume is difficult to read correctly.

b) Do not make a large sealing plug; approximately 1/4 inch is adequate, otherwise you cut down on the blood volume area.

c) Treat capillary tubes gently. Place tubes in centrifuge with plugged end to the outside. Avoid screwing locking lid down too tightly or you will shatter tubes.

d) Be careful to properly dispose of used lancets and capillary tubes. The danger of transmission of hepatitis is very great if you were to stick yourself accidentally with a lancet used on an infected person.

e) Use the second capillary tube as a check on the first answer, especailly if one tube is hemolyzed (plasma will be red because the red blood cells have been broken down) or if tube packs on a slant and is hard to read.

f) The gasket should be cleaned and checked regularly for nicks and broken glass.

*Inclusion of trade names is for identification only and does not imply endorsement by the Public Health Service or the U.S. Department of Health, Education, and Welfare.

FROM THE STATES . . .

Alaska - In FY-73, Early Periodic Screening, Diagnosis, and Treatment (EPSDT), identified potential anemia in 14% of 450 children in the age group 0-6 years. In FY-74, EPSDT conducted nutrition screening on 3,600 individuals between the ages of 0-21 years and identified potential anemia in 9% of this group. During the period March-December 1974, the Supplemental Feeding Program for Women, Infants, and Children (WIC) identified 33% of 128 infants and children with potential anemia. The criteria for identifying individuals with low hemoglobin values were 11 grams for children 6 months - 5 years, and 12 grams for children over 5 years of age.

Arizona - Cholesterol determinations are included in Arizona's battery of screening measurements. Children under 16 years of age with cholesterol levels greater than 160 mg.%, and adults with levels greater than 200 mg.% are enrolled in an intervention program designed to help avert cardiovascular disease. Intervention involves:

a. Determining other risk factors, such as smoking and family history of heart disease;

b. Prescribing a diet in which the animal protein does not exceed the RDA for total protein. This diet reduces the sources of animal fat and cholesterol by adjusting quantities, while maintaining the basic diet pattern; and

c. Reevaluation to determine if biochemical improvement can be demonstrated.

The following table presents the cholesterol distributions by age in 420 children screened between July 1 and December 31, 1974. Of note is the large number with cholesterols over 200 mg.% and the increase in the prevalence of high cholesterols with increasing age. These preliminary data together with other surveillance data regarding the prevalence of overweight and potential obesity continue to point to problems of overnutrition as being potentially a major concomitant of future morbidity and mortality due to a variety of chronic diseases.

Cholesterol Distributions by Age
Initial Visits Only, Arizona
July 1 - December 31, 1974

Cholesterol Level Mg/100 Ml	6 Months Through 1 Year		2 Years Through 5 Years		6 Years Through 12 Years		13 Years Through 17 Years		Total	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
<140	29	28.2	35	17.4	6	14.6	4	5.3	74	17.6
140 - 159	30	29.1	65	32.3	5	12.2	8	10.7	108	25.7
160 - 179	26	25.2	47	23.4	12	29.3	26	34.7	111	26.4
180 - 199	15	14.6	29	14.4	10	24.4	15	20.0	69	16.4
200 - 219	3	2.9	18	9.0	4	9.8	14	18.7	39	9.3
220 - 239	0	-	6	3.0	1	2.4	3	4.0	10	2.4
240 +	0	-	1	0.5	3	7.3	5	6.7	9	2.1
Total	103		201		41		75		420	