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Analysis of Weight and Height of Apparently Healthy Population, Ages 65 to 94 Years. (25251)

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This paper presents a study of average weights at each inch of height for men and women in successive 5 year age groups from 65 to 94 years of age. A review of the literature has failed to reveal a comparable study and we believe that this constitutes the first comprehensive analysis of height and weight in old age. This study represents one facet of a larger survey of blood pressure and health of this old age white population of the United States. Previous publications have dealt with relationship of blood pressure to age and sex (1) of blood pressure to weight and height (2), etc.

Materials and methods. Detailed information concerning collection and statistical evaluation of the data has been presented (1-3). 2925 males and 2694 females were finally accepted for study. Statistical evidence that the sample was reasonably homogenous and representative of aged, clinically healthy, white population of U. S. has been presented(3). Average weight at each inch of height was computed separately for each sex and 5 year age group. A more consistent progression of weight with increasing height was then obtained from these crude data by use of weighted moving average, a commonly employed statistical procedure for this type of data.* The derived figures were plotted and freehand curves fitted to them. No attempt was made to achieve absolute uniformity in profile of these curves.

Results. Table I presents the crude data and number of observations for each inch of height. Height range in males was essentially from 61″ to 73″; while in females from 58″ to 68″. Females consistently weighed less than

* Weight in lbs for each inch of height represents a weighted average of values for 5 consecutive inches from 2 below to 2 above inclusive. Weighting values of 1, 4, 6, 4, 1, were assigned. Average weights based on fewer than 5 frequencies were omitted. With this technique, weight obtained for every inch of height is actually based upon roughly 5 times as many observations as in the crude data and "weighting" tends to reduce distortion occurring at extremes of height due to unequal frequencies.

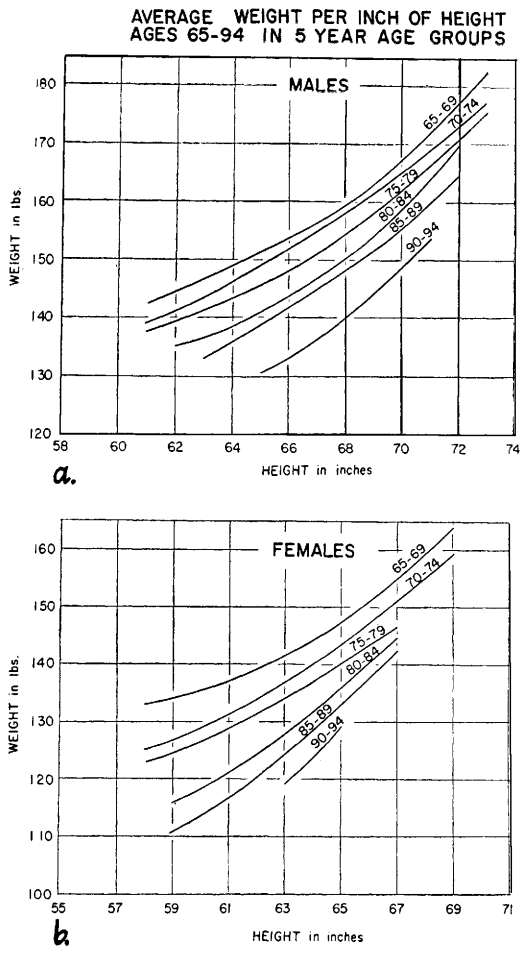

FIG. 1.

males of same height. Weight in both sexes increases in curvilinear fashion with increasing height.

Fig. 1A and 1B are presentations of the weight per inch of height derived from Table I by use of a weighted moving average. Thus, in both sexes at every inch of height, there is a decrease in average weight of progressively older 5 year age groups. Average decrease in weight with advancing age seems to be similar in both sexes. However, while among males decrease in weight with age is uniform throughout all levels of height, among women, those of short height experience a greater decrease than tall subjects. Therefore, it would seem that short individuals of both sexes, but primarily females, lose a greater proportion of their body weight than tall persons with adding age after 65, though this may simply represent weight changes of different surviving generations.

A study of modal and mean heights of 5 year age groups of both sexes and standard deviation of frequency distribution of height was made. It is significant that neither the mean nor modal height show any consistent decrease with advancing age. This indicates that the average height of surviving populations remains virtually unaltered after 65 years, being about 67″ in males and 62″ in females. The standard deviation for height remains constant after 65 years. Therefore, approximately 67% of male subjects are between 64″ and 70″ tall, and approximately 67% of females between 59″ and 65″. The fact that both mean height and standard deviation remain constant after age 65 years indicates that the distribution of height has not changed materially. This suggests that these subjects have neither lost height nor has mortality or morbidity favored any particular height group as compared with any other.

Discussion. Decrease in weight with age after 65 probably can be explained as the additive result of 2 factors: 1, loss of body substance, *i.e.*, protein, water, fat and calcium which is the physiological accompaniment of aging(4,5); 2, progressive reduction in proportion of overweight subjects due to relatively higher mortality rate among obese as compared with "underweights."

From our analysis of the mean, modal height and standard deviation of height in each 5 year age group, it appears that survival is not affected by height in this older age group. This is somewhat contrary to previous investigators(6) who reported that up to age 40 tall persons had a somewhat poorer survival rate than those of short or average height.

Limits of desirable weight variation of approximately ± 20% are traditional with insurance companies, but we feel these a bit broad and that limits of ± 10% are more suitable.

Summary. 1) Average weights per inch of height for both sexes in older population, ages 65 to 94, have been presented. This is the first study of its kind to appear. It is based

TABLE I. Weight per Inch of Height—Ages 65-106 in 5 Year Age Groups. Crude data.

Height (inches)	65-69 N	65-69 Wt	70-74 N	70-74 Wt	75-79 N	75-79 Wt	80-84 N	80-84 Wt	85-89 N	85-89 Wt	90-94 N	90-94 Wt	95-106 N	95-106 Wt
Males (total 2925)														
52					1	160								
53														
54			1	138									1	125
55														
56							1	124						
57			1	157					1	105				
58			2	131					2	122				
59	2	122	3	130	1	132	5	140	1	90				
60	10	149	6	149	4	125	2	148	6	121	3	130		
61	13	144	7	131	5	152	8	130	2	116	2	118	1	107
62	24	140	20	140	6	146	11	140	8	115	4	126	2	122
63	41	148	29	147	19	148	9	128	12	132	6	144		
64	66	148	39	146	42	142	27	140	27	140	12	128		
65	77	152	51	154	44	148	21	138	24	144	12	130	5	146
66	100	155	89	153	74	145	58	149	37	141	11	132	2	140
67	93	155	93	154	69	155	53	148	26	146	19	135	4	138
68	126	159	89	158	73	154	55	148	36	146	13	139	5	163
69	76	163	81	163	47	154	32	157	29	156	7	148	1	147
70	80	167	61	165	55	161	45	156	31	158	9	147	2	165
71	79	172	45	174	40	158	20	159	28	163	9	154		
72	62	182	31	172	22	173	17	166	24	160	7	163	1	200
73	18	180	20	172	12	182	9	187	10	169	3	154		
74	11	186	6	180	7	188	2	142	3	185	2	159		
75	5	171	4	146					1	170				
76	4	162	3	197										
77							1	125	2	162	1	135		
78							1	165	1	180				
79			1	138										
80									1	148				
81									1	135				
82	1	185												
Total N	888		682		521		377		313		120		24	
Females (total 2694)														
49	1	108												
50	1	96												
51	1	175	1	110										
52	1	155	2	108										
53											1	139		
54			1	145	2	101	1	87	2	124	2	90		
55	1	120	3	126			3	118	2	90				
56	6	138	6	124	6	118	2	88	5	114				
57	14	135	11	142	6	126	3	121	3	133	2	104		
58	30	133	24	137	7	119	12	116	8	113	4	86	1	110
59	42	132	22	123	17	117	9	106	11	109	4	114		
60	91	135	64	129	53	126	44	122	32	110	22	108	2	100
61	92	138	72	129	61	131	49	123	29	119	12	124	3	109
62	123	139	102	138	70	136	48	125	37	125	19	125	6	122
63	122	139	97	136	71	134	54	129	30	125	12	112	1	107
64	120	143	102	136	52	138	58	133	34	130	12	121	7	136
65	70	150	68	143	42	142	20	126	24	130	12	131	1	118
66	61	156	38	153	33	138	9	153	14	139	10	141	2	124
67	25	154	29	154	10	148	12	136	8	135	4	150	1	147
68	19	158	12	138	11	142	8	155	7	159	2	150		
69	9	169	3	149	3	111	1	190	2	134				
70	8	148	5	174	4	164	2	172	2	130	2	165		
71	1	150	3	154	2	170			2	135				
72	1	150			3	175								
73			2	160										
74							1	214						
75	1	189												
76	1	147	1	148										
Total N	841		668		453		336		252		120		24	

on a population sample of apparently healthy persons and the sample size is considered statistically adequate. 2) There exists a definite trend towards a decrease in average weight of successive 5 year age groups after age of 65. There were 2 reasons for this: 1) individual weight loss accompanying aging due to loss of body substance, 2) high mortality rate among obese which favors survival of a larger proportion of underweight people. 3) Height and survival were not related.

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New Inhibitors of *in vitro* Conversion of Acetate and Mevalonate to Cholesterol. (25252)

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The *in vitro* conversion of labeled acetate (1) and labeled mevalonate(2) into cholesterol by rat liver homogenates have been reported, as well as the effect of known hypocholesteremic agents upon these syntheses(3,4). The present studies are concerned with the effect of several new compounds upon the enzymatic synthesis by rat liver homogenates of cholesterol from both acetate and mevalonate. The compounds are Δ1-testololactone, Δ4-androstene 17-*α*-ol-3-one-17*β*-oic acid, and *β*-hydroxy - *β* - fluoromethyl - δ - valerolactone. (fluoromevalonic acid).* The effects of fluoride ions, fluoroacetate, and zinc ions upon these conversions have also been investigated.

Methods. Livers were obtained from 100 g Sprague Dawley rats maintained on Purina Lab Chow. The animals were killed by decapitation and their livers quickly removed and placed on ice. Homogenization was carried out in the manner reported by Bucher(1), in 2.5 volumes of .1 M phosphate buffer of pH 7.0.† Five ml of the supernatant solution after refrigerated centrifugation at 700 x G for 10 minutes were used as the source of enzyme for each determination. To use the identical enzyme preparation for all levels of compounds studied in each test, several livers were pooled and 5 ml aliquots used for each level and for controls. To each aliquot was added .5 mg of DPN and .5 mg of ATP in .1 ml volumes. Twenty-five *μ*g of 2-C^{14} acetate (24.4 *μ*c/mg) contained in 1 mg of K acetate in .1 ml was the acetate substrate. Forty *μ*g of 2-C^{14} mevalonic acid (1.6 *μ*c/mg as the dibenzylethylenediammonium salt) in .1 ml volume was the mevalonate substrate. The mevalonic acid was liberated from its salt by treatment with alkali and extraction with ether(5). Compounds under test were added either as a fine suspension or as a solution in a .2 ml volume of 5% propylene glycol. The enzymatic synthesis was carried out in 50 ml Erlenmeyer flasks placed in a Dubnoff metabolic shaker under an atmosphere of 95% oxygen-5% CO_2. The samples were incubated for 2 hours at 34°C. After this period .5 mg of cholesterol was added to each flask and the entire contents saponified with alcoholic KOH in a

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† | ml | |
|---|---|
| 4 | 1M KH_2PO_4 |
| 6 | 1M K_2HPO_4 |
| 5 | .1M $MgCl_2$ |
| 3 | 1M Nicotinamide |
| 82 | deionized water |