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NUTRITIONAL EVALUATION OF A NORMAL MILITARY POPULATION

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Report of

NUTRITIONAL EVALUATION OF A NORMAL MILITARY POPULATION

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NUTRITIONAL EVALUATION OF A NORMAL MILITARY POPULATION

OBJECT:

The object of this study was to gather anthropometric and biochemical information on military personnel of all ages living in the Denver, Colorado area. This should provide a reference group for other nutrition surveys of military populations.

SUMMARY:

Studies were conducted at four military installations including Fitzsimons General Hospital, Fort Carson, Lowry Air Force Base and Buckley Naval Air Station. Information on age, heights, body weights, blood pressures and skinfold thickness measurements at four sites, were collected on 4174 enlisted men. In addition, chemical analyses were performed on approximately 800 bloods and urines. Blood analyses included hemoglobin, hematocrits, plasma proteins, vitamin C, vitamin A, carotene, total cholesterol, total lipids and phospholipids. In the urine the vitamin excretions of thiamine, riboflavin and N^1methylnicotinamide were computed per gram of creatinine excreted.

Data were summarized by age groups and compared to the ICNND and other normal standards.

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INTRODUCTION

The evaluation of the nutritional status of man as reflected in relative emaciation, obesity, growth, skeletal and muscular development is still a major neglected area of human nutrition. The U. S. Armed Forces have never attempted to establish normal standards which would permit studies of the correlation between these factors and nutritional status. Recent studies by Pollack in Formosa (1) and by the Interdepartmental Committee on Nutrition for National Defense survey teams in 16 countries in Asia, Africa, Europe and South America (2) have stressed the importance of obtaining anthropometric and biochemical data on military personnel for purposes of comparison among surveys and with other groups. Anthropometric data from the surveys generally are compared with data from the 1912 medico-actuarial studies on civilian populations (3), and data on American military draftees in 1943 (4). For the last group data available are limited to age, height and weight at time of induction.

Another problem which is of concern to the U. S. Armed Forces is that of obesity, particularly among individuals in the older age groups, who are engaged in light or sedentary activities. Although the optimum size of body fat stores at various age levels has not been established with any great degree of precision, there is no doubt that other things being equal, the size of the body fat deposits reflects the extent of a positive caloric balance over a period of time.

Since height, weight, body composition, and various constituents of blood, urine and feces depend in part on the supply of nutrients, they may serve as useful, though limited, criteria of some aspects of nutritional status. The purpose of this study was to obtain anthropometric and biochemical data on military personnel at installations in the Denver, Colorado area. These data would contribute to the evaluation of the nutritional status of military populations.

EXPERIMENTAL DESIGN

The study was carried out in military establishments in the Denver, Colorado area. All sites were at altitudes above 5200 feet. A total of 4174 enlisted men between the ages of 17 and 59 years were examined. Included were 835 men at Fitzsimons General Hospital (FGH) 1548 men at Lowry Air Force Base (LAFB), 278 men at Buckley Naval Air Station (BNAS), all in the immediate vicinity of Denver, Colorado, and 1513 men at Fort Carson, Colorado Springs, Colorado.

Essentially, the study was divided into two phases, a physical or anthropometric, and a biochemical. The first phase applied to all men while the second applied to only every 4th or 5th man examined.

The men came to the survey team in groups of 30 to 40. After case histories were recorded the men stripped down to shorts and socks and were weighed on a Flima (French) balance. Weights were recorded to the nearest 20 grams, which is the limit of accuracy of the balance used. This balance was tested twice daily, morning and afternoon, using a standard 50-pound weight, and was adjusted as necessary.

Later the body weights recorded were also expressed as a per cent of standard weight, which can be defined as the average weight of individuals of the same sex, age and height. The standard weight values used in this study were derived from the medico-actuarial tables (3) by adjusting to an approximate nude weight and to height without shoes.

Heights were recorded to the nearest 0.2 centimeters. Skinfold measurements were taken at 4 different body sites. The selection of these particular sites was based on accessibility, relative homogeneity of the layer of skin and subcutaneous fat in a given area, precision in locating the site and the validity as an index of total body fat (6). The following sites were measured: a) dorsum of arm, taken at the midposterior midpoint between the acromion and the tip of the olecranon with the elbow in 90° flexion; b) chest juxta nipple, taken adjacent to the nipple between the anterior axillary line and the nipple, but not to include any glandular tissues; c) abdomen, at the umbilicus line; and d) subscapular (back), taken at the tip of the scapula with the subject in a relaxed standing position.

The calipers used for skinfold measurements were developed at this Laboratory (5), and had a circular face measuring 7.12 mm^2. They were calibrated, using a 70 gm weight to a pressure of 10 gm/mm^2. The application of the calipers was usually 1 cm from the fingers that held the skinfold and at a depth approximately equal to the thickness of the fold. All the skinfold measurements were taken in a vertical plane, except where the lines of Linn resulted in torsion of the skinfold, and then the skinfold was taken along these lines.

Other anthropometric measurements included those of calf, biceps, and elbow and knee joints, which will be reported later. Also recorded were pulse rates and blood pressures, taken while the men were seated and after having rested for one minute.

In the biochemical phase of the study bloods and urines were collected on every 4th or 5th man examined. The biochemical determinations on the blood included, vitamin A and carotene (7), ascorbic acid (8), hemoglobin (9), hematocrit (10), plasma protein (11), total cholesterol (12), total lipids (13), and phospholipids (14). The urine analyses included thiamine (15), riboflavin (16), N^1methylnicotinamide (17), and creatinine (18).

At FGH fasting urines (six hours) and bloods were examined so that a comparison could be made with random specimens taken at LAFB and Carson. The procedure was to collect all urine between midnight and 0600 hours, and to draw the blood samples at the latter hour. Bloods and urines were not examined at BNAS.

In addition to obtaining basic anthropometric and biochemical data, ancillary data recorded included years in service, military occupation, marital status, race, area of origin and whether the individual lived and ate his meals on or off the military reservation.

In summarizing the data, means and standard deviations were computed by age groups at each installation, and for the combined installations. The eight age groups used were: under 20, 20 - 24, 25 - 29, 30 - 34, 35 - 39, 40 - 44, 45 - 49, and 50 and over.

The military sample studied may not be truly representative of a normal American population and should be considered as a selective sample. Men entering the military services (Army, Navy and Air Force) are subject to minimum and maximum standards for height, weight and chest measurement. The minimum standard for height is 60 inches, for weight 105 pounds and for chest measurement 28.75 inches. This applies for black or white men. For Puerto Ricans, Filipinos and men of Oriental origin the minimums are height 60 inches, weight 101 pounds and chest measurement 28.5 inches. At the other extreme men above 78 inches in height can also be rejected by the Armed Services. Some exceptions can be made but men may be rejected for "excessive overweight which is greatly out of proportion to the height if it interferes with normal physical activity or with proper training" (19).

The men at FGH were classified as being in a category of light physical activity, since they were assigned primarily to either administrative duties or to specialized hospital positions, such as operating room personnel, x-ray and medical laboratory technicians, etc. The men at BNAS and LAFB were classified as engaged in light to moderate activities since the group at BNAS included administrative personnel and air craft technicians of various types and the group at LAFB included mostly trainees attending various special aviation training schools. The men at Carson, particularly in the younger age groups, would fall in the moderate to heavy physical activity category, since there were a large number of trainees or instructors in basic or advanced training activities.

RESULTS

The men studied ranged in age from 17 to 59 years. The largest number were in the 20 - 29 age groups, which contained slightly over 50% of the men (Table I). The "under 20" group had 6% and the "50 and over" group 2% of the total.

Heights and body weights are summarized by age groups in Table II. It is readily apparent that the mean heights at the various ages are not significantly different among the various installations. But it is of interest that the averages for the combined units are consistently and considerably higher than those for the 1912 medico-actuarial survey (Table III and Fig. 1). Mean heights for the combined units ranged from a high of 175.7 cm for the "below 20" age group to a low of 172.0 cm for the "50 and over" group. Comparable values from the medico-actuarial study are 169.2 and 171.5 cm. Comparative values for military inductees (4), Canadians (20), American Indians (21), and medico-actuarial 1959 (22) also are shown in Fig. 1. The per cent distribution of ages within the various height levels is shown in Table IV. Also shown is the distribution of subjects by height classification (Table IV and Fig. 2).

The mean body weights at the various age levels do not differ significantly among the four installations surveyed. However, here again the values are considerably higher than those derived from the 1912 medico-actuarial survey (Table III). The differences ranged from 1.37 kg for the "50 and over" group to 9.19 kg for the "under 20" age group. The average "per cent of standard weight" values for the same age groups were 101.4 and 105.8, respectively. Comparative values for military inductees, Canadians, American Indians and medico-actuarial 1959 are shown in Fig. 3. The per cent distribution of ages within the various weight levels is shown in Table V. Also shown is the distribution of subjects by weight classes (Table V and Fig. 4). Similar distributions of "per cent of standard weight" appear in Table VI and Fig. 6.

Mean skinfold thicknesses, as measured at four body sites on 4142 men, are presented by age group and military installation in Tables VII and VIIa. The age-group mean arm skinfolds ranged from 1.10 to 1.32 cm, for chest from 1.80 to 2.82 cm, for abdomen from 1.74 to 2.88 cm, and for subscapular from 1.42 to 2.10 cm.

Blood pressures were taken on 3309 men. Mean systolic and diastolic pressures and percentages of men with systolic pressures over 150 mm Hg were shown in Tables VIII and VIIIa, by age and by military installation. The mean systolic pressures ranged from 118 mm Hg for the "under 20" group to 128 mm Hg for the top 3 age groups. Mean diastolic pressures ranged from 73 for the "under 20" group to 87 mm Hg for the "50 and over" group. Figure 8 shows values from the present study and similar values from the 1959 medico-actuarial study and Lasser and Master (23). The number of men with systolic blood pressures of 150 mm or above constitute 5.2% of those for whom blood pressures were taken (Table IX). Including all those of 140 mm and over raises the proportion to 10.3%. The average body weights of men with blood pressures of 150 mm and over are considerably above the average for all men examined in all age groups except the "below 20" (Table IXa).

The average levels of various blood constituents by age groups are shown in Tables X and Xa. Averages for the four installations are not shown separately because of the small numbers involved in many of the categories. For the combined installations there are no significant differences between age groups. The overall averages and standard deviations were 15.9 gm/100 ± 1.13 for hemoglobins, 51.3% ± 3.33 for hematocrits, 6.51 gm/100 ± 0.64 for plasma protein, 124.6 mcg/100 ± 42.1 for serum carotene, 40.2 mcg/100 ± 13.7 for serum vitamin A and 0.83 mg/100 ± 0.33 for whole blood ascorbic acid. The ICNND has set up ranges for classifying blood and urine constituents into four suffioienoy categories, deficient, low, acceptable and high (Table XI). The reference values for hemoglobin and hematocrit are those for persons living at elevations of 5000 - 6000 feet since the men examined were living at that altitude. The proportions of the values in the present survey falling in each of the four categories are shown in Table XII. Very few of the values, with the exception of the plasma proteins were in the deficient range.

The average levels of urinary excretion of the vitamins, thiamine, riboflavin, and N^1methylnicotinamide are shown by age groups in Table XIII. The values are expressed in quantities per gram of creatinine. Expressed in this form thiamine excretion values ranged from 77 to 231 mcg per gram, with a mean of 143, riboflavin values from 670 to 1123 mcg per gram, with a mean of 776, and N^1methylnicotinamide values from 5.44 to 9.27 mg per gram with a mean of 6.20. There were no systematic increases or decreases with age. Shown in Table XIV are the proportions of the values falling within each of the ICNND interpretive groups.

The excretion of vitamins in the six-hour fasting urines taken at FGH are shown in Table XV both as quantities excreted in six hours and per gram of creatinine. Shown in Table XV are the proportions of the values for each manner of expression whioh fall within each of the ICNND standard groups. The quantities per gram of creatinine for the six hour fasting samples cannot be established as significantly different from corresponding values from the random samples in view of the wide range of values for each category in the ICNND standards.

Serum total cholesterol, total lipids, and phospholipids were determined on a total of 717 bloods drawn at FGH, LAFB and Carson (Table XVI). For all the lipid fractions there was an upward trend with increasing age (Fig. 10). In each case the lowest mean was that for "below 20" age group. The high mean for total cholesterol was found in the "50 and over" group, while for the other two fractions it was the "45 - 49" group. The range in means for cholesterol was 174 to 208 mg%, for total lipids 711 - 859 mg%, and for phospholipids 7.9 to 10.2 mg%.

DISCUSSION

Heights and Weights

The mean height of 175.7 cm for the "under 20" age group is consistently higher than corresponding values for similar age groups used for comparison. (Fig. 1) Men in this group averaged 2.3 cm taller than the military inductees of 1943, 6.5 cm taller than the 1912 medico-actuarial group, 1.9 cm taller than the 1959 medico-actuarial group, and 3.0 cm taller than the men in the 1955 Canadian survey. The mean for the youngest group was 3.7 cm ($1\frac{1}{2}$ inches) greater than that for the oldest group. The oldest age group (50 and over) averaged only slightly taller than men in comparable age groups in the other surveys cited. This suggests that for all the surveys, the men born during the years prior to World War I were of comparable height but that for those born later, there is a consistent tendency toward higher stature.

One reason for the increased height of United States and Canadian populations may be the relatively high standard of living in these countries. Food production has been high during the past 30 or more years and the economic level of the population generally has permitted the purchase and use of adequate quantities of the available foodstuffs. There also tends to be a very close association between good nutrition of the mothers during pregnancy and lactation and good nutrition of the offspring during the years of their maximum growth.

The average heights for the combined army units, FGH and Carson, were consistently below those for the combined navy-air force units, BNAS and LAFB. This may have been due to differences among the services in the admission standards for heights.

The average body weights by age groups for the men studied were consistently higher than corresponding values for other groups used for comparison (Fig. 3). There was a gradual increase in average weight in relation to age through the 40 - 44 age group, followed by a decrease in the last two age groups, where the number of men measured is small. The body weights in the present survey averaged considerably above those in the 1912 medico-actuarial tables. The differences ranged from 9.2 kg in the lowest age group to 4.2 and 1.4 for the 45 - 49 and 50 and over groups, respectively. The same trend of difference is true when comparison is made with the 1943 military inductees, and the Canadian survey.

The per cent of standard weight for height exceeded 130% for 5.8% of the men examined and fell below 80% for only 1.6% of all the men studied. A somewhat higher proportion of the Army personnel fell into the above 130% of standard weight group than was the case of the Navy and Air Force personnel.

The higher average level of body weights in the various age groups may be attributed in part to the increase in average heights. This again may be a reflection of the emphasis on vitamin and mineral supplementation, the enrichment of foods and the generally high economic status of the population of the United States. This permits the maintenance of a high level of nutriture which can and does often lead to over-nutrition and obesity.

Blood Pressures

As would be expected there was an increase in the average systolic and diastolic blood pressures with increase in age. Dispersion, as measured by the standard deviation, also increased both absolutely and relatively with increase in age. The blood pressure values by age groups in the present survey were, generally speaking, in the same ranges as those presented in the work of Lasser and Master (23), Robinson, et al. (24) and 1959 medico-actuarial reports (22). Only 5.2% of all systolic pressures taken were 150 mm Hg or greater. The proportion was 0.5% for the "under 20" age group and reached 12.9% for the "50 and over" group. Higher body weights tended to go with the higher blood pressures. Except for the "under 20" group, the average body weights for the men with blood pressures of 150 mm and over were higher than the averages for all men in each age group.

A very high percentage of the higher blood pressures were found in the army (FGH and Carson) groups, even though the average weights for the navy and air force (BNAS and LAFB) were consistently greater. This may reflect a difference in duties and physical condition. The navy and air force men were attending training schools of various types. On the other hand, except for some young trainees, the army men for the most part, were engaged in sedentary to light physical activities in performing duties as administrative and technical laboratory personnel.

Skinfold Measurements

The skinfold thickness measurements showed an increase with age at 3 of the 4 sites measured. The arm site yielded fairly constant averages over the entire age range covered by this study. This is not entirely consistent with the finding of Pascale, et al. (6) who felt that the arm site was one of the best for predicting body densities and fat from skinfold measurements. But it should be noted that they were working with an age group 26 years and under. Other studies with skinfold measurement data for men largely in the lower age groups are the USAMRNL Fort Carson study (25), Newman (26), and Brozek, et al. (27). The mean arm skinfold measurements are not too dissimilar in the five studies, but the means for the chest, abdomen and subscapular sites measured in the present study were substantially higher than those reported by Pascale (6) and in the Carson study (25). The difference is unexplained, but could be due either to differences in techniques or differences among men measured. The estimation of body fat from skinfold measurements will be discussed in a future report.

Blood Chemistry

The blood hemoglobin measurements, which had a mean of 15.9 gm/100 ml and the blood hematocrits with a mean of 51.3%, were both in the high normal range as established by the ICNND. This is not surprising since practically all the personnel examined had been living for some time at a mile high or better altitude. Wintrobe (28) has presented data showing that the mean hematocrits are 47% for men living at sea level. In the Pole Mountain experiment (31) blood hemoglobins averaged 16.2 gm/100 ml after two weeks at 8300 feet altitude. The average values in the present study are in the same range (14.3 - 17.4 gm/100 ml) as the normal American values reported by Phillips, et al. (9), Wintrobe (28), and the values on American Navaho Indians reported by Darby, et al. (21). Only 0.1% of the men had hemoglobin values in the ICNND deficient range of less than 12.3 gm and only 0.3% had hematocrit values in the deficient range of less than 38%. There was no systematic increase or decrease with age increase for either of these blood constituents.

The mean plasma protein values also showed no increase or decrease with age change. The mean value of 6.51 gm/100 ml is slightly lower than values reported by Darby, et al. (21) for Navaho Indians. Tested against ICNND standards, 16.5% of the men examined were in the deficient range of less than 6.0 gm/100 ml but with only 3.1% having values below 5.5 gm (Table XII). The use of 6.0 gm/100 as the dividing line for protein deficiency by the ICNND is subject to some question as slightly lower values frequently are found in normal populations. In a study at Fort Carson in 1946 (32), using the Phillips $CuSO_4$ method for protein (11), the range for 595 men was 5.4 to 7.3 gm/100 ml with a mean of 6.4 gm/100 ml. This was also true for a group of 85 men during the Canadian Winter Trial of 1944, where the range was 5.3 - 7.2 gm/100 ml with a mean of 6.3 gm/100 ml (32).

Whole blood ascorbic acid values did not seem to vary with age. The mean blood value of 0.83 mg% is roughly equivalent to an intake of at least 80 mg of ascorbic acid per day. Bessey (29) feels that a normal range for whole blood ascorbic acid is from 0.60 to 1.00 mg/100 ml. Fisher, et al. (30) found blood levels of 0.6 to 1.0 mg% on daily intakes of 60 - 75 mg of ascorbic acid, and the Pole Mountain study (31) showed a mean blood level of 0.64 mg% on a daily intake of 60 mg. None of the vitamin C values in this study were in the deficient ICNND interpretive range.

Neither serum vitamin A nor carotene increased greatly with age as reported by Leitner, et al. (33). Only 0.3% of the men were in the ICNND deficient range for vitamin A and none were deficient in carotene. Bessey (29) cites values of 15 - 20 mcg/100 ml as evidences of vitamin A deficiency and considers values of 30 - 40 mcg/100 ml to be in the normal range. No deficiency blood carotene levels have been specified; but Bessey (29) considers the normal range of carotene values to be 75 - 200 mcg/100 ml, the wide range usually reflecting variations in the daily dietary intake of yellow and green vegetables.

Blood levels for total cholesterol, total lipids and phospholipids all showed increases with increases in age (Fig. 10). The average values by age groups were in the same range as values reported by Keys, et al. (34) using the same method, for ages up to 40. Above this age values in the present study were lower, but this may be due to the small number of men examined in the older age groups. Lawry, et al. (35) reported values by ages that fairly closely paralleled the present study but were approximately 25 mg% higher (Fig. 10). A comparison was made of fasting blood and random blood levels (Table XVII). Much to our surprise only the vitamin C and carotene levels were increased after a meal.

Urinary Excretion

There was no apparent direct relationship between excretions of thiamine, riboflavin and N^1MN with age. Thiamine values for 11.3% of the men fell in the ICNND deficient range of below 27 mcg/gm of creatinine. There may be various reasons for the deficient thiamine excretions by ICNND standards. Of the 11.3% of the men in the deficient range, 90% were married and only 10% single men. It may be assumed that married men may eat one meal (at noon time) at the military mess, since they are authorized to eat anywhere they choose. The single men eating at the military mess have access to a very good balanced diet, containing all the essential nutrients as prescribed by the Master Menu. On the other hand the married men living at home eat what they like, even though it may not always be a well-balanced meal. A positive identification of a vitamin deficiency cannot be based on one day's urinary excretion alone. In the evaluation of nutritional status, there usually must be a positive correlation between vitamin excretion levels, dietary intake and the clinical evaluation of nutritional deficiency signs. None of the men were deficient in riboflavin and only 0.3% were deficient in N^1MN by ICNND standards. There is no readily apparent explanation for the relatively low thiamine excretions in this study, especially since the men appeared to be a fairly healthy American population with normal nutrition.

When the values for thiamine, riboflavin and N^1MN were expressed in terms of amounts per gram of creatinine it was recognized that the creatinine factor might be influenced by body size, diurnal variation in creatinine excretion, and the dietary intake of creatinine. However, Plough and Consolazio (36) have shown that the urinary excretion of these vitamins can be predicted within units of $\pm$ 30 - 40% from urinary excretions expressed per gram of creatinine. At FGH, where fasting six-hour urine excretions were available a comparison was made between total excretions and excretion expressed per gram of creatinine. The two values for individuals, when tested against comparable ICNND standards, were fairly close together in assigning men to the various sufficiency classes, especially in the deficient range. These results are in general agreement with Plough, *et al.* (36) who report that the use of fasting urine samples gives more accurate results in a biochemical evaluation of nutritional status.

SUMMARY AND CONCLUSIONS

The nutritional status of military personnel from the Army, Navy and Air Force in all age groups were evaluated both anthropometrically and biochemically. Anthropometric measurements were collected on 4174 enlisted men and included age, heights, body weights, blood pressures and skinfold thicknesses. Biochemical analyses in bloods and urines were done on approximately 800 samples.

The data was analyzed by age groups and compared to the ICNND and other normal data in the literature.

The following conclusions were noted in the data:

1. There was a decrease in height with age (175.7 - 172.0 cm), the tallest men being in the youngest age group.

2. The body weights increased with age up to age 45 years (69.9 - 77.3 kg).

3. There was an increase in 3 of the 4 skinfold thickness measurements with an increase in age (chest, abdomen and subscapular).

4. Of all the blood and urine data only total cholesterol, total lipids and phospholipids, showed an increase with age.

5. 11.3% of the thiamine excretions/gm of creatinine were in the deficient ICNND range and 16.0% of the plasma protein values were in the deficient ICNND range of below 6.0 gm.

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TABLE I

ANTHROPOMETRIC MEASUREMENTS ON MILITARY PERSONNEL

Number of Men, By Age Group and By Military Installation

Age Group	Fitzsimons GH	Fort Carson	Lowry AFB	Buckley NAS	Total No.
Under 20	30	40	171	9	250
20 - 24	302	397	440	71	1210
25 - 29	153	282	537	44	1016
30 - 34	107	184	215	50	556
35 - 39	116	241	128	51	536
40 - 44	72	201	43	44	360
45 - 49	32	113	10	6	161
50 and Over	23	55	4	3	85
Totals	835	1513	1548	278	4174

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45 - 49	32	113	10	6	161
50 and Over	23	55	4	3	85
Totals	835	1513	1548	278	4174

TABLE II

ANTHROPOMETRIC MEASUREMENTS ON MILITARY PERSONNEL

Height (cm), No Shoes: Means and Standard Deviations
By Age Group and By Military Installation

Age Group	Fitzsimons GH (Army) ± S.D.	Fort Carson (Army) ± S.D.	Lowry AFB (Air Force) ± S.D.	Buckley NAS (Navy) ± S.D.
Under 20	175.9 ± 7.3	173.0 ± 6.3	176.2 ± 6.6	179.0 ± -
20 - 24	175.2 ± 6.4	174.4 ± 7.2	175.2 ± 6.9	175.0 ± 6.1
25 - 29	174.0 ± 7.3	173.7 ± 6.7	175.9 ± 4.8	176.0 ± 5.3
30 - 34	173.2 ± 6.8	173.5 ± 7.0	175.0 ± 6.7	174.9 ± 6.6
35 - 39	173.7 ± 6.0	172.2 ± 6.7	175.3 ± 5.7	173.9 ± 5.7
40 - 44	173.6 ± 6.0	173.9 ± 7.3	174.6 ± 6.0	175.4 ± -
45 - 49	171.6 ± 6.0	172.5 ± 7.2	173.2 ± 6.8	170.5 ± -
50 and Over	171.7 ± 5.7	172.0 ± 6.7	171.0 ± 6.2	173.4 ± -

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Body Weight (kg), Nude: Means and Standard Deviations
By Age Group and By Military Installation

Age Group	Fitzsimons GH (Army) ± S.D.	Fort Carson (Army) ± S.D.	Lowry AFB (Air Force) ± S.D.	Buckley NAS (Navy) ± S.D.
Under 20	68.51 ± 7.6	69.16 ± 8.8	70.42 ± 9.3	68.51 ± -
20 - 24	73.53 ± 11.1	71.32 ± 10.0	71.50 ± 10.2	73.25 ± 11.2
25 - 29	74.58 ± 10.9	74.33 ± 12.8	74.31 ± 11.4	74.66 ± 11.9
30 - 34	75.81 ± 15.4	76.85 ± 12.7	76.20 ± 11.8	74.47 ± 9.2
35 - 39	75.95 ± 11.0	75.78 ± 14.0	77.24 ± 11.7	77.22 ± 13.5
40 - 44	75.82 ± 11.7	77.07 ± 12.6	78.71 ± 12.2	83.48 ± -
45 - 49	76.34 ± 11.8	76.08 ± 13.9	79.65 ± 13.2	79.60 ± -
50 and Over	75.71 ± 11.1	73.60 ± 11.6	69.90 ± 12.3	74.60 ± -

TABLE III

ANTHROPOMETRIC MEASUREMENTS ON MILITARY PERSONNEL

Average Height and Body Weight,
Military and 1912 Medico-Actuarial
And Average Per Cent of Standard Weight for Military
By Age Groups

Age Group	Height (cm) Military 1957-59	Height (cm) Medico-Actuarial 1912	Height (cm) Difference	Weight (kg) Military 1957-59	Weight (kg) Medico-Actuarial 1912	Weight (kg) Difference	Per Cent of Standard Weight Military
Under 20	175.7	169.2	+6.5	69.93	60.74	+9.19	105.8
20 - 24	174.8	171.3	+3.5	72.05	64.95	+7.10	105.7
25 - 29	175.0	171.6	+3.4	74.37	66.95	+7.42	105.6
30 - 34	174.2	171.6	+2.6	76.18	68.81	+7.37	106.7
35 - 39	173.4	171.5	+1.8	76.31	70.35	+5.96	106.0
40 - 44	174.0	171.5	+2.5	77.30	71.30	+6.00	103.9
45 - 49	172.3	171.4	+0.9	76.49	72.30	+4.19	104.5
50 and Over	172.0	171.5	+0.5	74.17	72.80	+1.37	101.4

TABLE IV

ANTHROPOMETRIC MEASUREMENTS ON MILITARY PERSONNEL

Per Cent Distribution of Heights, By Height Classes
And By Ages Within Height Classes

	All Groups		Age Group							
Height (cm)	Number of Men	Per Cent of Total	Under 20	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 & Over
150 - 154.9	21	0.5	0.0	20.0	15.0	30.0	15.0	10.0	10.0	0.0
155 - 159.9	48	1.2	4.4	20.0	15.6	15.6	22.1	6.7	8.9	6.7
160 - 164.9	230	5.5	4.2	24.5	24.1	10.9	17.4	7.1	9.0	2.8
165 - 169.9	698	16.7	4.8	25.8	21.2	14.2	15.4	10.5	5.3	2.8
170 - 174.9	1199	28.7	5.8	25.2	25.0	15.8	14.5	7.7	3.3	2.7
175 - 179.9	1131	27.1	7.4	28.0	26.0	12.9	12.9	6.6	4.3	1.9
180 - 184.9	622	14.9	6.6	28.2	27.0	13.5	11.8	8.9	3.0	1.0
185 - 189.9	176	4.2	4.3	32.1	31.5	13.0	7.4	9.2	1.9	0.6
190+	49	1.2	10.9	37.0	23.9	15.2	4.3	8.7	0.0	0.0

TABLE V

ANTHROPOMETRIC MEASUREMENTS ON MILITARY PERSONNEL

Per Cent Distribution of Weights, By Weight Classes
And By Ages Within Weight Classes

Weight (kg)	All Groups		Age Group							
	Number of Men	Percent of Total	Under 20	20 - 24	25 - 29	30 - 34	35 - 39	40 - 44	45 - 49	50 & Over
50 - 53.9	87	2.1	1.4	25.8	28.6	17.1	7.1	4.3	5.7	10.0
54 - 57.9	196	4.7	1.9	35.0	31.1	9.4	11.9	4.4	6.3	0.0
58 - 61.9	246	5.9	1.5	26.3	36.9	13.1	9.6	6.6	3.5	1.5
62 - 65.9	452	10.8	3.0	33.6	21.7	13.7	13.7	9.1	3.0	2.2
66 - 69.9	580	13.9	1.5	27.8	31.5	12.8	14.3	7.4	3.2	1.5
70 - 73.9	572	13.7	1.1	26.9	26.7	15.5	13.6	8.8	5.0	2.4
74 - 77.9	626	15.0	1.0	27.4	25.9	18.2	11.5	10.0	4.0	2.2
78 - 81.9	434	10.4	1.4	20.2	29.6	14.0	16.5	9.7	4.0	4.6
82 - 85.9	355	8.5	1.0	20.4	25.9	19.6	14.0	12.9	4.5	1.7
86 - 89.9	213	5.1	0.6	19.5	31.1	11.5	19.5	9.2	6.3	2.3
90+	413	9.9	0.0	12.5	28.1	19.4	18.2	12.5	7.2	2.1

TABLE VI

ANTHROPOMETRIC MEASUREMENTS ON MILITARY PERSONNEL

Per Cent Distribution of "Per Cent of Standard Weight"
Within Age Groups

Age Group	Number of Men	70-79	80-89	90-99	100-109	110-119	120-129	130-139	140+
Under 20	250	0.4	2.8	30.4	34.8	22.0	6.0	2.4	1.2
20 - 24	1210	0.7	8.2	25.3	33.2	20.3	7.8	3.1	1.2
24 - 29	1016	1.1	3.1	29.1	31.8	17.0	11.0	3.7	3.1
30 - 34	556	2.3	11.4	18.6	28.2	24.3	8.4	5.8	2.9
35 - 39	536	1.9	8.2	26.7	29.3	17.7	10.5	3.2	2.6
40 - 44	330	2.4	10.3	27.6	27.6	15.8	10.6	3.6	2.1
45 - 49	161	5.0	12.4	21.8	30.4	15.5	6.8	6.2	1.9
50 & Over	85	7.1	8.2	21.2	37.7	21.2	1.8	3.6	1.8
Totals	4144	1.6	7.4	25.7	31.2	19.3	9.0	3.7	2.1

TABLE VII

ANTHROPOMETRIC MEASUREMENTS ON MILITARY PERSONNEL

Skinfold Thickness (cm), Means and Standard Diviations, By Age Groups and By Installation

Age Group	Number of Men	ARM Mean	ARM S.D.	CHEST Mean	CHEST S.D.	ABDOMEN Mean	ABDOMEN S.D.	SUBSCAPULAR Mean	SUBSCAPULAR S.D.
Fitzsimons GH									
Under 20	30	1.01	0.24	1.31	0.64	1.47	0.73	1.17	0.32
20 - 24	302	1.13	0.53	2.03	1.19	2.13	1.17	1.61	0.78
25 - 29	153	1.18	0.55	2.55	1.31	2.48	1.27	1.90	0.96
30 - 34	107	1.18	0.57	2.76	1.48	2.79	1.37	2.02	1.07
35 - 39	116	1.18	0.45	3.14	1.24	2.95	1.25	2.30	0.97
40 - 44	72	1.08	0.48	3.07	1.31	2.90	1.24	2.16	0.95
45 - 49	32	1.20	0.58	3.46	1.29	3.36	1.22	2.43	0.95
50 and Over	23	1.19	0.42	3.46	1.21	3.24	1.09	2.35	0.75
Combined Ages	835	1.10	0.60	2.53	1.36	2.51	1.29	1.89	0.95
Fort Carson									
Under 20	40	1.30	0.71	1.59	0.78	1.77	0.83	1.59	0.70
20 - 24	398	1.63	0.84	2.00	1.00	2.14	0.98	1.96	0.85
25 - 29	281	1.46	0.78	1.89	1.16	2.16	1.11	1.88	0.90
30 - 34	184	1.60	0.77	2.24	1.11	2.56	1.17	2.07	0.93
35 - 39	241	1.40	0.70	2.21	1.06	2.52	1.15	1.90	0.84
40 - 44	201	1.23	0.59	2.40	1.14	2.52	1.16	1.90	0.79
45 - 49	113	1.22	0.65	2.58	1.29	2.73	1.21	1.96	0.87
50 and Over	55	1.31	0.75	2.56	1.13	2.46	1.09	1.92	1.10
Combined Ages	1513	1.45	0.76	2.15	1.12	2.35	1.12	1.93	0.87
Lowry AFB									
Under 20	171	1.08	0.39	1.96	0.94	1.78	0.89	1.44	0.63
20 - 24	438	1.10	0.51	2.03	1.08	1.93	1.06	1.61	0.74
25 - 29	536	1.12	0.55	2.31	1.12	2.33	1.19	1.78	0.80
30 - 34	216	1.21	0.54	2.52	1.15	2.48	1.02	1.95	0.78
35 - 39	128	1.23	0.51	2.64	1.07	2.52	0.99	1.90	0.67
40 - 44	44	1.17	0.55	2.99	1.09	2.94	1.09	2.17	0.88
45 - 49	10	1.12	0.42	2.94	1.01	2.74	1.34	1.99	0.87
50 and Over	3	1.50	0.40	2.40	1.60	2.33	0.46	1.80	0.66
Combined Ages	1546	1.13	0.52	2.27	1.12	2.21	1.13	1.74	0.77
Buckley NAS									
Under 20	9	0.98	0.41	1.72	0.92	1.83	0.84	1.25	0.60
20 - 24	71	1.15	0.51	2.47	1.10	2.74	1.15	2.34	1.12
25 - 29	44	0.99	0.48	2.21	1.18	2.28	1.28	1.66	0.91
30 - 34	50	1.09	0.40	2.49	0.97	2.63	1.11	1.86	0.72
35 - 39	51	1.13	0.42	2.71	1.18	2.74	1.33	2.06	0.89
40 - 44	14	1.08	0.37	3.66	1.04	3.57	1.08	2.38	1.02
45 - 49	6	1.43	0.50	3.85	1.17	3.43	1.26	3.17	1.21
50 and Over	3	0.87	-	2.90	-	2.50	-	1.60	-
Combined Ages	248	1.10	0.45	2.56	1.16	2.66	1.23	2.04	0.99

TABLE VIIa

ANTHROPOMETRIC MEASUREMENTS ON MILITARY PERSONNEL

Skinfold Thickness (cm), Means and Standard Deviations, By Age Groups for All Installations Combined

Age Group	Number of Men	Skinfold Thickness ARM Mean ± S.D.	CHEST Mean ± S.D.	ABDOMEN Mean ± S.D.	SUBSCAPULAR Mean ± S.D.
Under 20	250	1.10 ± 0.42	1.80 ± 0.88	1.74 ± 0.86	1.42 ± 0.60
20 - 24	1209	1.28 ± 0.62	2.05 ± 1.08	2.10 ± 1.07	1.77 ± 0.81
25 - 29	1014	1.22 ± 0.61	2.23 ± 1.16	2.30 ± 1.18	1.82 ± 0.86
30 - 34	557	1.32 ± 0.61	2.47 ± 1.18	2.58 ± 1.14	2.00 ± 0.88
35 - 39	536	1.29 ± 0.57	2.56 ± 1.11	2.63 ± 1.15	2.00 ± 0.83
40 - 44	331	1.18 ± 0.55	2.68 ± 1.17	2.70 ± 1.16	2.01 ± 0.85
45 - 49	161	1.22 ± 0.62	2.82 ± 1.27	2.88 ± 1.22	2.10 ± 0.90
50 and Over	84	1.27 ± 0.64	2.81 ± 1.17	2.67 ± 1.07	2.02 ± 0.98

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Comparisons of Skinfold Thickness in Other Studies (cm)

Present Study	1.28	2.05	2.10	1.77
Pascale (1955)	1.21	1.36	1.64	1.22
Carson (1956)	1.34	1.42	1.56	1.33
Brozek, et al. (1958)	1.30	-	-	-
Newman (1956)	1.14	1.00	1.46	1.36

TABLE VIII

BLOOD PRESSURES OF MILITARY PERSONNEL

Systolic and Diastolic Pressures, Means and Standard Deviations, By Age Groups and By Installation

Installation	Number of Men	Systolic Pressure Mean ± S.D. (mm) (mm)	Systolic Pressure % 150 mm and Over	Diastolic Pressure Mean ± S.D. (mm) (mm)
Fitzsimons GH				
Under 20	30	124 ± 13	3.9	76 ± 9
20 - 24	303	128 ± 13	15.7	80 ± 10
25 - 29	153	127 ± 12	7.8	81 ± 10
30 - 34	107	128 ± 13	13.7	83 ± 12
35 - 39	116	131 ± 14	29.4	86 ± 12
40 - 44	73	129 ± 15	11.8	85 ± 12
45 - 49	32	133 ± 17	7.8	87 ± 12
50 and Over	23	133 ± 17	9.8	87 ± 13
Fort Carson				
Under 20	30	122 ± 10	0.0	80 ± 7
20 - 24	348	124 ± 14	4.9	80 ± 10
25 - 29	243	124 ± 14	4.5	82 ± 11
30 - 34	170	124 ± 15	5.3	83 ± 12
35 - 39	236	129 ± 17	9.7	86 ± 13
40 - 44	197	128 ± 17	9.1	85 ± 12
45 - 49	109	127 ± 20	11.0	83 ± 14
50 and Over	53	126 ± 19	9.4	88 ± 13
Lowry AFB				
Under 20	171	117 ± 12	0.0	72 ± 9
20 - 24	415	119 ± 13	2.2	74 ± 10
25 - 29	390	119 ± 12	0.5	81 ± 10
30 - 34	161	121 ± 14	0.6	82 ± 12
35 - 39	96	121 ± 12	3.1	82 ± 12
40 - 44	29	125 ± 17	6.9	86 ± 12
45 - 49	5	124 ± 16	0.0	80 ± 13
50 and Over	3	116 ± 29	0.0	83 ± 21
Buckley NAS				
Under 20	9	116 ± 15	0.0	68 ± 12
20 - 24	71	119 ± 11	0.0	74 ± 9
25 - 29	44	118 ± 9	0.0	71 ± 9
30 - 34	49	119 ± 11	2.0	77 ± 11
35 - 39	51	121 ± 12	2.0	75 ± 10
40 - 44	14	121 ± 12	0.0	81 ± 12
45 - 49	6	126 ± 14	0.0	83 ± 12
50 and Over	3	129 ± 21	33.3	76 ± 12

TABLE VIIIa

BLOOD PRESSURES OF MILITARY PERSONNEL

Systolic and Diastolic Pressures, Means and Standard Deviations, By Age Groups

Age Group	Number of Men	Systolic Pressure (mm) Mean ± S.D.	Systolic Pressure % 150 mm and Over	Diastolic Pressure (mm) Mean ± S.D.
Under 20	240	118 ± 12	0.5	73 ± 9
20 - 24	1137	123 ± 13	2.4	77 ± 10
25 - 29	830	122 ± 12	1.7	81 ± 10
30 - 34	474	123 ± 14	4.7	82 ± 12
35 - 39	499	127 ± 15	8.1	84 ± 12
40 - 44	313	128 ± 16	10.5	85 ± 12
45 - 49	152	128 ± 19	12.4	84 ± 13
50 and Over	82	128 ± 19	12.9	87 ± 13

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Comparisons of Systolic Blood Pressures in Other Studies (mm Hg)

	Actuarial 1959	Lasser, et al.	Robinson, et al.
Under 20	117	-	-
20 - 24	119	123	119
25 - 29	121	126	119
30 - 34	122	127	118
35 - 39	123	129	118
40 - 44	124	130	120
45 - 49	126	135	123
50 and Over	129	138	128

TABLE IX

BLOOD PRESSURES OF MILITARY PERSONNEL

Systolic Blood Pressure: Number of Men With Pressures Of 140 mm and Above, By Age Group and By Pressure Levels

Age Group	Number of Men	Blood Pressures, mm Hg					
		140-149	150-159	160-169	170-179	180-189	190+
Under 20	240	13	2	0	0	0	0
20 - 24	1137	45	19	10	1	0	0
25 - 29	830	37	10	6	1	2	0
30 - 34	474	24	23	5	2	0	0
35 - 39	499	33	33	8	2	1	1
40 - 44	313	24	21	4	6	1	0
45 - 49	152	14	10	6	4	0	1
50 and Over	82	5	6	4	3	0	0

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TABLE IXa

Body Weights of Men and Those With Blood Pressures Of 150 mm and Over, By Age Groups

Age Group	All Men	Body Weights of Men w/BP 150 mm and Over	Difference
Under 20	69.9	64.7	-5.2
20 - 24	72.1	77.2	+5.1
25 - 29	74.4	86.4	+12.0
30 - 34	76.2	84.2	+8.0
35 - 39	76.3	88.5	+12.2
40 - 44	77.3	82.8	+5.5
45 - 49	76.5	84.5	+8.0
50 and Over	74.2	75.8	+1.6

TABLE X

BLOOD ANALYSES ON MILITARY PERSONNEL

Means and Standard Deviations for Selected Constituents
By Age Group, for All Installations Combined

Age Group	Number of Men	Hemoglobin (gm/100 ml) Mean ± S.D.	Number of Men	Hematocrit (%) Mean ± S.D.
Under 20	21	16.2 ± 0.86	22	52.0 ± 2.19
20 - 24	120	16.2 ± 0.86	120	51.4 ± 2.63
25 - 29	171	15.9 ± 1.16	176	51.4 ± 3.92
30 - 34	150	15.4 ± 1.00	146	51.3 ± 3.44
35 - 39	165	15.9 ± 1.24	159	51.0 ± 2.95
40 - 44	89	15.6 ± 1.13	86	51.3 ± 3.58
45 - 49	68	15.9 ± 1.26	63	50.7 ± 3.30
50 and Over	48	16.3 ± 1.16	45	51.6 ± 3.00
Mean	832	15.9 ± 1.13	817	51.3 ± 3.33
		Plasma Protein (gm/100 ml)		**Serum Carotene (mcg/100 ml)**
Under 20	21	6.84 ± 0.42	21	133.7 ± 80.1
20 - 24	122	6.76 ± 0.46	109	128.3 ± 44.0
25 - 29	184	6.37 ± 0.67	146	116.0 ± 37.5
30 - 34	155	6.26 ± 0.70	138	121.6 ± 37.7
35 - 39	165	6.45 ± 0.63	139	125.2 ± 46.8
40 - 44	91	6.59 ± 0.59	87	120.9 ± 40.9
45 - 49	70	6.69 ± 0.44	52	142.9 ± 46.2
50 and Over	48	6.64 ± 0.55	41	134.0 ± 52.4
Mean	856	6.51 ± 0.64	733	124.6 ± 42.1
		Serum Vitamin A (mcg/100 ml)		**Whole Blood Ascorbic Acid (mg/100 ml)**
Under 20	21	40.4 ± 8.3	16	1.19 ± 0.43
20 - 24	107	41.3 ± 9.2	106	0.98 ± 0.39
25 - 29	145	40.0 ± 14.6	149	0.75 ± 0.20
30 - 34	137	34.8 ± 13.2	122	0.80 ± 0.40
35 - 39	138	40.1 ± 14.2	136	0.83 ± 0.35
40 - 44	84	44.5 ± 16.9	83	0.71 ± 0.30
45 - 49	51	44.5 ± 11.7	53	0.79 ± 0.32
50 and Over	41	42.4 ± 13.8	53	0.92 ± 0.37
Mean	724	40.2 ± 13.7	698	0.83 ± 0.33

TABLE XI

ICNND Suggested Guide to Interpretation Of Blood and Urine Data, Adult Man Living at 5,000 Feet Elevation

	Deficient	Low	Acceptable	High
Blood				
Hemoglobin, gm/100 ml	<12.3	12.3-14.2	14.3-15.6	>15.6
Hematocrit, %	<38	38 - 43	44 - 47	>47
Total Plasma Protein, gm/100 ml	<6.0	6.0-6.4	6.5-7.0	>7.0
Plasma Ascorbic Acid, mg/100 ml	<0.1	0.1-0.19	0.2-2.4	>0.4
Plasma Vitamin A, mcg/100 ml	<10	10 - 19	20 - 50	>50
Plasma Carotene, mcg/100 ml	<20	20 - 39	40 - 100	>100
Urine				
N^1MN, mg/gm creatinine	<0.5	0.5-1.59	1.6-4.3	>4.3
Riboflavin, mcg/gm creatinine	<27	27 - 79	80 - 270	>270
Thiamine, mcg/gm creatinine	<27	27 - 65	66 - 130	>130

TABLE XII

BLOOD ANALYSES OF MILITARY PERSONNEL

Per Cent Distribution of Values By ICNND Standards

	Number of Men	Deficient %	Low %	Acceptable %	High %
Hemoglobin, gm/100	832	0.1	8.8	29.8	61.3
Hematocrit, %	816	0.3	1.0	6.5	92.2
Plasma Protein, gm/100	856	16.5*	25.2	34.6	23.7
Vitamin A, mcg/100	724	0.3	4.3	75.1	20.3
Carotene, mcg/100	733	0.0	0.6	33.6	65.8
Vitamin C, mg/100	702	0.0	1.2	8.6	90.2

* In this low protein range 0.2% of the men were in the 4.5 to 4.9 gm range, 2.9% fell in the 5.0 to 5.9 gm range and 13.3% in the 5.5 to 5.9 gm/100 range.

TABLE XIII

URINE ANALYSES ON MILITARY PERSONNEL

Thiamine, Riboflavin and N[1]Methylnicotinamide
Excretion Per Gram of Creatinine,
Means and Standard Deviations, By Age Groups

Age Group	Number of Men	Per Gram Creatinine		
		N[1]MN, mg Mean $\pm$ S.D.	Riboflavin, mcg Mean $\pm$ S.D.	Thiamine, mcg Mean $\pm$ S.D.
Under 20	22	6.59 $\pm$ 3.22	861 $\pm$ 400	146 $\pm$ 123
20 - 24	120	5.52 $\pm$ 1.53	747 $\pm$ 464	204 $\pm$ 275
25 - 29	185	5.24 $\pm$ 3.38	688 $\pm$ 441	117 $\pm$ 94
30 - 34	152	5.65 $\pm$ 3.84	736 $\pm$ 566	118 $\pm$ 138
35 - 39	159	7.69 $\pm$ 7.17	809 $\pm$ 709	146 $\pm$ 264
40 - 44	86	5.71 $\pm$ 2.99	670 $\pm$ 453	77 $\pm$ 65
45 - 49	67	6.37 $\pm$ 4.95	982 $\pm$ 585	184 $\pm$ 325
50 and Over	41	9.27 $\pm$ 5.36	1123 $\pm$ 831	231 $\pm$ 339
Mean	832	6.20 $\pm$ 4.10	776 $\pm$ 549	143 $\pm$ 189

TABLE XIV

URINE ANALYSES OF MILITARY PERSONNEL

Per Cent Distribution of Values By ICNND Standards

All Units	Number of Men	Deficient %	Low %	Acceptable %	High %
N^1 Methylnicotinamide, mg/gm creatinine	837	0.3	10.0	35.6	54.1
Riboflavin, mcg/gm creatinine	831	0.0	1.3	8.7	90.0
Thiamine, mcg/gm creatinine	738	11.3	21.4	29.6	37.7

TABLE XV

URINE ANALYSES ON MILITARY PERSONNEL

Urinary Vitamin Excretion in Six Hour Samples at FGH
By Amount in Six Hour and Per Gram of Creatinine, By Age Groups

Age Group	Number of Men	N^1MN mg per 6 hr	N^1MN mg per gm Cr	RIBOFLAVIN mcg per 6 hr	RIBOFLAVIN mcg per gm Cr	THIAMINE mcg per 6 hr	THIAMINE mcg per gm Cr	CREATININE mg per 100 ml	CREATININE mg per 6 hr
Under 20	3	0.30	0.70	292	687	54.7	124	206	388
20 - 24	41	0.74	1.79	205	497	75.0	182	169	339
25 - 29	32	0.61	1.62	237	634	60.7	163	148	309
30 - 34	14	0.58	1.43	229	560	90.5	224	140	364
35 - 39	16	1.01	3.16	191	603	78.7	249	136	304
40 - 44	10	0.60	1.42	226	529	60.4	141	127	412
45 - 49	5	0.92	2.23	359	954	110.4	268	118	387
50 & Over	4	0.37	1.45	113	425	62.5	243	108	245
Mean	125	0.70	1.83	221	576	72.9	191	149	335

- -

Per Cent Distribution By ICNND Standards
Of Values From FGH Six Hour Samples

Urine	Number of Men	Deficient %	Low %	Acceptable %	High %
N^1MN mg/6 hr volume	127	4	46	33	17
N^1MN mg/gm creatinine	124	2	46	45	7
Riboflavin mcg/6 hr volume	126	0	2	10	88
Riboflavin mcg/gm creatinine	124	0	0	5	95
Thiamine mcg/6 hr volume	127	3	9	32	56
Thiamine mcg/gm creatinine	124	0	6	22	72

TABLE XVI

BLOOD ANALYSES ON MILITARY PERSONNEL

Total Cholesterol, Total Lipids and Phospholipids in Serum, Means and Standard Deviations, By Age Groups

	Total Cholesterol mg%		Total Lipids mg%		Phospholipids mg/100	
Age Group	Number of Men	Mean ± S.D.	Number of Men	Mean ± S.D.	Number of Men	Mean ± S.D.
Under 20	28	174 ± 27.4	16	711 ± 149	15	7.9 ± 1.9
20 - 24	99	183 ± 10.5	67	755 ± 94	80	8.6 ± 2.4
25 - 29	158	188 ± 11.4	95	764 ± 152	108	8.3 ± 1.4
30 - 34	122	186 ± 33.2	84	818 ± 189	81	8.3 ± 1.8
35 - 39	124	204 ± 43.3	85	841 ± 215	77	8.9 ± 1.9
40 - 44	81	204 ± 16.1	64	839 ± 157	62	9.6 ± 2.7
45 - 49	63	206 ± 13.9	42	859 ± 196	39	10.2 ± 2.8
50 & Over	42	208 ± 39.1	26	788 ± 224	21	9.8 ± 2.3

- - - - - - - - - - - - - - - - -

Comparison of Total Cholesterols in Other Studies (mg%)

Age Group	Keys, et al.	Lawry, et al.
Under 20	168	-
20 - 24	174	-
25 - 29	184	212
30 - 34	195	222
35 - 39	200	230
40 - 44	219	238
45 - 49	236	243
50 and Over	252	-

TABLE XVII

BLOOD ANALYSES ON MILITARY PERSONNEL

Comparison of Fasting and Random Blood Levels

Blood Study	FGH (Fasting) Mean ± S.D.	Random Mean ± S.D.
Hemoglobin, gm/100 ml	15.9 ± 0.70	15.9 ± 1.13
Hematocrit, %	50.8 ± 3.43	51.4 ± 3.33
Plasma Protein, gm/100 ml	6.50 ± 0.35	6.50 ± 0.64
Vitamin C, mg/100 ml	0.74 ± 0.44	0.85 ± 0.33
Vitamin A, mcg/100 ml	42.4 ± 8.8	39.7 ± 13.7
Carotene, mcg/100 ml	99.5 ± 32.1	129.7 ± 42.1

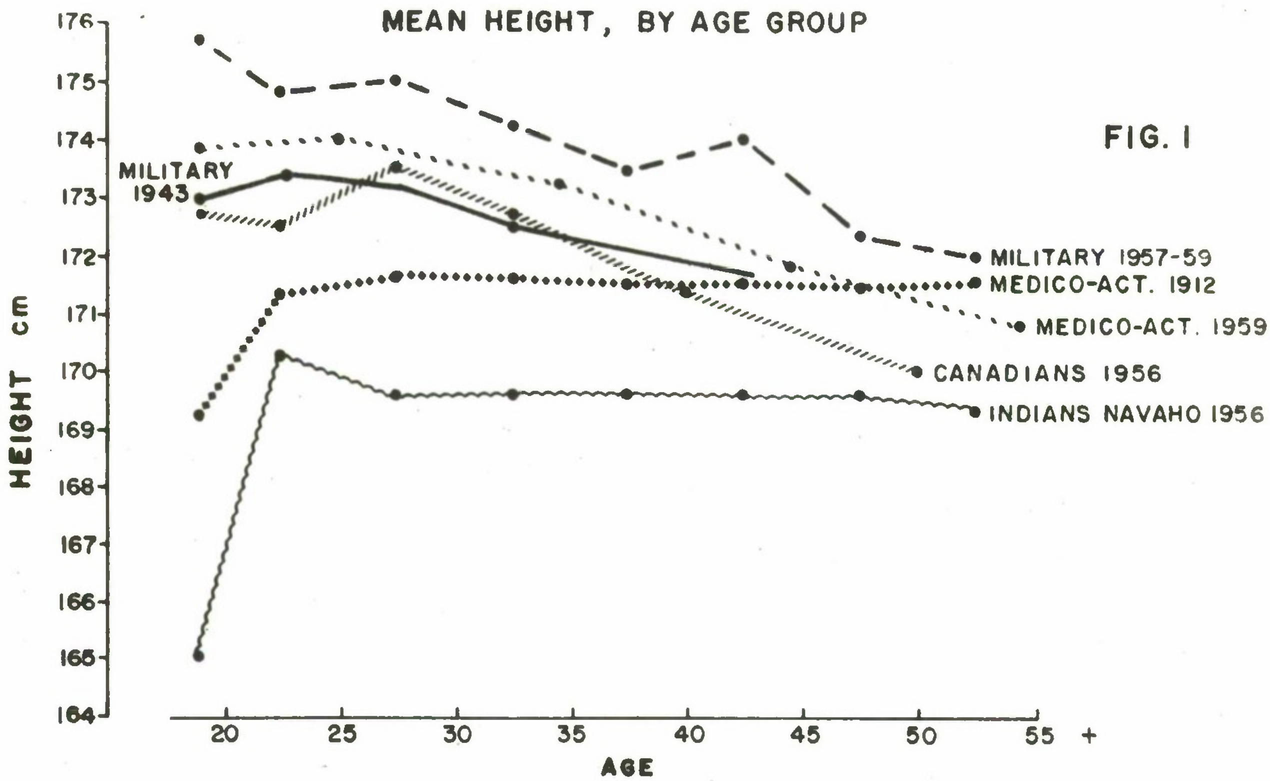

MEAN HEIGHT, BY AGE GROUP
HEIGHT cm
AGE
MILITARY 1943
MILITARY 1957-59
MEDICO-ACT. 1912
MEDICO-ACT. 1959
CANADIANS 1956
INDIANS NAVAHO 1956
176
175
174
173
172
171
170
169
168
167
166
165
164
20
25
30
35
40
45
50
55 +

FIG. I

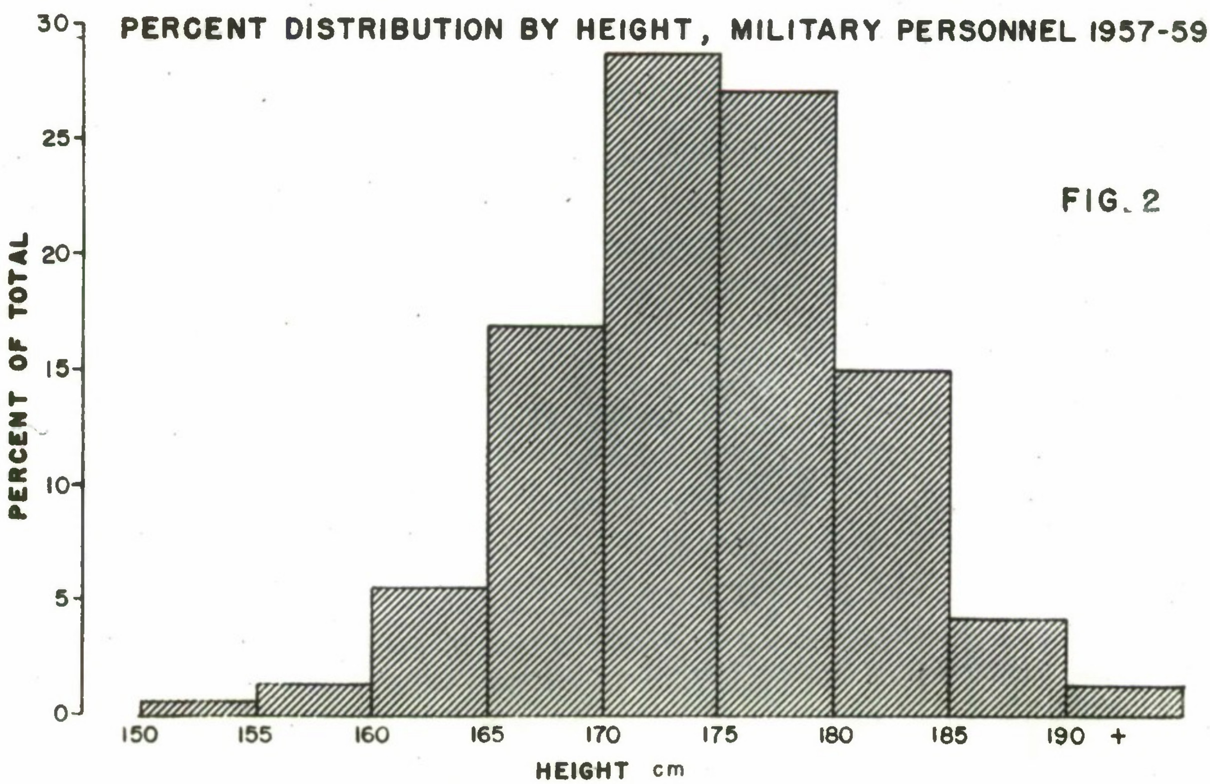
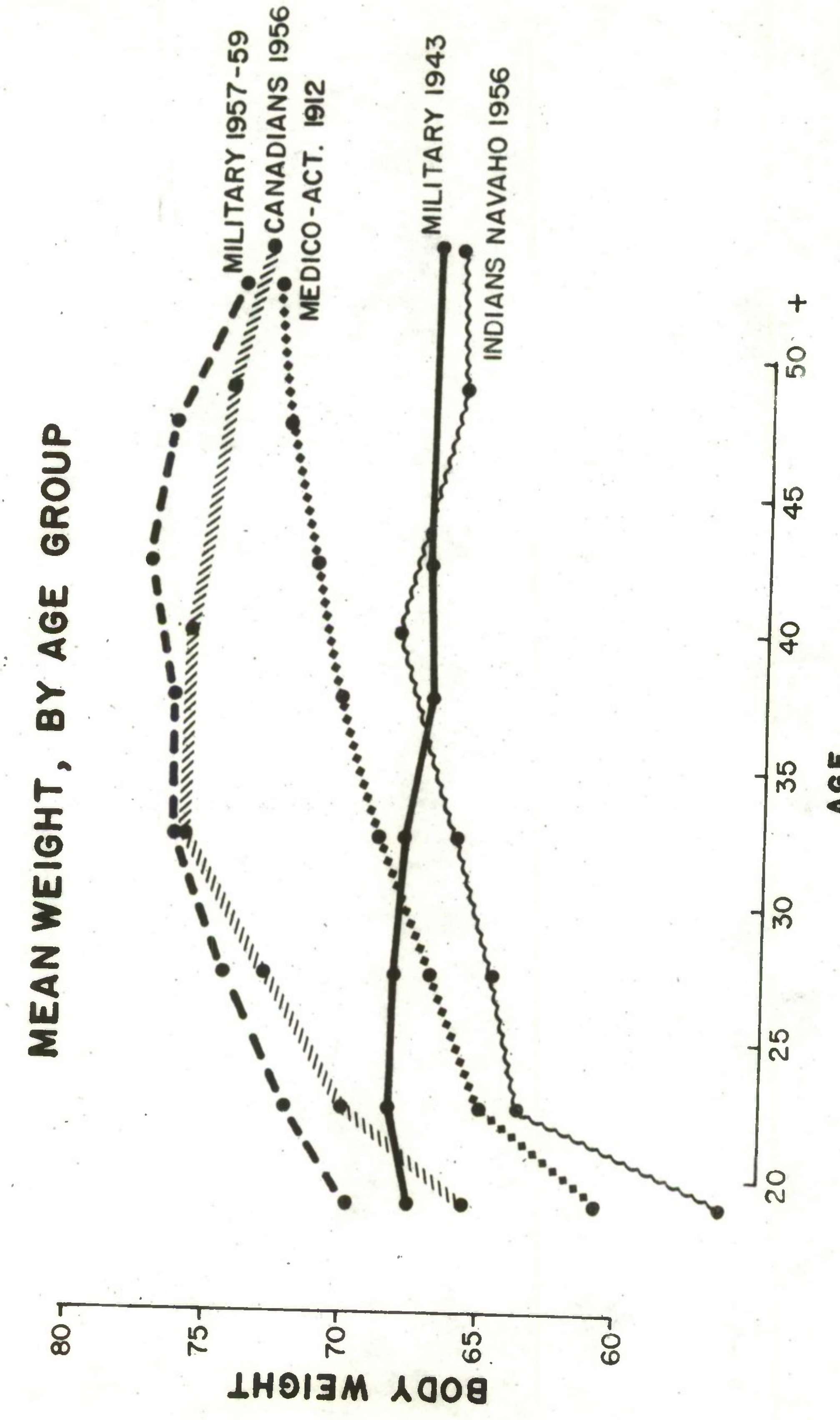

PERCENT DISTRIBUTION BY HEIGHT, MILITARY PERSONNEL 1957-59
PERCENT OF TOTAL
HEIGHT cm
30
25
20
15
10
5
0
150
155
160
165
170
175
180
185
190 +

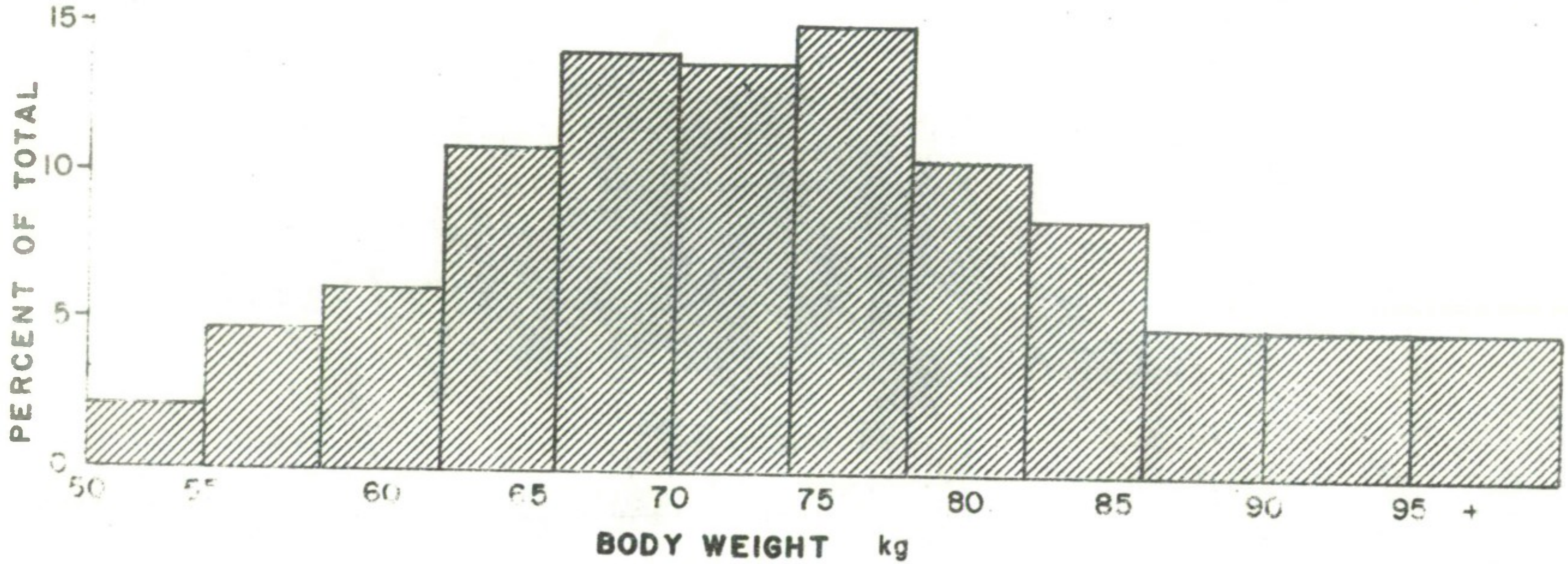
FIG. 2

FIG. 3



MEAN WEIGHT, BY AGE GROUP
MILITARY 1957-59
CANADIANS 1956
MEDICO-ACT. 1912
MILITARY 1943
INDIANS NAVAHO 1956
BODY WEIGHT
80
75
70
65
60
AGE
20
25
30
35
40
45
50
+

PERCENT DISTRIBUTION BY WEIGHT, MILITARY PERSONNEL 1957-59



3 10 68

FIG. 4

BODY WEIGHT AS PERCENT OF STANDARD WEIGHT BY AGE GROUPS
MILITARY PERSONNEL 1957 - 59

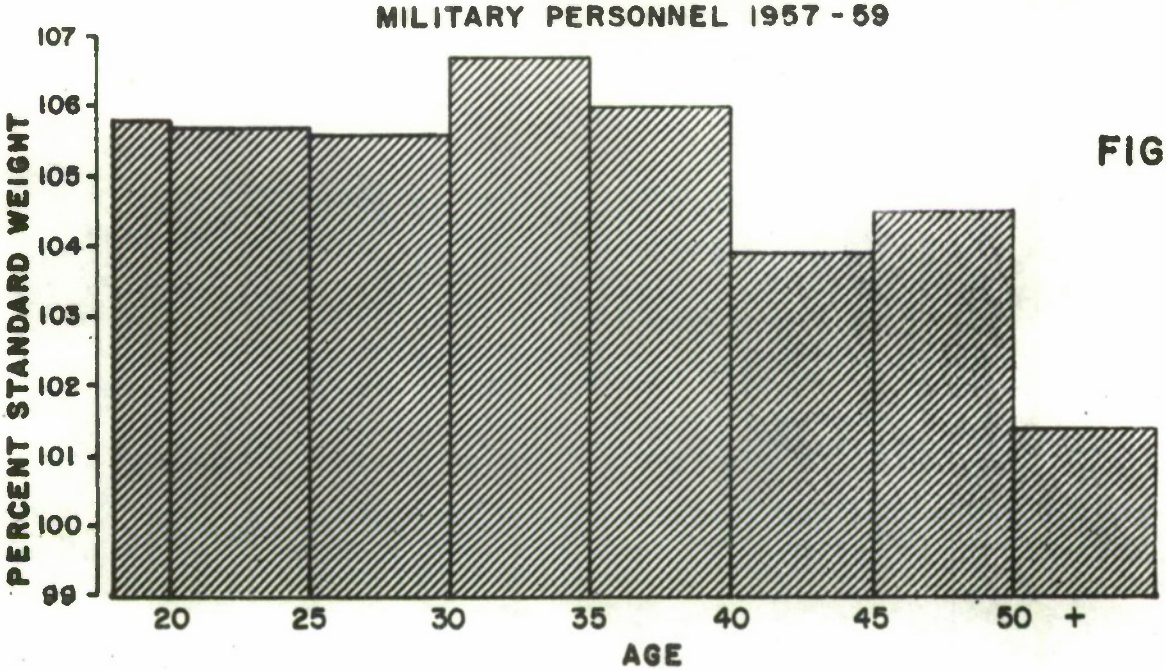


FIG. 5

PERCENT DISTRIBUTION BY PERCENT OF STANDARD WEIGHT, MILITARY 1957-59

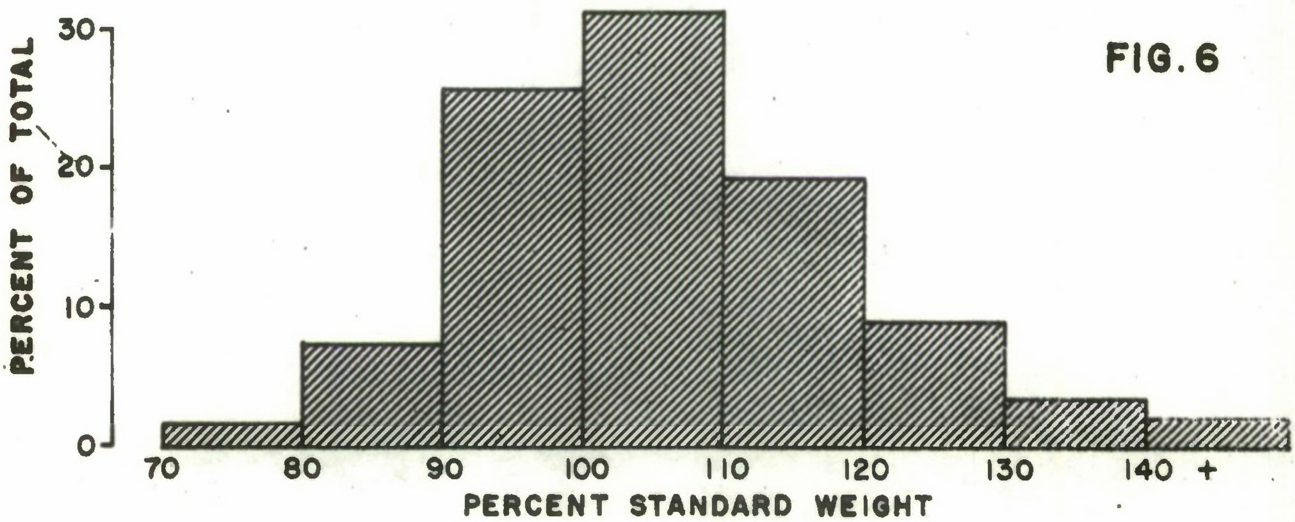


FIG. 6

MEAN SKINFOLD MEASUREMENTS BY AGE GROUP, MILITARY PERSONNEL, 1957-59

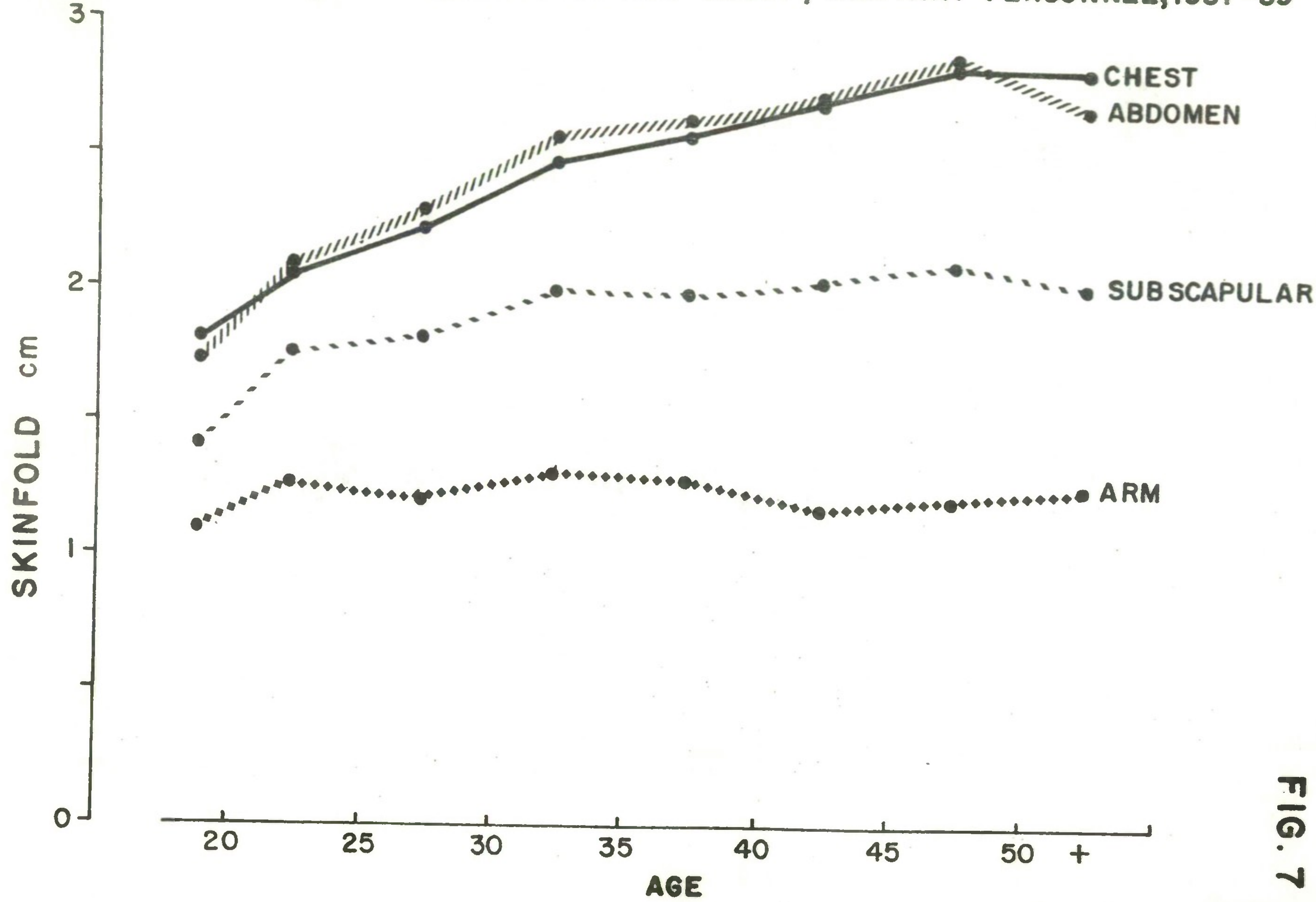


FIG. 7

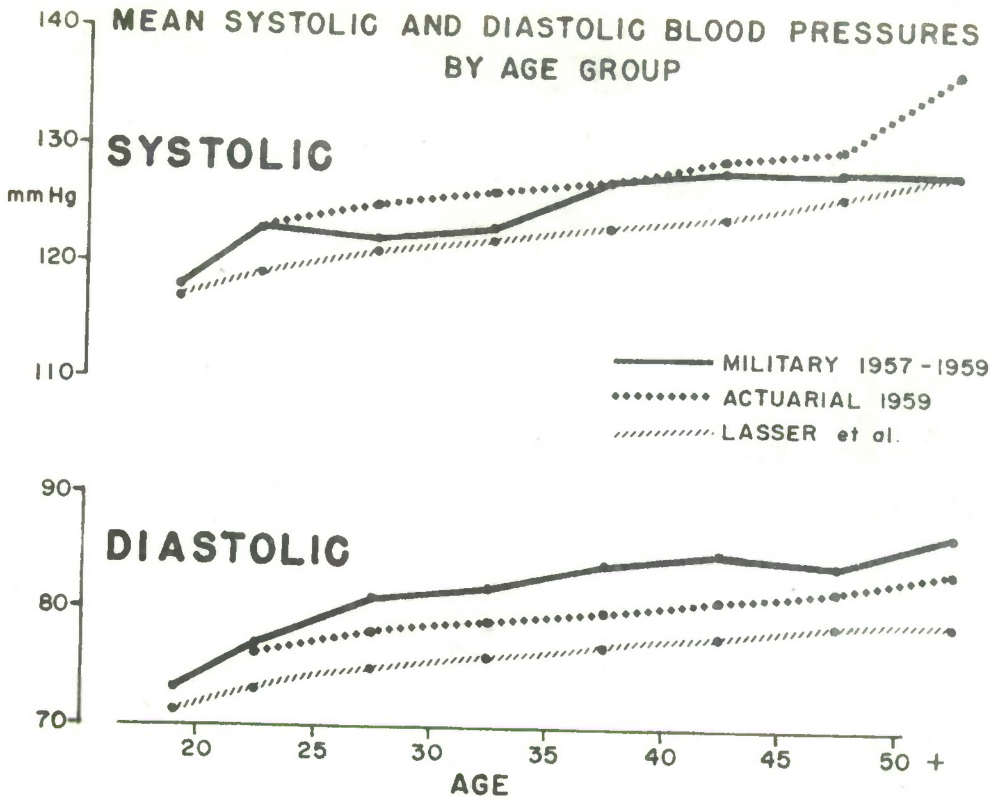

MEAN SYSTOLIC AND DIASTOLIC BLOOD PRESSURES
BY AGE GROUP
SYSTOLIC
mm Hg
140
130
120
110
MILITARY 1957 - 1959
ACTUARIAL 1959
LASSER et al.
DIASTOLIC
90
80
70
20
25
30
35
40
45
50 +
AGE

FIG. 8

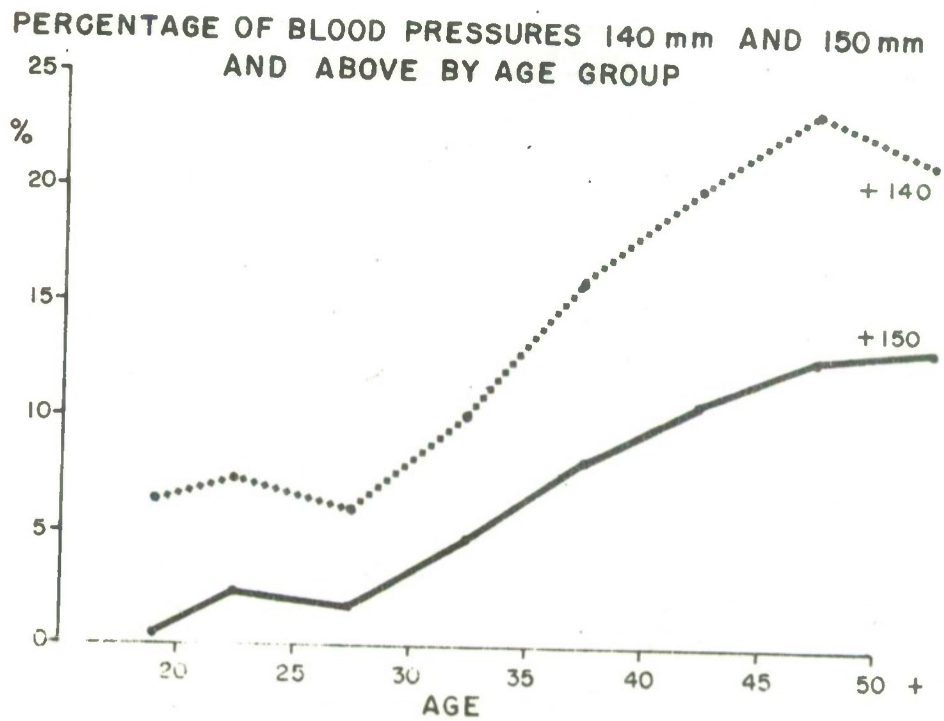
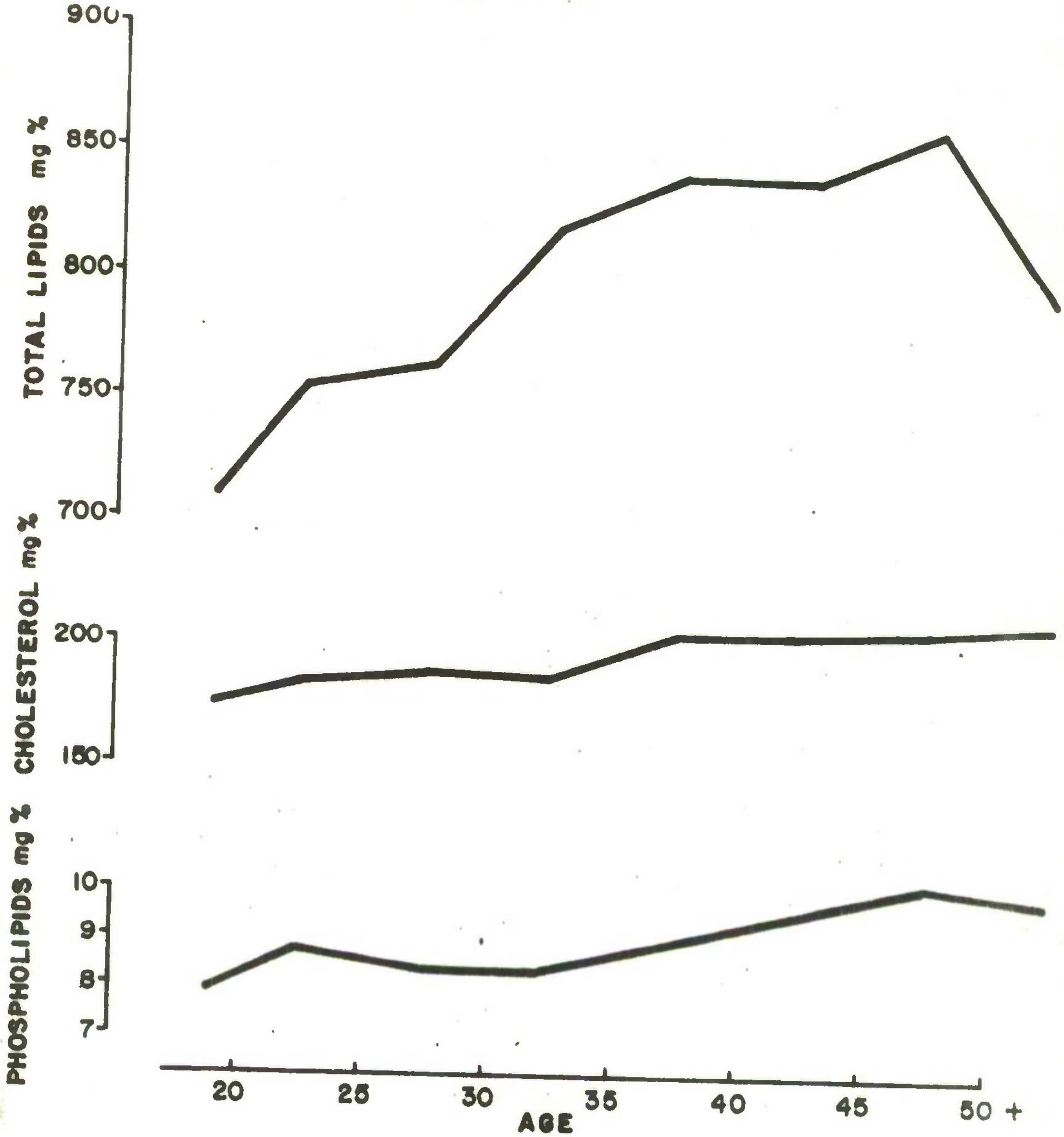

PERCENTAGE OF BLOOD PRESSURES 140 mm AND 150 mm
AND ABOVE BY AGE GROUP
%
25
20
15
10
5
0
+ 140
+ 150
20
25
30
35
40
45
50 +
AGE

FIG. 9

FIG. 10

MEAN TOTAL LIPIDS, CHOLESTEROL, AND PHOSPHOLIPIDS BY AGE GROUP



USA Medical Research and Nutrition Laboratory Proj. No. 6X60-11-001 Report No. 260

NUTRITIONAL EVALUATION OF A NORMAL MILITARY POPULATION

C. Frank Consolazio, Ralph Shapiro, Gerhard J. Isaac
and Laurence M. Hursh

43 pp, 17 Tables, 11 Fig. 14 August 1961 UNCLASSIFIED

Anthropometric and biochemical data was gathered on a normal distribution of military personnel, including army, navy and air force units. Information on age, heights, body weights, blood pressures and skinfold thickness measurements were collected on 4174 enlisted men of all ages. Chemical analyses were performed on every 5th man examined and included hemoglobin, hematocrit, plasma protein, vitamin C, vitamin A, carotene, and fat partitions in the blood. In addition, the urines were analyzed for thiamine, riboflavin and N^1MN and calculated/gm of creatinine excreted. Data was classified into 8 separate age groups and then compared to ICNND and other normal data in the literature.

1. Nutrition
2. Anthropometry
3. Evaluation of Nutritional Status
4. Vitamin Excretions
5. Blood Levels

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