

VITAL and HEALTH STATISTICS

DATA FROM THE NATIONAL HEALTH SURVEY

Osteoarthritis and Body Measurements

The relationship of osteoarthritis to body measurements as
shown in data from the Health Examination Survey, 1960-1962.

Washington, D.C.

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In accordance with specifications established by the National Health Survey, the Bureau of the Census, under a contractual agreement, participated in the design and selection of the sample, and carried out the first stage of the field interviewing and certain parts of the statistical processing.

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PREFACE

The analysis of Health Examination Survey (HES) data in the body of this report is based on the sample group examined in Cycle I of the HES rather than on estimates for the target population. In simple terms reference is made to the 6,672 persons in the HES sample rather than the 111,086,000 people from which the sample was selected. For this reason the reader must be warned not to use the data as descriptive of the total population of the United States, since their probability of selection is not taken into account.

The use of uninflated data from the sample differs from the usual treatment of the examination data by the National Center for Health Statistics. The sampling scheme of the HES and the associated procedures for estimation and for computing the variances of the estimates were designed to yield an unbiased representation of the civilian, noninstitutionalized population of the conterminous United States at (essentially) a fixed point in time, and confidence intervals for that representation.

In this report, however, the data are treated as a manifestation of some general process. This is different from a description of the target population of the first cycle of the Health Examination Survey. Rather it concerns a defined biological or medical process (presumably of some generality) which may be manifesting itself in the persons examined by the HES. Under a concept of possible repeated trials, it is assumed that the process would yield varying sets of measurements from one trial to another, and it is in this very general sense that "sampling variability" is treated in this report. The implied variances do not refer to the sampling error or precision of statistics from the survey.

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IN THIS REPORT data are presented on the relation of osteoarthritis to body measurements. A strong positive relationship was found in both sexes between both osteoarthritis of the hands and osteoarthritis of the feet for those body measurements that denote body and limb girths and breadths. The age group 45-54 appeared to show the strongest association between body measurements and osteoarthritis.

SYMBOLS

Data not available-----	---
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OSTEOARTHRITIS AND BODY MEASUREMENTS

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INTRODUCTION

Between 1959 and 1962 the Health Examination Survey conducted a series of examinations on a probability sample of the civilian, noninstitutionalized population of the continental United States between 18 and 79 years of age.¹ A detailed description of the sample and response of the 6,672 persons who were examined has been published.² The survey was designed to obtain information on certain chronic diseases, on dental health, and on the distribution of some anthropometric and sensory characteristics. The sample persons were given a standard examination, which lasted about 2 hours, in mobile clinics especially designed for the purpose.

The relation between physique and susceptibility to osteoarthritis has been a matter of interest for many years. Clinicians have felt that obesity must be considered as a factor in the genesis of osteoarthritis, due to increased mechanical strain on weight-bearing joints.

Seltzer³ made a large series of body measurements on 38 cases of osteoarthritis and 112 cases of rheumatoid arthritis. He found that the degenerative joint disease group might be roughly described as being bigger, heavier, and more lateral in body build than the rheumatoid arthritis. They also had a greater overall muscular development and skeletal robusticity than the rheumatoid arthritis group. No significant differences between the two groups could be ascertained in the skeletal structure of the lower extremities.

Kelgren and Lawrence⁴ made an X-ray survey of 1 out of every 10 sample persons (204 males

and 277 females) aged 55-64 years in the town of Leigh, England. They found a significant elevation in the prevalence of osteoarthritis in some of the joints examined for those persons labeled as obese. Obesity was assessed from standard height-weight tables.

Silberberg and others,⁵ in doing a postmortem examination of 200 human sternoclavicular joints, observed an apparently high incidence of severe osteoarthritic lesions in comparatively young obese individuals.

As can be seen, in only one of the reported studies were body measurements taken on the subjects. Unfortunately in that study (Seltzer's) osteoarthritic individuals were compared with those having rheumatoid arthritis rather than with a normal control population.

OSTEOARTHRITIS DIAGNOSIS

Data presented in this report concern osteoarthritis as determined by X-rays taken of the hands and feet, and its relationship to 17 measurements of body size. A previous report⁶ on this subject described the techniques of measuring osteoarthritis. The reader may refer to that report for detailed information on the procedure employed for establishing a diagnosis of osteoarthritis. In the present report osteoarthritis of the hands and feet are considered separately.

At the 1961 symposium for the epidemiology of chronic rheumatism in Rome it was generally agreed that X-ray evidence is at present the most reliable criterion in assessing the diagnosis of osteoarthritis.⁷ The diagnosis of osteoarthritis

used in the survey is based solely on X-ray evidence. Standards for the diagnostic criteria and for the content of the examination for osteoarthritis used in the survey were those recommended by the late Dr. Joseph J. Bunim, Clinical Director of the National Institute of Arthritis and Metabolic Diseases. The grading of X-rays for arthritis was performed at the Institute under his direction. In the examination, X-rays were taken of both the hands and feet of the subject. The degree of osteoarthritis found was divided into the following five grades:

- None 0
- Doubtful 1
- Minimal 2
- Moderate 3
- Severe 4

Grade 0 thus indicated a definite absence of X-ray changes of osteoarthritis and grade 2 that osteoarthritis was definitely present but of minimal severity. The term osteoarthritis as used in this report refers to X-ray evidence, grades 2-4.

For a small number of sample persons examined by the HES no X-rays were available. These included 210 pregnant women and 49 other men and women whose X-rays were unsatisfactory or were not taken for a variety of reasons. It was a policy of the survey not to X-ray pregnant women for their protection.

A previous report⁸ describes many of the body measurements taken and the measurement techniques used. The following is a list of the body measurements that are used in the present report as variables:

Height

Weight

Biacromial diameter.—The observer located the outermost edges of the acromial process and marked it. The movable bar of the anthropometer was adjusted to measure the width between the most lateral surfaces of the acromial process.

Right arm girth.—The girth measurement was made at the midpoint of the upper arm.

Chest girth.—In men a steel tape was applied in the horizontal plane around the chest at the nipple line. In women a steel tape was applied in the horizontal plane at the uppermost part of the axillary folds.

Waist girth.—The steel tape was applied at the natural indentation of the waistline. When there was no natural indentation, the tape was applied at a level midway between the iliac crests and the bottom edge of the rib cage.

Skinfold thickness, right arm.—The observer grasped a skinfold parallel to the long axis of the right arm over the triceps area (back of the arm, not side) and 1 centimeter above the midpoint mark. He then applied the calipers at the level of the mark.

Skinfold thickness, infrascapular.—The measurement was taken 1 centimeter below the tip of the right scapula.

Sum of the skinfolds.—The sum of the right arm and infrascapular skinfold measurements.

Sitting height erect.—Examinee sat erect.

Knee height.—The examinee sat erect, heels and knees together. Measurement was made from the top of the footboard to the top of the knee joint in back of the patella (knee cap).

Popliteal height.—The examinee sat relaxed. The measurement was made from the top of the footboard to the top of the sitting surface.

Elbow rest height.—The examinee sat erect, both elbows at right angles. Measurement was made from the top of the sitting surface to the lowest bony portion of the elbow.

Thigh clearance height.—The examinee sat erect, knees and heels together. Measurement was made from the top of the sitting surface to the junction of the abdomen and thigh.

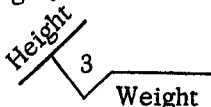
Buttock-knee length.—The examinee sat erect, knees together. The measurement was made from the most posterior protrusion of the sacral area to the foremost edge of the patella.

Buttock-popliteal length.—The examinee sat erect, hands on knees, popliteal fossae at the edge of the sitting board. The measurement was made from the inner edge of a black-board (held in light contact with the examinee's back at right angles to the sitting board) to the front edge of the sitting board.

Elbow-to-elbow breadth.—The examinee sat erect, forearms at right angles and elbows held as tightly as possible to the sides. The measurement was made across the humeral epicondyles (lateral projections of the elbows) with firm pressure.

Seat breadth.—The examinee sat erect, knees together. The measurement was made across the greatest lateral protrusion on each side of the buttocks.

Ponderal index.—Height divided by the cubed root of weight.



Results

The relationship of each of the body measurements to osteoarthritis of the hands and to osteoarthritis of the feet was investigated by using three methods. In method one, men and women were divided into different size groupings of each particular body measurement. For example, the following grouping was made of the arm girth:

1. 7.1-10 inches
2. 10.1-12 inches
3. 12.1-14 inches
4. 14.1-20 inches

Rates of osteoarthritis were calculated for these size groupings for the six age groups from 18-74 years. The last age group 75-79 years was omitted because it contained too few people for reliable presentation. Each of the age groups can be examined for a trend. For example, the rates for

osteoarthritis of the hands for men for three age groups are as follows:

Age	Arm girth in inches	
	7.1-10	10.1-12
	Rate per 100 adults	
25-34 years-----	0.0	2.8
35-44 years-----	0.0	8.3
45-54 years-----	21.4	32.0
	12.1-14	14.1-20
25-34 years-----	6.6	11.8
35-44 years-----	18.3	25.0
45-54 years-----	43.6	64.1

A clear trend toward increasing prevalence of osteoarthritis with increasing arm girth is apparent in each age group. Tables giving the number of people in the size groupings are included in the even numbered tables 2-38.

The second statistical analysis is also applied to separate age groups. To test the association within each age group a linear regression analysis is employed using a chi-square test of a null hypothesis that there is no association between measurements for a particular part of the body and osteoarthritis.⁹ An X^2 value with one degree of freedom is calculated for the regression of p_i on z_i , where z_i represents scores corresponding to equally spaced grouped body measurements and

$$p_i = \frac{\text{cases of OA in } i\text{th class}}{\text{total persons in } i\text{th class}}$$

Each increase in the score for the body dimensions involved represents an equal equivalent increase in the actual dimension of the body measurement. For example the following would be the scores assigned for right arm girth:

Scores Z_i	Actual dimensions in inches
1-----	7.1-8.0
2-----	8.1-9.0
3-----	9.1-10.0
4-----	10.1-11.0
5-----	11.1-12.0
6-----	12.1-13.0

Table A. Levels of significance of significant X^2 for osteoarthritis of the hands, by age, sex, and body measurements: Health Examination Survey, 1960-62

Sex and body measurements	18-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years
<u>Men</u>						
Height-----	-	-	-	-	-	-
Weight-----	-	.05	.01	.001	-	-
Biacromial diameter-----	-	-	.01	-	-	-
Right arm girth-----	-	.01	.0005	.0005	.05	-
Waist girth-----	-	-	-	.01	-	-
Skinfold thickness, right arm-----	-	-	-	-	-	-
Skinfold thickness, infrascapular-----	-	-	-	.05	-	-
Popliteal height-----	-	-	-	-	-	-
Thigh clearance height-----	-	-	.01	.05	.05	-
Sitting-height erect-----	-	-	-	-	-	-
Buttock-knee length-----	-	-	-	-	-	-
Buttock-popliteal length-----	-	.05	-	-	-	-
Chest girth-----	-	-	.05	.01	-	-
Seat breadth-----	-	-	.05	.01	.05	-
Elbow-to-elbow breadth-----	-	-	.01	.001	.05	-
Elbow rest height-----	-	-	.05	-	-	-
Ponderal index-----	-	-	.05	.01	-	.05
Sum of skinfolds-----	-	-	-	-	-	-
Knee height-----	-	.05	-	.05	-	-
<u>Women</u>						
Height-----	*	-	-	-	.01	-
Weight-----	*	.05	.01	.0005	.05	-
Biacromial diameter-----	*	.01	-	.0005	-	-
Right arm girth-----	*	.0005	.001	.0005	.05	-
Waist girth-----	*	.05	.01	.0005	.05	-
Skinfold thickness, right arm-----	*	.05	.01	.0005	-	-
Skinfold thickness, infrascapular-----	*	.05	.01	.0005	.05	-
Popliteal height-----	*	-	-	-	-	-
Thigh clearance height-----	*	-	.01	.001	-	-
Sitting-height erect-----	*	-	-	-	.05	-
Buttock-knee length-----	*	-	-	.01	-	-
Buttock-popliteal length-----	*	-	.05	.05	-	-
Chest girth-----	*	.05	.05	.0005	-	-
Seat breadth-----	*	.01	.01	.0005	.05	-
Elbow-to-elbow breadth-----	*	.05	.01	.0005	-	-
Elbow rest height-----	*	-	-	-	.05	-
Ponderal index-----	*	-	.001	.0005	-	-
Sum of skinfolds-----	*	.05	.01	.0005	.05	-
Knee height-----	*	-	-	.01	-	-

Table B. Levels of significance of significant X^2 for osteoarthritis of the feet, by age, sex, and body measurements: Health Examination Survey, 1960-62

Sex and body measurements	18-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years
<u>Men</u>						
Height-----	-	-	-	-	-	-
Weight-----	-	-	.05	.0005	-	-
Right arm girth-----	-	-	-	.001	-	-
Chest girth-----	-	-	-	.01	-	-
Waist girth-----	-	-	-	.05	-	-
Skinfold thickness, right arm-----	-	-	-	.01	-	-
Skinfold thickness, infrascapular-----	-	-	-	.05	-	-
Sitting-height erect-----	-	-	-	-	-	-
Knee height-----	-	-	-	.05	-	-
Popliteal height-----	-	-	-	-	-	-
Thigh clearance height-----	-	-	-	.05	.001	-
Buttock-knee length-----	-	-	-	-	-	-
Buttock-popliteal length-----	.05	-	-	-	-	-
Seat breadth-----	-	-	-	.0005	-	-
Elbow-to-elbow breadth-----	-	-	-	-	-	-
Elbow rest height-----	¹ .05	-	-	-	-	-
Ponderal index-----	-	-	-	.01	-	-
Sum of skinfolds-----	-	-	-	.05	-	-
Biacromial diameter-----	-	-	-	-	-	-
<u>Women</u>						
Height-----	-	-	-	-	-	-
Weight-----	-	.01	.05	.0005	.05	-
Right arm girth-----	-	.05	.01	.01	.01	.05
Chest girth-----	-	-	-	.01	-	-
Waist girth-----	-	.05	-	.01	-	-
Skinfold thickness, right arm-----	-	.01	-	.05	.05	.05
Skinfold thickness, infrascapular-----	-	.05	-	.01	.01	-
Sitting-height erect-----	-	-	-	-	-	-
Knee height-----	-	-	-	-	-	-
Popliteal height-----	-	-	-	-	-	¹ .05
Thigh clearance height-----	-	-	-	.01	.05	.05
Buttock-knee length-----	-	.05	-	.05	-	-
Buttock-popliteal length-----	-	.01	-	-	-	-
Seat breadth-----	-	.05	.05	.05	.05	-
Elbow-to-elbow breadth-----	-	-	-	.01	-	-
Elbow rest height-----	-	-	-	-	-	-
Ponderal index-----	-	.05	.05	.01	.05	.05
Sum of skinfolds-----	-	.01	-	.01	.01	-
Biacromial diameter-----	-	.01	-	.0005	-	-

¹ X^2 's are for trends opposite in direction to that of the rest of significant values.

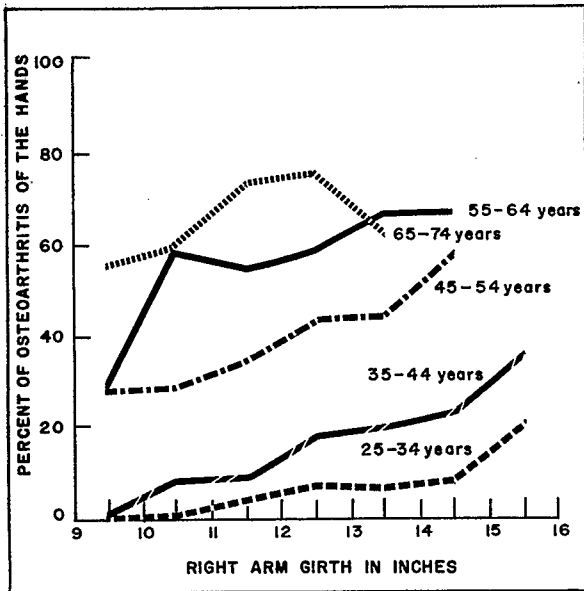


Figure 1. Percent of osteoarthritis of the hands in men, by age groups and right arm girth.

In effect this X^2 value provides a statistical test for the functional relationship of the body measurements to osteoarthritis. For the three age-sex groups (arm girth - OA hands) listed previously the X^2 values are 10.24, 16.27, and 19.33, respectively. At one degree of freedom all of these values are highly significant.

X^2 values were computed for each age-sex group with the exception of the 18-24-year age group for osteoarthritis of the hands in women in which only one case of osteoarthritis was found. Tables A and B give the levels of statistical significance corresponding to the computed X^2 values for each of the body measurements.

The third method of examining the data involves the use of a summary comparison by sex. In this method the actual prevalence rate for each group is divided by an expected rate. The expected value of a particular group is obtained by weighing age-specific rates for the total sample by the age-sex distribution of that rate. The data are presented as a ratio of actual to expected rates. If the rate is more than 1.0 the actual rate is higher than expected. If the ratio is less than 1.0 the

actual rate is lower than expected. This summary statistic can then be examined for the presence of a trend.

Findings

In general osteoarthritis prevalence increased as the size of the body measurements increased. For example, rates for osteoarthritis of the hands are shown to increase fairly steadily as arm girths become larger (fig. 1). The same trend may be seen in the ratio of actual/expected rates (table 7 and fig. 2). The significance of the trend is also reflected in the X^2 values for OA hands (men) for the corresponding age groups (table A).

A rough classification of the body measurements according to the strength of their overall relationship to osteoarthritis may be made on the

Table C. Body measurements by number of significant X^2 values: Health Examination Survey, 1960-62

Body measurement	Significant <.05	Significant <.001
Group I		
Right arm girth-----	14	6
Weight-----	13	4
Group II		
Seat breadth-----	12	2
Ponderal index-----	11	2
Thigh clearance height-----	10	2
Skinfold thickness, infrascapular-----	9	1
Waist girth-----	8	1
Sum of skinfolds-----	8	1
Skinfold thickness, right arm-----	8	1
Elbow-to-elbow breadth-----	7	2
Chest girth-----	7	1
Biacromial diameter-----	5	2
Group III		
Buttock-popliteal length---	5	-
Knee height-----	4	-
Buttock-knee length-----	3	-
Elbow rest height-----	2	-
Sitting-height erect-----	1	-
Height-----	1	-
Group IV		
Popliteal height-----	-	-

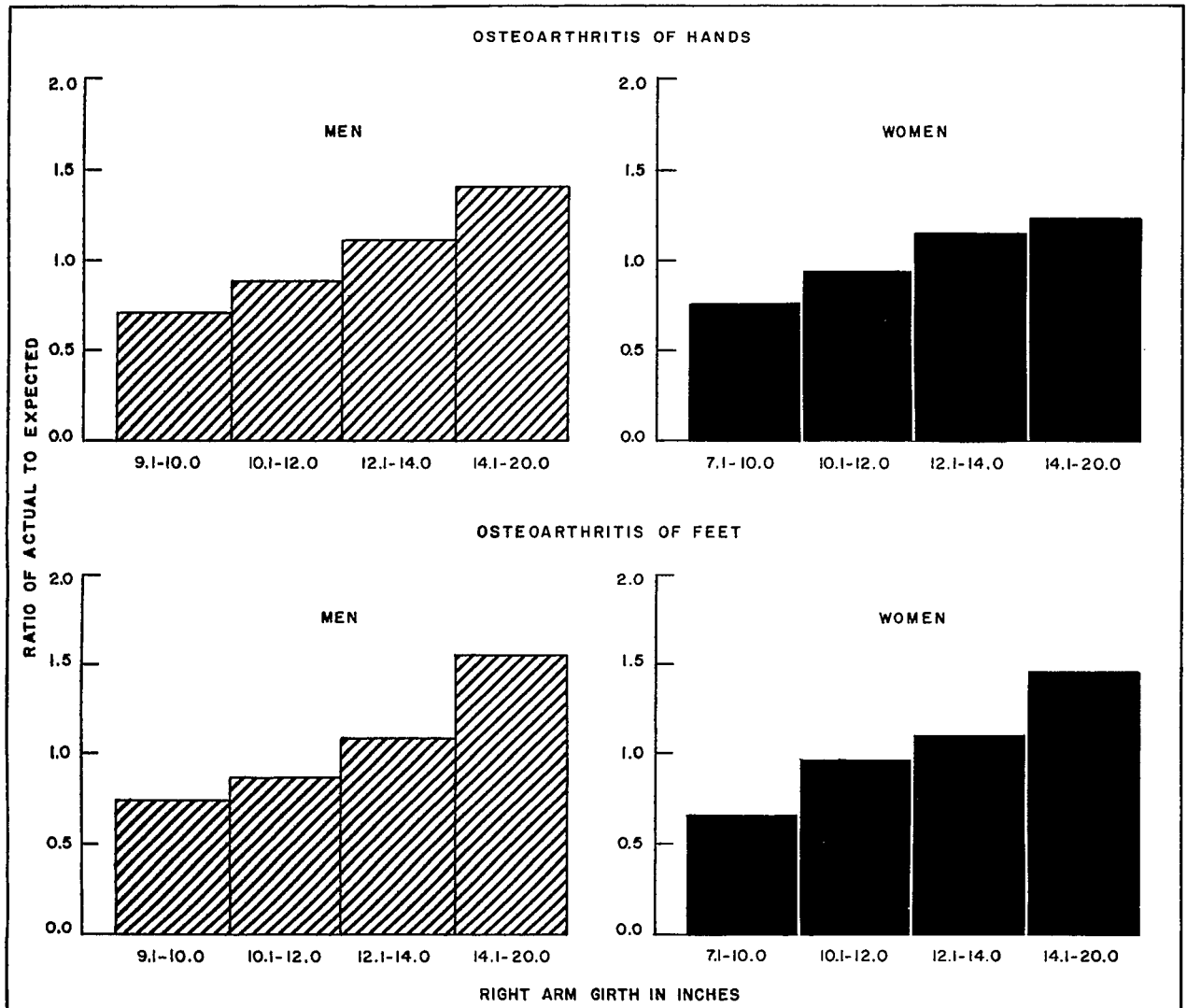


Figure 2. Ratio of actual to expected rate of osteoarthritis, by right arm girth.

basis of the size of the standardized coefficient of regression of the rate of osteoarthritis on body measurements for the individual age groups. Group I contains the body measurements having the strongest relationship while group IV contains the body measurements having no relationship. The other two groups are intermediate in strength (table C). The body measurements shown below are grouped in order of their diminishing strength of relationship to osteoarthritis.

- Group I: 1. Right arm girth
2. Weight

- Group II: 1. Seat breadth
2. Ponderal index

3. Thigh clearance height
4. Skinfold thickness, infrascapular
5. Waist girth
6. Sum of skinfolds
7. Skinfold thickness, right arm
8. Elbow-to-elbow breadth
9. Chest girth
10. Biacromial diameter

- Group III: 1. Buttock-popliteal length
2. Knee height
3. Buttock-knee length
4. Elbow rest height
5. Sitting height erect
6. Height

- Group IV: 1. Popliteal height

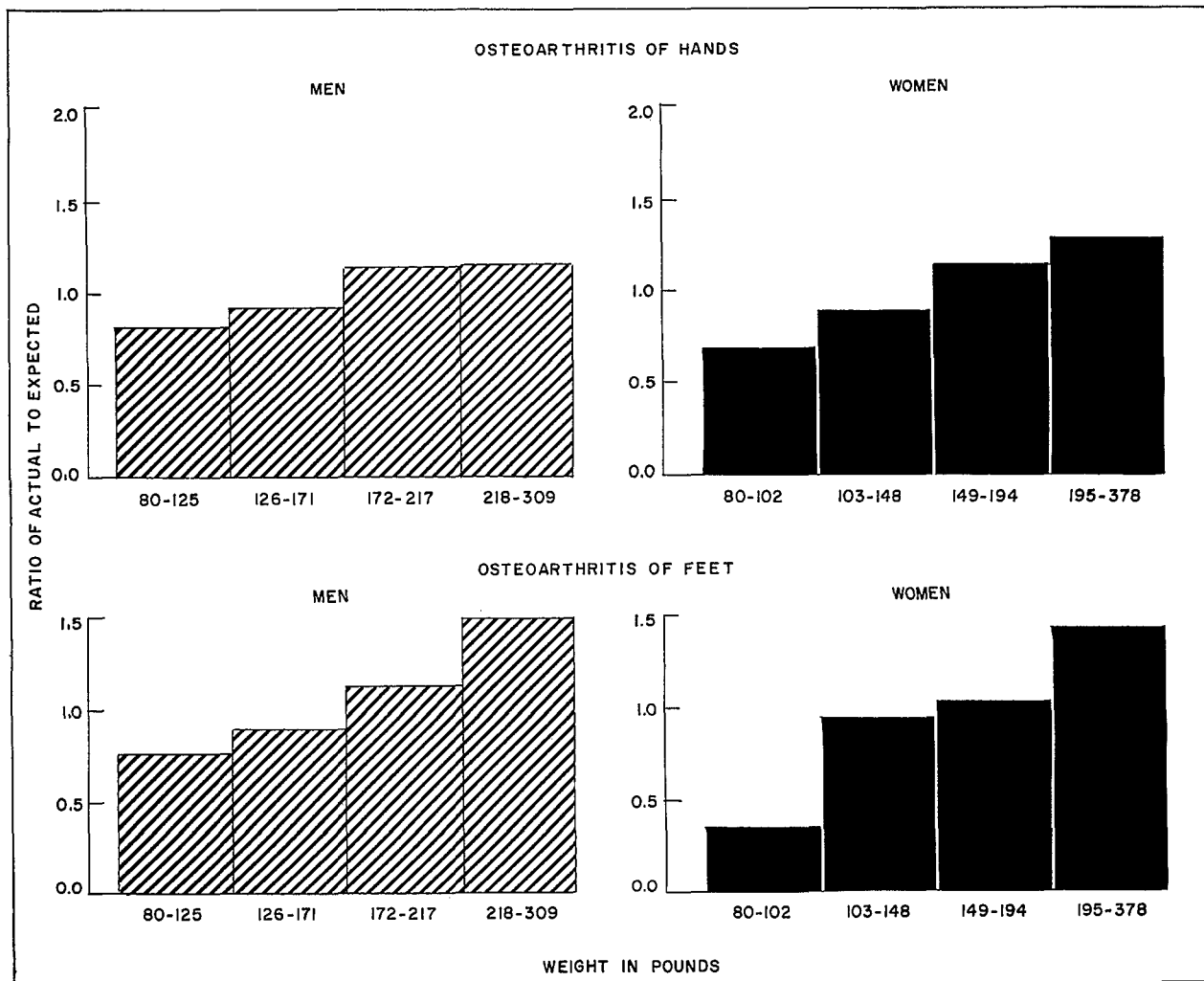


Figure 3. Ratio of actual to expected rate of osteoarthritis, by weight.

The ratio actual/expected tables 3 and 7 and figures 2 and 3 serve to illustrate the strong positive relationship of arm girth and weight to osteoarthritis. The lack of any trend in the actual/expected ratios for osteoarthritis by popliteal height can also be demonstrated (table 21 and fig. 8). Similarly intermediate strength trends can be found in the ratio for Groups II and III (tables 1, 5, 9-20 and 23-37, and figs. 4-7).

It should be noted that Groups I and II consist in the main of body and limb girths and

breadths. Groups III and IV, on the other hand, are composed of length measurements.

Sex

In general, trends for osteoarthritis by body measurements are roughly similar for both sexes. On the whole, however, there appears to be a somewhat stronger association between body measurements and OA for women than for men (tables A and B).

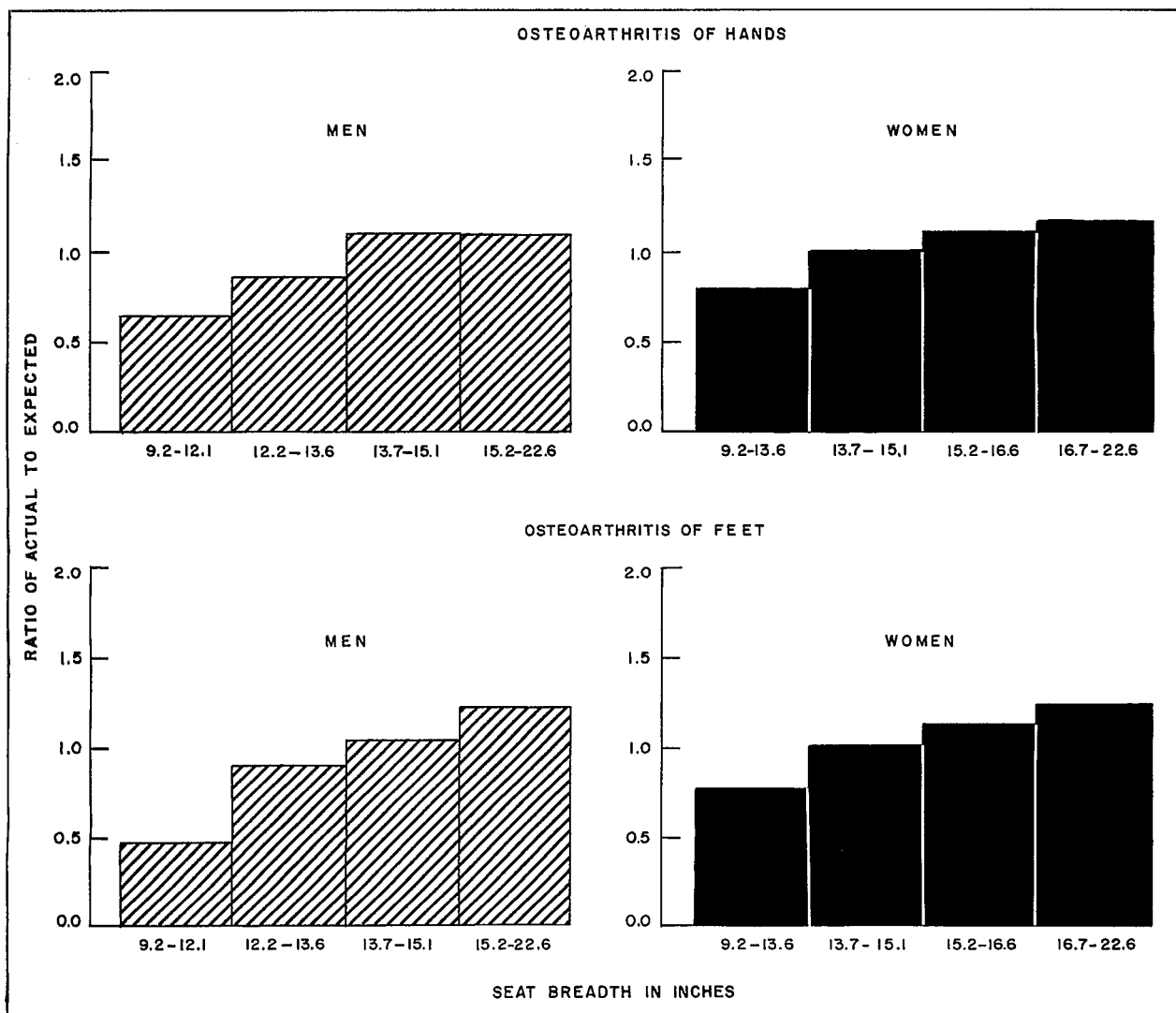


Figure 4. Ratio of actual to expected rate of osteoarthritis, by seat breadth.

Age

The age group 45-54 appears to show the strongest relationship between body measurements and osteoarthritis (tables A and B). In the older age groups (55-64 and 65-74) the relationship becomes much weaker for OA of the hands. The decrease in strength is somewhat less for OA of the feet (odd numbered tables 1-37, and A and B).

Discussion

Although the sample population of the Health Examination Survey was different in composition from the other groups previously studied,³⁻⁵ the findings of the HES were in general in agreement with those of the other studies. It is thus quite likely that in humans, at least, there is an association between body measurements and osteo-

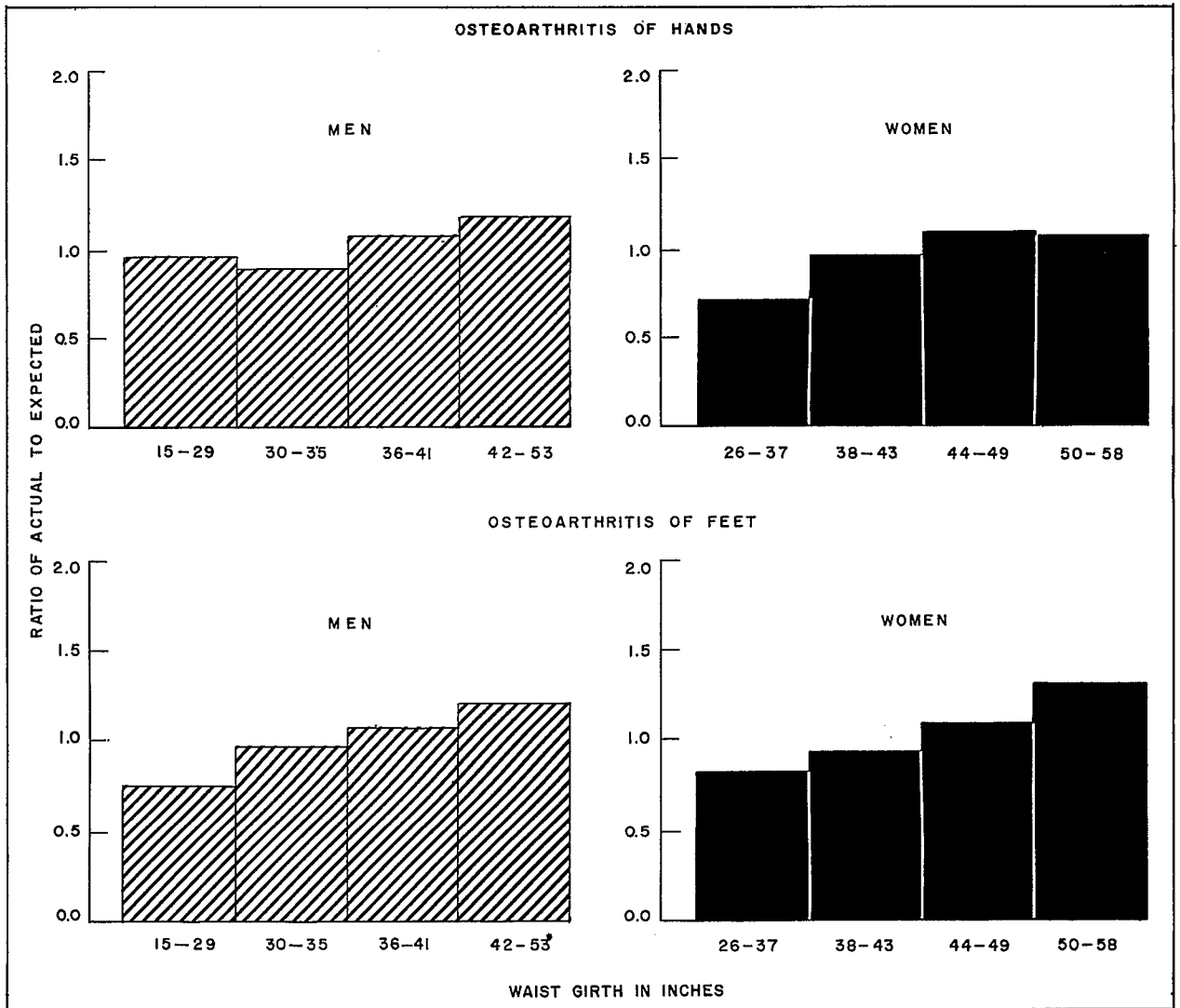


Figure 5. Ratio of actual to expected rate of osteoarthritis, by waist girth.

arthritis. This association is present in both weight-bearing and nonweight-bearing joints. The relationship appears to be much stronger for those body measurements which denote body and limb girths and breadths rather than lengths.

Body fat, as determined by skinfold measurements, appears to be positively correlated with osteoarthritis. However, a muscle factor is probably also involved. This may be demonstrated by the strong trend observed for osteoarthritis of

the hands in men with increasing arm girths, while right arm skinfold thickness has little effect on osteoarthritis of the hands (in men). The diameter of the upper arm, corrected for subcutaneous fat, can be used as a criteria of muscularity in men.¹⁰

Some attempts have been made to determine the effect of obesity experimentally in animals. Silberberg¹¹ found that the incidence of osteoarthritis in underfed Strain A mice was lower and that lesions appeared later than in the *ad*

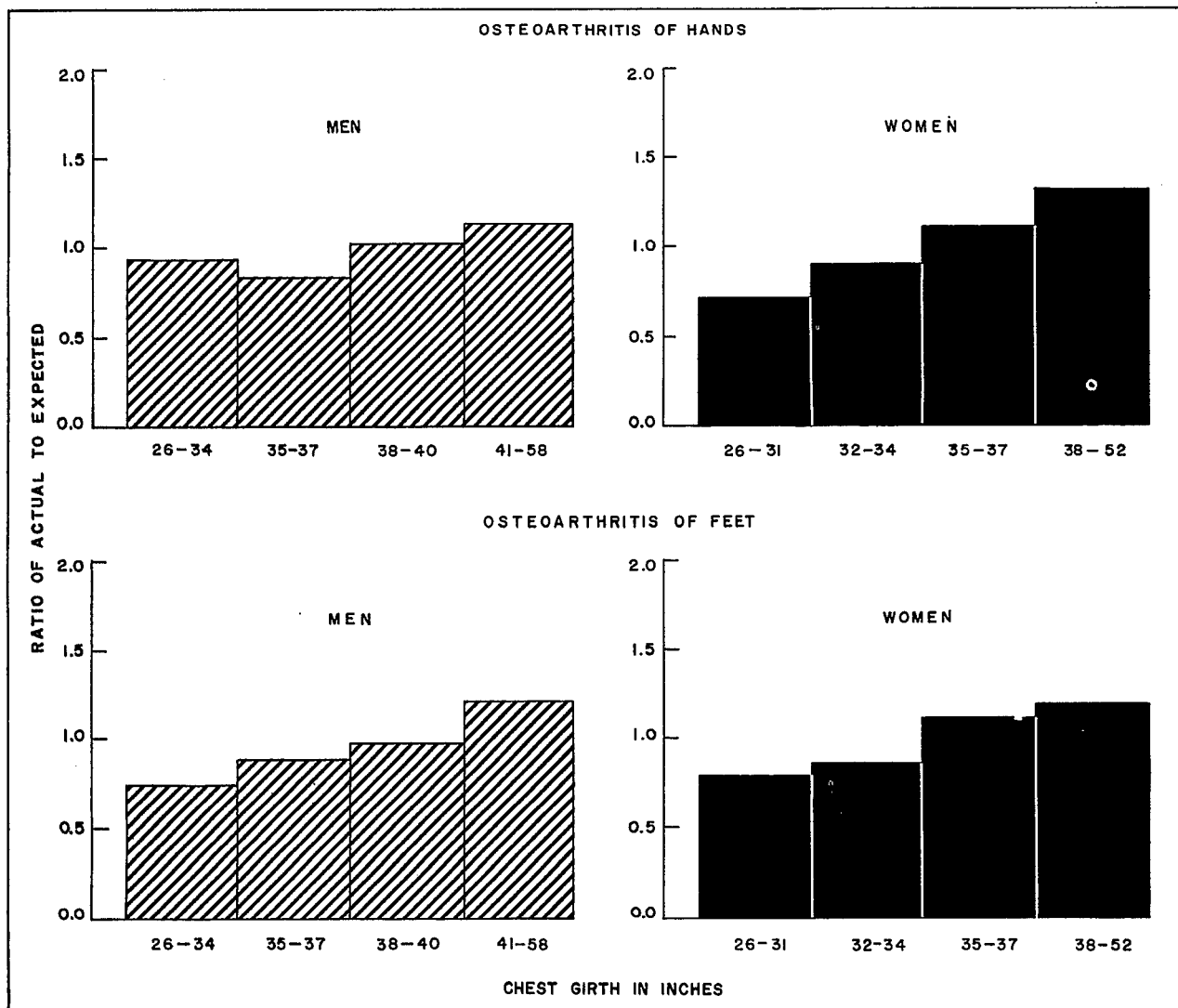


Figure 6. Ratio of actual to expected rate of osteoarthritis, by chest girth.

libitum fed controls. On the other hand Mickelsen and others¹² observed that body-weight restriction produced by caloric reduction in Strain STR/IN mice which otherwise became obese spontaneously produced no reduction in either the severity or incidence of osteoarthritis. One possible explanation of these conflicting findings is the use of two different strains of mice in the studies.

Regardless of the presence or absence of a relationship between obesity or body measure-

ments and osteoarthritis in mice the findings of the Health Examination Survey and other studies cited appear to establish the presence of such a relationship in man. The data available at present unfortunately are not sufficient to allow the formation of any firm conclusions in regard to the biological mechanism involved in this relationship; however, a few hypotheses can be offered. Excess weight undoubtedly is an important factor in causing excess strain on weight-bearing joints.

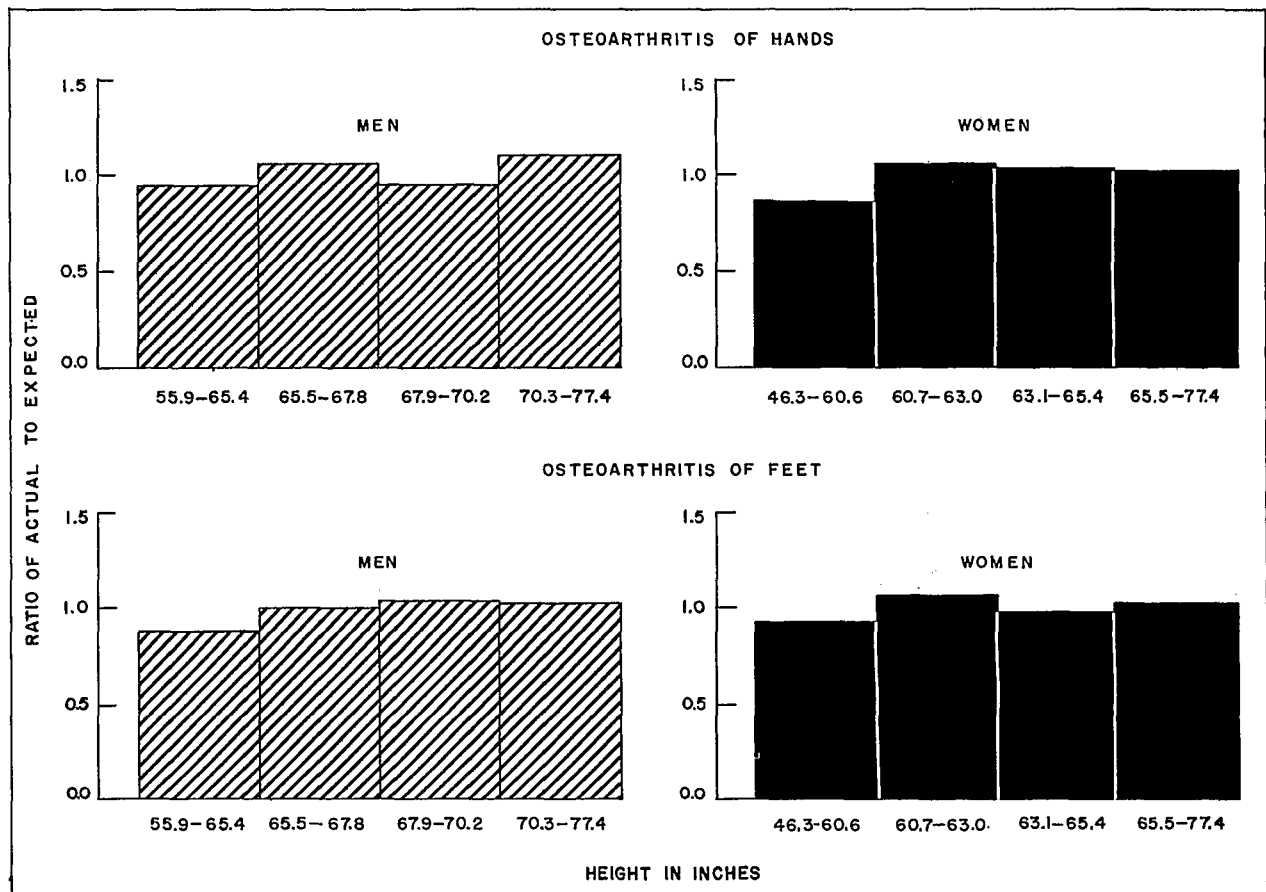


Figure 7. Ratio of actual to expected rate of osteoarthritis, by height.

In addition, muscle bulk tends to increase with increased physical work or exercise. Excess usage of the joints involved may result in increased joint wear and tear and a greater incidence of micro-trauma. Bauer and Bennett compared the roentgenographic appearance of symmetrical joints in humans who subjected one joint to constant use or unusual trauma. For example, roentgenograms of one patient revealed extensive arthritic changes with loose-body formation in the right knee whereas the left knee showed very minimal change. This patient had operated a treadle machine for 30

years. In doing so she was required to flex and extend her right knee hundreds of times a day thereby subjecting this joint to unusual use for 30 years.¹³

Another possible hypothesis to be investigated is the effect of an excess quantity of some component of the diet, such as fat, directly on the joints. Finally body build and osteoarthritis may be connected on a genetical basis which may link specific body types with a hereditary predisposition to early development of osteoarthritis.¹⁴

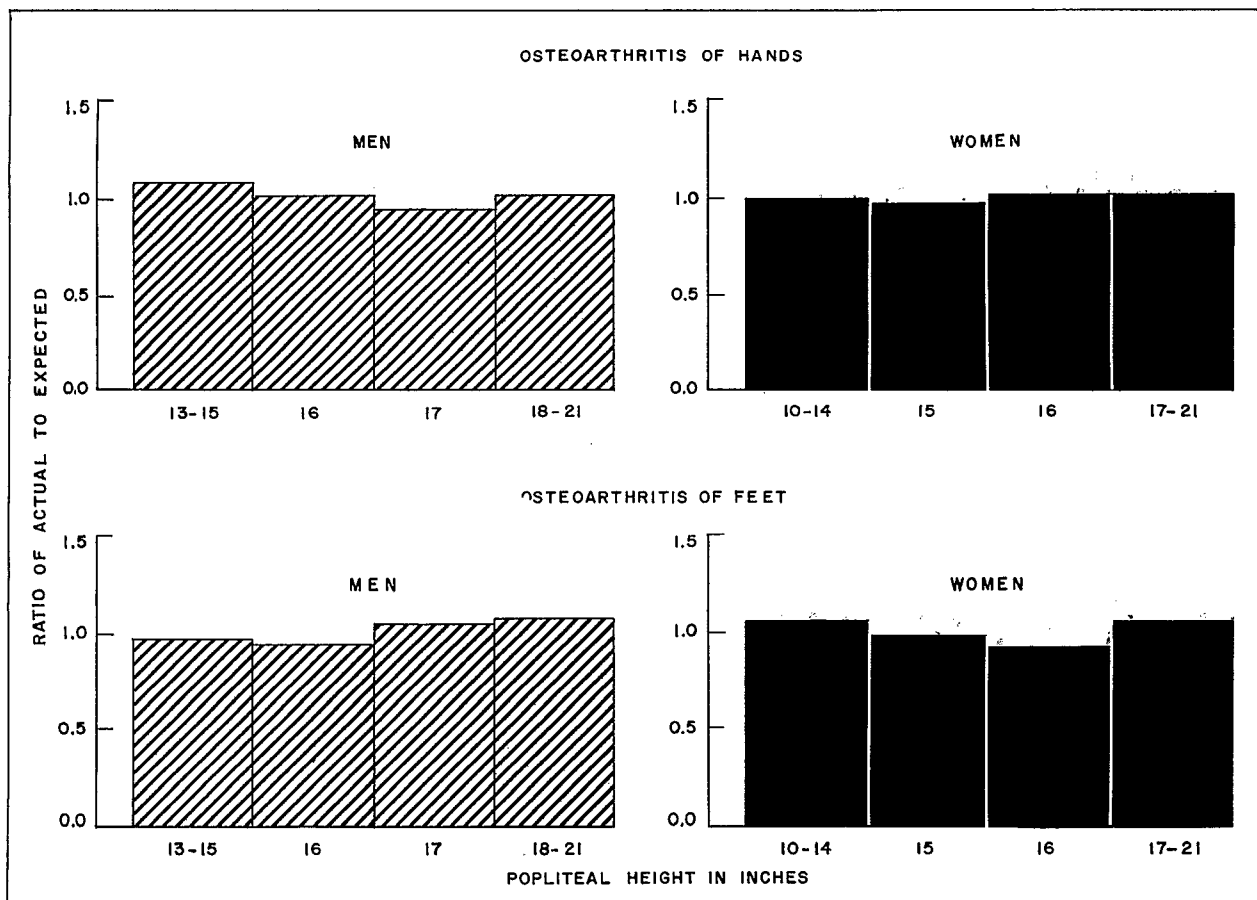


Figure 8. Ratio of actual to expected rate of osteoarthritis, by popliteal height.

SUMMARY

A positive association was found between a number of body measurements and osteoarthritis. This association was present for both osteoarthritis of the hands and osteoarthritis of the feet. The relationship appears to be much stronger for those body measurements which

denote body and limb girths and breadths rather than lengths.

The age group 45-54 years appeared to show the strongest association between body measurements and osteoarthritis. Trends for osteoarthritis and body measurements were in general similar for both sexes but of somewhat greater strength in women.

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Table 1. Prevalence rates of osteoarthritis in adults, by sex, height, site, and age: Health Examination Survey, 1960-62

Site and age	Men—height in inches				Women—height in inches			
	55.9-65.4	65.5-67.8	67.9-70.2	70.3-77.4	46.3-60.6	60.7-63.0	63.1-65.4	65.5-77.4
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	0.0	3.3	3.5	2.9	0.0	0.0	0.0	0.9
25-34 years-----	0.0	5.5	5.0	7.0	0.0	2.4	1.3	2.0
35-44 years-----	9.1	17.6	13.9	16.6	9.8	12.9	10.1	9.2
45-54 years-----	43.7	42.1	34.6	42.3	24.8	35.3	35.2	32.0
55-64 years-----	55.2	59.0	55.0	61.7	56.2	68.5	68.3	81.6
65-74 years-----	66.2	70.7	67.1	68.2	71.3	81.2	80.6	56.3
Actual/expected-----	0.94	1.06	0.94	1.09	0.86	1.07	1.03	1.02
<u>OA feet</u>								
18-24 years-----	4.9	1.6	6.4	4.8	0.0	1.7	1.3	2.8
25-34 years-----	8.8	6.8	9.7	9.8	1.3	4.8	4.8	4.6
35-44 years-----	13.6	16.0	16.9	17.2	11.8	9.7	10.9	9.2
45-54 years-----	17.2	24.3	20.9	26.1	20.8	23.1	23.0	27.8
55-64 years-----	23.8	29.5	28.7	25.0	34.3	43.8	39.2	38.8
65-74 years-----	35.3	39.4	41.1	22.7	44.3	47.5	35.8	31.3
Actual/expected-----	0.88	1.00	1.04	1.03	0.93	1.06	0.98	1.03

Table 2. Number of adults in sample, by sex, height, and age: Health Examination Survey, 1960-62

Age	Men—height in inches					Women—height in inches				
	Total	55.9-65.4	65.5-67.8	67.9-70.2	70.3-77.4	Total	46.3-60.6	60.7-63.0	63.1-65.4	65.5-77.4
All ages, 18-74 years-	2,992	457	829	1,038	668	3,279	599	1,043	1,061	576
18-24 years-----	408	41	122	141	104	432	52	116	155	109
25-34 years-----	666	68	146	238	214	667	76	209	230	152
35-44 years-----	699	88	188	266	157	748	102	217	276	153
45-54 years-----	541	87	152	191	111	697	149	238	213	97
55-64 years-----	416	105	122	129	60	436	105	162	120	49
65-74 years-----	262	68	99	73	22	299	115	101	67	16

Table 3. Prevalence rates of osteoarthritis in adults, by sex, weight, site, and age: Health Examination Survey, 1960-62

Site and age	Men--weight in pounds				Women--weight in pounds				
	80-125	126-171	172-217	218-309	80-102	103-148	149-194	195-378	
<u>OA hands</u>		Rate per 100 adults							
18-24 years-----	0.0	3.2	3.4	0.0	0.0	0.3	0.0	0.0	
25-34 years-----	0.0	3.8	7.3	7.5	0.0	1.0	4.5	3.0	
35-44 years-----	0.0	12.6	17.9	20.6	0.0	8.3	15.6	14.5	
45-54 years-----	21.1	36.6	42.6	60.0	9.5	26.2	42.3	47.4	
55-64 years-----	63.3	52.0	65.1	43.8	28.6	63.2	70.3	81.4	
65-74 years-----	58.3	67.9	74.0	50.0	92.3	74.0	75.7	82.4	
Actual/expected-----	0.81	0.92	1.13	1.14	0.69	0.89	1.14	1.27	
<u>OA feet</u>									
18-24 years-----	3.8	3.9	5.7	6.7	0.0	1.8	2.1	0.0	
25-34 years-----	7.7	8.6	8.8	15.0	2.4	3.5	7.1	9.1	
35-44 years-----	16.7	15.1	16.6	26.5	10.0	9.3	10.4	18.2	
45-54 years-----	0.0	19.8	24.7	44.0	9.5	21.2	24.8	36.8	
55-64 years-----	23.3	23.5	34.2	18.8	0.0	37.7	41.1	51.2	
65-74 years-----	33.3	33.3	46.6	50.0	15.4	46.8	40.0	47.1	
Actual/expected-----	0.76	0.90	1.12	1.50	0.36	0.95	1.03	1.43	

Table 4. Number of adults in sample, by sex, weight, and age: Health Examination Survey, 1960-62

Age	Men--weight in pounds					Women--weight in pounds				
	Total	80-125	126-171	172-217	218-309	Total	80-102	103-148	149-194	195-378
All ages, 18-74 years-	2,992	143	1,617	1,096	136	3,279	134	2,066	865	214
18-24 years-----	408	26	280	87	15	432	41	335	47	9
25-34 years-----	666	26	338	262	40	667	42	480	112	33
35-44 years-----	699	18	357	290	34	748	10	472	211	55
45-54 years-----	541	19	262	235	25	697	21	397	222	57
55-64 years-----	416	30	221	149	16	436	7	228	158	43
65-74 years-----	262	24	159	73	6	299	13	154	115	17

Table 5. Prevalence rates of osteoarthritis in adults, by sex,biacromial diameter, site, and age:
Health Examination Survey, 1960-62

Site and age	Men Biacromial diameter in inches				Women Biacromial diameter in inches			
	11-14	15	16	17-19	9-12	13	14	15-17
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	5.1	3.0	2.3	0.0	0.0	0.0	0.5	0.0
25-34 years-----	4.0	4.5	7.3	3.8	0.0	0.7	1.5	7.4
35-44 years-----	7.0	14.2	17.7	29.4	13.0	7.2	13.1	12.3
45-54 years-----	35.5	39.5	42.9	40.9	14.5	28.7	36.4	49.2
55-64 years-----	54.1	57.3	61.2	50.0	54.2	67.9	67.6	78.6
65-74 years-----	70.5	67.2	69.7	33.3	69.4	77.9	76.9	78.6
Actual/expected-----	0.92	0.98	1.10	1.08	0.81	0.95	1.07	1.32
<u>OA feet</u>								
18-24 years-----	1.7	5.6	4.7	0.0	0.0	1.6	1.1	6.1
25-34 years-----	8.9	7.9	10.5	9.4	0.0	2.8	5.6	8.8
35-44 years-----	8.8	17.8	17.3	20.6	13.0	9.9	10.7	8.2
45-54 years-----	17.8	20.9	28.6	18.2	14.5	19.3	26.1	36.5
55-64 years-----	19.8	33.3	24.3	20.0	29.2	41.7	37.6	57.1
65-74 years-----	34.7	38.9	42.4	0.0	40.3	42.1	50.0	21.4
Actual/expected-----	0.78	1.06	1.10	0.90	0.81	0.94	1.06	1.31

Table 6. Number of adults in sample, by sex, biacromial diameter, and age: Health Examination Survey, 1960-62

Age	Men Biacromial diameter in inches					Women Biacromial diameter in inches				
	Total	11-14	15	16	17-19	Total	9-12	13	14	15-17
All ages, 18-74 years-	2,992	587	1,396	864	145	3,279	292	1,384	1,324	279
18-24 years-----	408	59	198	128	23	432	33	182	184	33
25-34 years-----	666	101	292	220	53	667	48	282	269	68
35-44 years-----	699	114	325	226	34	748	46	292	337	73
45-54 years-----	541	107	258	154	22	697	55	296	283	63
55-64 years-----	416	111	192	103	10	436	48	187	173	28
65-74 years-----	262	95	131	33	3	299	62	145	78	14

Table 7. Prevalence rates of osteoarthritis in adults, by sex, right arm girth, site, and age: Health Examination Survey, 1960-62

Site and age	Men Right arm girth in inches				Women Right arm girth in inches			
	7.1-10.0	10.1-12.0	12.1-14.0	14.1-20.0	7.1-10.0	10.1-12.0	12.1-14.0	14.1-20.0
	Rate per 100 adults							
<u>OA hands</u>								
18-24 years-----	0.0	3.4	3.0	0.0	0.0	0.6	0.0	0.0
25-34 years-----	0.0	2.8	6.6	11.8	0.9	0.9	5.7	3.1
35-44 years-----	0.0	8.3	18.3	25.0	5.6	9.2	18.1	12.1
45-54 years-----	21.4	32.0	43.6	64.1	12.8	29.3	43.2	45.6
55-64 years-----	37.1	56.5	61.5	63.2	58.1	64.4	69.2	79.1
65-74 years-----	61.8	68.4	71.8	57.1	79.2	75.4	73.2	86.7
Actual/expected-----	0.71	0.88	1.11	1.42	0.75	0.94	1.15	1.24
<u>OA feet</u>								
18-24 years-----	8.7	3.8	4.5	6.7	1.3	1.8	3.7	0.0
25-34 years-----	5.6	7.8	9.5	13.7	3.2	3.6	8.0	9.4
35-44 years-----	0.0	16.2	15.5	27.1	8.5	9.2	10.8	20.7
45-54 years-----	0.0	17.6	25.9	33.3	15.1	22.0	25.6	35.1
55-64 years-----	20.0	22.3	33.7	31.6	22.6	37.9	42.0	53.5
65-74 years-----	35.3	34.6	38.8	85.7	24.5	47.0	46.4	46.7
Actual/expected-----	0.74	0.87	1.09	1.55	0.66	0.97	1.10	1.47

Table 8. Number of adults in sample, by sex, right arm girth, and age: Health Examination Survey, 1960-62

Age	Men Right arm girth in inches					Women Right arm girth in inches				
	Total	7.1-10.0	10.1-12.0	12.1-14.0	14.1-20.0	Total	7.1-10.0	10.1-12.0	12.1-14.0	14.1-20.0
	All ages, 18-74 years--	2,992	135	1,322	1,356	179	3,279	758	1,588	719
18-24 years-----	408	23	237	133	15	432	228	168	27	9
25-34 years-----	666	18	281	316	51	667	218	330	87	32
35-44 years-----	699	11	253	387	48	748	142	382	166	58
45-54 years-----	541	14	222	266	39	697	86	355	199	57
55-64 years-----	416	35	193	169	19	436	31	219	143	43
65-74 years-----	262	34	136	85	7	299	53	134	97	15

Table 9. Prevalence rates of osteoarthritis in adults, by sex, chest girth, site, and age: Health Examination Survey, 1960-62

Site and age	Men—chest girth in inches				Women—chest girth in inches			
	26-34	35-37	38-40	41-58	26-31	32-34	35-37	38-52
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	2.8	3.4	3.5	0.0	0.6	0.0	0.0	0.0
25-34 years-----	3.0	3.1	7.3	6.0	1.0	1.0	2.6	5.5
35-44 years-----	10.5	9.9	15.1	19.8	6.4	8.6	14.9	15.2
45-54 years-----	35.5	32.4	37.0	48.9	12.5	28.1	40.4	42.0
55-64 years-----	58.8	49.6	57.5	63.2	54.5	63.6	70.0	70.2
65-74 years-----	66.7	62.7	75.0	67.1	80.6	72.2	76.4	77.6
Actual/expected-----	0.93	0.83	1.02	1.14	0.73	0.90	1.11	1.32
<u>OA feet</u>	Rate per 100 adults							
18-24 years-----	7.0	2.9	5.3	4.1	1.2	1.5	4.3	0.0
25-34 years-----	7.6	8.7	7.7	11.4	3.4	4.2	5.1	7.3
35-44 years-----	7.9	17.6	15.1	18.4	9.2	8.9	10.5	15.2
45-54 years-----	9.7	19.4	21.2	28.0	15.0	19.2	27.3	30.4
55-64 years-----	17.6	22.6	29.1	31.6	36.4	31.8	44.7	42.7
65-74 years-----	33.3	30.7	38.1	45.7	36.1	40.0	44.3	47.8
Actual/expected-----	0.75	0.89	0.98	1.20	0.80	0.86	1.11	1.19

Table 10. Number of adults in sample, by sex, chest girth, and age: Health Examination Survey, 1960-62

Age	Men—chest girth in inches					Women—chest girth, in inches				
	Total	26-34	35-37	38-40	41-58	Total	26-31	32-34	35-37	38-52
All ages, 18-74 years-	2,992	273	881	1,013	825	3,279	664	1,305	799	511
18-24 years-----	408	71	174	114	49	432	168	202	47	15
25-34 years-----	666	66	196	220	184	667	206	289	117	55
35-44 years-----	699	38	182	272	207	748	141	314	181	112
45-54 years-----	541	31	139	189	182	697	80	281	198	138
55-64 years-----	416	34	115	134	133	436	33	129	150	124
65-74 years-----	262	33	75	84	70	299	36	90	106	67

Table 11. Prevalence rates of osteoarthritis in adults, by sex, waist girth, site, and age: Health Examination Survey, 1960-62

Site and age	Men Waist girth in inches				Women Waist girth in inches			
	15-29	30-35	36-41	42-53	26-37	38-43	44-49	50-58
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	5.2	2.0	0.0	0.0	0.0	0.7	0.0	0.0
25-34 years-----	4.7	3.6	9.3	3.6	1.3	1.1	6.0	0.0
35-44 years-----	9.2	15.0	15.5	20.0	6.0	11.1	18.0	10.0
45-54 years-----	31.7	33.6	44.4	54.2	17.1	33.2	38.5	42.0
55-64 years-----	64.3	47.1	61.9	67.4	54.1	65.6	70.0	75.0
65-74 years-----	68.2	65.7	70.6	68.8	86.4	72.9	77.4	75.8
Actual/expected-----	0.97	0.88	1.09	1.18	0.71	0.99	1.11	1.10
<u>OA feet</u>								
18-24 years-----	3.9	5.1	4.0	0.0	1.5	2.1	0.0	0.0
25-34 years-----	8.4	7.8	11.6	10.7	2.9	4.3	10.4	7.7
35-44 years-----	9.2	16.6	17.3	20.0	8.8	8.9	15.6	16.7
45-54 years-----	9.8	21.4	23.3	33.3	18.1	21.0	28.8	34.0
55-64 years-----	25.0	22.2	31.7	26.1	43.2	39.2	36.7	50.0
65-74 years-----	31.8	37.4	35.8	46.9	31.8	41.1	44.3	51.5
Actual/expected-----	0.75	0.95	1.07	1.21	0.84	0.94	1.10	1.32

Table 12. Number of adults in sample, by sex, waist girth, and age: Health Examination Survey, 1960-62

Age	Men Waist girth in inches					Women Waist girth in inches				
	Total	15-29	30-35	36-41	42-53	Total	26-37	38-43	44-49	50-58
All ages, 18-74 years-----	2,992	416	1,412	963	201	3,279	958	1,526	626	169
18-24 years-----	408	153	198	50	7	432	271	142	16	3
25-34 years-----	666	107	359	172	28	667	307	280	67	13
35-44 years-----	699	65	374	220	40	748	216	380	122	30
45-54 years-----	541	41	229	223	48	697	105	386	156	50
55-64 years-----	416	28	153	189	46	436	37	209	150	40
65-74 years-----	262	22	99	109	32	299	22	129	115	33

Table 13. Prevalence rates of osteoarthritis in adults, by sex, skinfold thickness (right arm), site, and age: Health Examination Survey, 1960-62

Site and age	Men Skinfold thickness in millimeters				Women Skinfold thickness in millimeters			
	1-5	6-15	16-25	26-60	1-10	11-20	21-30	31-60
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	4.1	3.6	0.0	0.0	0.0	0.4	0.0	0.0
25-34 years-----	5.1	5.4	5.5	3.6	1.7	0.9	1.9	3.9
35-44 years-----	11.9	14.7	15.7	17.5	7.4	6.6	12.8	15.5
45-54 years-----	31.9	41.2	37.8	41.9	18.5	27.1	33.1	42.5
55-64 years-----	57.8	57.6	55.2	57.1	63.6	66.4	64.4	74.7
65-74 years-----	58.8	71.2	62.2	76.9	83.3	78.3	74.5	72.7
Actual/expected-----	0.91	1.02	0.96	1.03	0.85	0.91	1.00	1.18
<u>OA feet</u>								
18-24 years-----	5.5	3.6	6.6	4.8	1.7	1.6	1.0	4.3
25-34 years-----	7.1	9.0	11.0	7.1	1.7	3.1	4.2	11.7
35-44 years-----	16.9	16.8	15.1	15.0	7.4	8.0	12.1	11.6
45-54 years-----	10.6	22.4	22.5	38.7	22.2	21.3	21.4	30.1
55-64 years-----	20.0	29.3	25.4	14.3	27.3	31.9	42.5	44.8
65-74 years-----	29.4	35.9	40.0	69.2	25.0	38.7	43.1	56.8
Actual/expected-----	0.79	1.01	1.02	1.21	0.73	0.85	1.02	1.28

Table 14. Number of adults in sample, by sex, skinfold thickness (right arm), and age: Health Examination Survey, 1960-62

Age	Men Skinfold thickness in millimeters					Women Skinfold thickness in millimeters				
	Total	1-5	6-15	16-25	26-60	Total	1-10	11-20	21-30	31-60
All ages, 18-74 years-	2,992	356	1,873	588	175	3,279	194	1,305	1,274	506
18-24 years-----	408	73	253	61	21	432	58	249	102	23
25-34 years-----	666	98	367	145	56	667	59	319	212	77
35-44 years-----	699	59	441	159	40	748	27	287	305	129
45-54 years-----	541	47	352	111	31	697	27	225	299	146
55-64 years-----	416	45	290	67	14	436	11	119	219	87
65-74 years-----	262	34	170	45	13	299	12	106	137	44

Table 15. Prevalence rates of osteoarthritis in adults, by sex, skinfold thickness (infrascapular), site, and age: Health Examination Survey, 1960-62

Site and age	Men Skinfold thickness in millimeters				Women Skinfold thickness in millimeters			
	1-10	11-15	16-20	21-60	1-10	11-20	21-30	31-65
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	4.2	2.1	0.0	0.0	0.0	0.6	0.0	0.0
25-34 years-----	4.7	4.8	5.6	6.4	1.4	0.4	3.3	7.1
35-44 years-----	11.7	15.5	14.7	18.9	6.5	9.8	15.4	15.9
45-54 years-----	35.6	37.7	41.3	45.5	17.8	31.2	40.6	40.0
55-64 years-----	55.3	59.3	57.0	57.5	56.0	64.2	71.1	73.4
65-74 years-----	63.7	76.7	71.4	64.7	76.6	73.2	80.0	74.3
Actual/expected-----	0.93	1.03	1.01	1.08	0.75	0.95	1.14	1.16
<u>OA feet</u>								
18-24 years-----	4.2	4.2	5.6	5.3	2.3	0.0	5.4	0.0
25-34 years-----	8.6	9.0	7.3	11.4	3.1	3.2	8.9	9.5
35-44 years-----	15.5	16.6	14.0	19.6	8.3	9.4	13.6	12.2
45-54 years-----	19.0	19.3	24.8	27.3	16.3	21.7	24.4	34.7
55-64 years-----	22.0	27.1	33.3	28.8	22.0	38.7	42.3	50.0
65-74 years-----	32.4	40.0	44.9	37.3	36.2	42.5	42.2	54.3
Actual/expected-----	0.88	0.99	1.07	1.15	0.75	0.94	1.10	1.34

Table 16. Number of adults in sample, by sex, skinfold thickness (infrascapular), and age: Health Examination Survey, 1960-62

Age	Men Skinfold thickness in millimeters					Women Skinfold thickness in millimeters				
	Total	1-10	11-15	16-20	21-60	Total	1-10	11-20	21-30	31-65
All ages, 18-74 years-	2,992	1,115	726	573	578	3,279	945	1,279	725	330
18-24 years-----	408	238	96	36	38	432	216	167	37	12
25-34 years-----	666	256	145	124	141	667	286	249	90	42
35-44 years-----	699	213	193	150	143	748	217	287	162	82
45-54 years-----	541	174	114	121	132	697	129	276	197	95
55-64 years-----	416	132	118	93	73	436	50	173	149	64
65-74 years-----	262	102	60	49	51	299	47	127	90	35

Table 17. Prevalence rates of osteoarthritis in adults, by sex, sitting height (erect), site, and age: Health Examination Survey, 1960-62

Site and age	Men Sitting height in inches				Women Sitting height in inches			
	27-32	33-34	35-36	37-40	17-30	31-32	33-34	35-38
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	10.0	1.8	3.5	2.3	0.0	0.0	0.0	1.6
25-34 years-----	0.0	3.8	5.5	6.3	0.0	1.7	1.6	1.8
35-44 years-----	0.0	13.5	14.8	18.2	10.0	10.6	10.8	10.5
45-54 years-----	37.5	40.9	40.1	37.3	36.0	26.8	35.4	34.3
55-64 years-----	52.2	55.2	58.8	60.0	54.8	64.1	69.7	82.1
65-74 years-----	59.1	67.9	72.2	58.3	71.4	77.2	77.9	50.0
Actual/expected-----	0.83	0.97	1.03	1.03	0.92	0.95	1.05	1.07
<u>OA feet</u>								
18-24 years-----	10.0	2.8	5.0	4.5	0.0	3.3	1.3	0.0
25-34 years-----	0.0	9.2	10.1	7.4	0.0	2.9	5.4	3.5
35-44 years-----	16.7	15.5	14.0	23.0	5.0	10.6	9.9	12.4
45-54 years-----	0.0	20.8	22.4	26.5	28.0	20.1	23.3	31.4
55-64 years-----	26.1	25.3	28.1	30.0	38.7	40.1	38.4	46.4
65-74 years-----	22.7	37.4	42.3	25.0	46.4	45.1	36.4	25.0
Actual/expected-----	0.72	0.95	1.01	1.13	1.02	0.99	0.98	1.16

Table 18. Number of adults in sample, by sex, sitting height (erect), and age: Health Examination Survey, 1960-62

Age	Men Sitting height in inches					Women Sitting height in inches				
	Total	27-32	33-34	35-36	37-40	Total	17-30	31-32	33-34	35-38
All ages, 18-74 years-	2,992	95	826	1,506	565	3,279	157	1,053	1,686	383
18-24 years-----	408	10	109	201	88	432	11	123	235	63
25-34 years-----	666	14	130	347	175	667	14	173	367	113
35-44 years-----	699	18	148	385	148	748	20	179	444	105
45-54 years-----	541	8	154	277	102	697	25	224	378	70
55-64 years-----	416	23	154	199	40	436	31	192	185	28
65-74 years-----	262	22	131	97	12	299	56	162	77	4

Table 19. Prevalence rates of osteoarthritis in adults, by sex, knee height, site, and age: Health Examination Survey, 1960-62

Site and age	Men--knee height in inches				Women--knee height in inches				
	17-19	20	21	22-25	15-17	18	19	20-25	
<u>OA hands</u>		Rate per 100 adults							
18-24 years-----	0.0	4.0	2.1	3.8	0.0	0.0	0.0	0.6	
25-34 years-----	2.3	4.2	3.7	8.1	0.0	0.8	2.0	1.9	
35-44 years-----	14.7	9.8	17.6	16.2	10.0	9.6	9.3	12.9	
45-54 years-----	33.3	37.2	39.1	45.9	22.0	27.3	34.0	37.7	
55-64 years-----	50.0	59.7	53.5	63.4	57.7	63.6	66.5	72.6	
65-74 years-----	65.5	65.3	74.0	64.3	78.9	74.5	76.7	76.1	
Actual/expected-----	0.88	0.94	1.00	1.13	0.84	0.93	1.00	1.11	
<u>OA feet</u>									
18-24 years-----	3.0	4.0	2.8	6.8	0.0	1.4	1.8	1.7	
25-34 years-----	2.3	7.7	9.3	10.7	0.0	4.1	5.2	4.3	
35-44 years-----	11.8	19.1	14.7	17.1	10.0	7.5	11.0	11.0	
45-54 years-----	17.5	16.0	25.3	27.7	15.3	22.4	22.9	26.4	
55-64 years-----	19.4	27.6	31.5	25.8	30.8	37.3	39.8	43.5	
65-74 years-----	41.4	35.8	42.7	26.2	36.8	49.1	41.7	36.6	
Actual/expected-----	0.77	0.95	1.06	1.08	0.73	0.99	1.01	1.12	

Table 20. Number of adults in sample, by sex, knee height, and age: Health Examination Survey, 1960-62

Age	Men--knee height in inches					Women--knee height in inches				
	Total	17-19	20	21	22-25	Total	15-17	18	19	20-25
All ages, 18-74 years-	2,992	298	812	1,022	860	3,279	199	723	1,239	1,118
18-24 years-----	408	33	101	141	133	432	17	73	168	174
25-34 years-----	666	43	143	246	234	667	38	123	249	257
35-44 years-----	699	68	183	238	210	748	40	146	290	272
45-54 years-----	541	63	156	174	148	697	59	165	253	220
55-64 years-----	416	62	134	127	93	436	26	110	176	124
65-74 years-----	262	29	95	96	42	299	19	106	103	71

Table 21. Prevalence rates of osteoarthritis in adults, by sex, popliteal height, site, and age: Health Examination Survey, 1960-62

Site and age	Men Popliteal height in inches				Women Popliteal height in inches			
	13-15	16	17	18-21	10-14	15	16	17-21
Rate per 100 adults								
<u>OA hands</u>								
18-24 years-----	0.0	2.2	3.6	3.1	0.0	0.0	0.0	1.4
25-34 years-----	6.7	4.4	3.8	7.4	2.3	1.3	1.6	1.6
35-44 years-----	20.0	17.4	13.4	12.3	12.0	11.5	9.4	8.5
45-54 years-----	53.2	37.5	40.5	35.6	33.6	28.1	35.6	34.9
55-64 years-----	53.2	57.8	52.5	68.4	67.5	65.4	68.3	65.4
65-74 years-----	69.7	69.3	68.9	62.9	69.3	81.6	76.9	82.4
Actual/expected-----	1.09	1.01	0.96	1.02	1.00	0.98	1.02	1.02
<u>OA feet</u>								
18-24 years-----	13.6	3.3	3.0	5.5	3.1	0.0	1.7	2.7
25-34 years-----	3.3	7.6	9.5	10.2	4.5	3.6	4.5	6.3
35-44 years-----	14.0	17.0	14.1	19.8	12.0	10.3	8.6	11.3
45-54 years-----	25.5	16.7	24.8	25.0	21.2	24.0	22.0	31.7
55-64 years-----	23.4	28.9	30.4	19.7	42.5	39.2	38.3	30.8
65-74 years-----	36.4	37.5	41.5	25.7	49.1	41.7	38.5	23.5
Actual/expected-----	0.97	0.94	1.04	1.06	1.06	0.98	0.93	1.06

Table 22. Number of adults in sample, by sex, popliteal height, and age: Health Examination Survey, 1960-62

Age	Men Popliteal height in inches					Women Popliteal height in inches				
	Total	13-15	16	17	18-21	Total	10-14	15	16	17-21
All ages, 18-74 years-	2,992	229	859	1,184	720	3,279	890	1,044	1,031	314
18-24 years-----	408	22	92	167	127	432	65	119	175	73
25-34 years-----	666	30	158	262	216	667	133	223	247	64
35-44 years-----	699	50	218	269	162	748	192	252	233	71
45-54 years-----	541	47	168	222	104	697	226	217	191	63
55-64 years-----	416	47	135	158	76	436	160	130	120	26
65-74 years-----	262	33	88	106	35	299	114	103	65	17

Table 23. Prevalence rates of osteoarthritis in adults, by sex, thigh clearance height, site, and age: Health Examination Survey, 1960-62

Site and age	Men--thigh clearance height in inches			Women--thigh clearance height in inches		
	3-4	5	6-10	3-4	5	6-10
<u>OA hands</u>	Rate per 100 adults					
18-24 years-----	4.7	2.2	3.3	0.8	0.0	0.0
25-34 years-----	0.0	5.4	6.6	1.5	1.2	3.0
35-44 years-----	7.0	13.2	19.8	7.6	8.3	18.3
45-54 years-----	29.7	39.0	45.9	23.1	34.2	40.0
55-64 years-----	45.9	59.8	62.9	60.3	68.3	73.3
65-74 years-----	62.2	70.2	72.3	80.0	74.4	71.1
Actual/expected-----	0.79	1.00	1.16	0.89	0.99	1.20
<u>OA feet</u>						
18-24 years-----	3.1	4.5	5.0	1.5	1.6	1.8
25-34 years-----	7.9	9.9	8.2	4.0	3.3	7.4
35-44 years-----	11.3	15.8	18.5	11.1	8.8	12.6
45-54 years-----	14.9	21.1	28.3	20.9	20.3	32.9
55-64 years-----	16.3	26.2	41.6	38.1	36.6	50.0
65-74 years-----	29.7	39.0	44.7	36.2	44.2	55.3
Actual/expected-----	0.86	0.99	1.20	0.92	0.92	1.33

Table 24. Number of adults in sample, by sex, thigh clearance height, and age: Health Examination Survey, 1960-62

Age	Men--thigh clearance height in inches				Women--thigh clearance height in inches			
	Total	3-4	5	6-10	Total	3-4	5	6-10
All ages, 18-74 years-----	2,992	457	1,614	921	3,279	917	1,701	661
18-24 years-----	408	64	223	121	432	133	243	56
25-34 years-----	666	76	333	257	667	200	332	135
35-44 years-----	699	71	380	248	748	171	386	191
45-54 years-----	541	74	308	159	697	182	360	155
55-64 years-----	416	98	229	89	436	126	224	86
65-74 years-----	262	74	141	47	299	105	156	38

Table 25. Prevalence rates of osteoarthritis in adults, by sex, buttock-knee length, site, and age: Health Examination Survey, 1960-62

Site and age	Men--buttock-knee length in inches			Women--buttock-knee length in inches		
	17-22	23-24	25-28	17-20	21-22	23-28
<u>OA hands</u>	Rate per 100 adults					
18-24 years-----	3.2	3.1	0.0	0.0	0.4	0.0
25-34 years-----	3.4	5.8	8.2	1.5	1.0	3.2
35-44 years-----	13.0	16.0	15.8	8.3	9.9	12.8
45-54 years-----	38.7	38.9	52.9	21.0	31.0	40.7
55-64 years-----	56.0	58.1	58.3	63.8	65.3	71.9
65-74 years-----	64.6	73.4	50.0	78.3	75.6	75.3
Actual/expected-----	0.95	1.03	1.01	0.87	0.97	1.12
<u>OA feet</u>						
18-24 years-----	2.5	5.8	3.8	0.0	1.9	1.7
25-34 years-----	6.3	9.8	13.1	1.5	3.7	6.8
35-44 years-----	16.8	15.3	23.7	10.0	10.4	10.2
45-54 years-----	19.1	32.9	26.5	16.0	22.3	28.4
55-64 years-----	24.2	30.2	16.7	34.0	40.7	39.7
65-74 years-----	36.9	38.7	25.0	43.5	43.5	41.2
Actual/expected-----	0.91	1.05	1.16	0.83	0.99	1.08

Table 26. Number of adults in sample, by sex, buttock-knee length, and age: Health Examination Survey, 1960-62

Age	Men--buttock-knee length in inches				Women--buttock-knee length in inches			
	Total	17-22	23-24	25-28	Total	17-20	21-22	23-28
All ages, 18-74 years-----	2,992	1,141	1,672	179	3,279	356	1,981	942
18-24 years-----	408	157	225	26	432	55	260	117
25-34 years-----	666	206	399	61	667	67	410	190
35-44 years-----	699	262	399	38	748	60	453	235
45-54 years-----	541	204	303	34	697	81	422	194
55-64 years-----	416	182	222	12	436	47	268	121
65-74 years-----	262	130	124	8	299	46	168	85

Table 27. Prevalence rates of osteoarthritis in adults, by sex, buttock-popliteal length, site, and age: Health Examination Survey, 1960-62

Site and age	Men--buttock-popliteal length in inches				Women--buttock-popliteal length in inches			
	14-18	19	20	21-24	14-16	17-18	19-20	21-24
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	2.4	2.5	6.0	0.0	0.0	0.5	0.0	0.0
25-34 years-----	4.1	4.7	5.2	9.6	2.9	1.8	1.5	0.0
35-44 years-----	13.1	16.6	16.6	11.4	3.7	8.9	12.0	20.0
45-54 years-----	41.5	35.1	40.2	48.0	24.2	29.3	36.5	35.9
55-64 years-----	57.2	50.4	64.0	62.9	73.3	66.8	66.1	71.4
65-74 years-----	64.6	69.5	76.3	50.0	64.7	76.8	74.6	92.3
Actual/expected-----	0.97	0.95	1.09	1.06	0.86	0.96	1.03	1.19
<u>OA feet</u>								
18-24 years-----	1.6	5.0	4.8	10.8	0.0	1.4	1.8	4.3
25-34 years-----	7.1	9.9	9.8	9.6	2.9	2.7	5.2	14.3
35-44 years-----	16.0	17.0	12.4	22.9	3.7	9.5	11.0	15.6
45-54 years-----	22.1	21.8	23.8	22.0	18.2	23.1	23.3	28.2
55-64 years-----	23.0	32.6	27.0	25.7	26.7	40.7	39.8	38.1
65-74 years-----	36.5	37.9	44.1	8.3	41.2	47.0	39.0	30.8
Actual/expected-----	0.91	1.06	1.01	1.07	0.74	1.00	1.00	1.22

Table 28. Number of adults in sample, by sex, buttock-popliteal length, and age: Health Examination Survey, 1960-62

Age	Men--buttock-popliteal length in inches					Women--buttock-popliteal length in inches				
	Total	14-18	19	20	21-24	Total	14-16	17-18	19-20	21-24
All ages, 18-74 years-	2,992	1,004	1,017	684	287	3,279	156	1,588	1,359	176
18-24 years-----	408	127	160	84	37	432	30	211	168	23
25-34 years-----	666	197	212	174	83	667	34	329	269	35
35-44 years-----	699	237	247	145	70	748	27	359	317	45
45-54 years-----	541	195	174	122	50	697	33	324	301	39
55-64 years-----	416	152	129	100	35	436	15	214	186	21
65-74 years-----	262	96	95	59	12	299	17	151	118	13

Table 29. Prevalence rates of osteoarthritis in adults, by sex, seat breadth, site, and age: Health Examination Survey, 1960-62

Site and age	Men--seat breadth in inches				Women--seat breadth in inches				
	9.2-12.1	12.2-13.6	13.7-15.1	15.2-22.6	9.2-13.6	13.7-15.1	15.2-16.6	16.7-22.6	
<u>OA hands</u>		Rate per 100 adults							
18-24 years-----	0.0	3.9	2.8	0.0	0.0	0.0	3.2	0.0	
25-34 years-----	0.0	3.1	7.7	4.3	0.4	1.1	6.5	2.6	
35-44 years-----	8.3	9.6	18.1	17.8	5.9	11.0	13.4	16.4	
45-54 years-----	35.0	29.6	43.7	47.2	20.2	32.8	41.4	41.9	
55-64 years-----	41.2	54.0	58.5	67.3	59.1	69.0	65.5	79.1	
65-74 years-----	33.3	67.6	75.0	52.4	75.4	75.8	79.2	68.0	
Actual/expected-----	0.65	0.86	1.11	1.10	0.79	1.01	1.12	1.17	
<u>OA feet</u>									
18-24 years-----	3.1	5.3	4.2	0.0	1.9	1.1	3.2	0.0	
25-34 years-----	6.3	8.1	9.1	12.0	3.3	3.0	9.7	7.9	
35-44 years-----	16.7	14.9	16.4	20.0	8.1	9.3	14.0	13.1	
45-54 years-----	5.0	16.0	23.3	34.8	17.3	23.3	29.0	24.2	
55-64 years-----	11.8	27.3	28.0	28.6	33.3	40.6	36.3	58.1	
65-74 years-----	16.7	34.3	42.7	33.3	30.4	50.0	41.6	44.0	
Actual/expected-----	0.49	0.91	1.04	1.23	0.78	1.01	1.12	1.23	

Table 30. Number of adults in sample, by sex, seat breadth, and age: Health Examination Survey, 1960-62

Age	Men--seat breadth in inches					Women--seat breadth in inches				
	Total	9.2-12.1	12.2-13.6	13.7-15.1	15.2-22.6	Total	9.2-13.6	13.7-15.1	15.2-16.6	16.7-22.6
All ages, 18-74 years-	2,992	109	1,132	1,382	369	3,279	994	1,412	633	240
18-24 years-----	408	32	206	142	28	432	209	181	31	11
25-34 years-----	666	16	260	298	92	667	269	267	93	38
35-44 years-----	699	12	249	348	90	748	186	344	157	61
45-54 years-----	541	20	162	270	89	697	168	305	162	62
55-64 years-----	416	17	150	200	49	436	93	187	113	43
65-74 years-----	262	12	105	124	21	299	69	128	77	25

Table 31. Prevalence rates of osteoarthritis in adults, by sex, elbow-to-elbow breadth, site, and age: Health Examination Survey, 1960-62

Site and age	Men--elbow-to-elbow breadth in inches				Women--elbow-to-elbow breadth in inches				
	12-13	14-15	16-17	18-25	12-13	14-15	16-17	18-25	
<u>OA hands</u>		Rate per 100 adults							
18-24 years-----	4.3	3.1	2.8	0.0	0.4	0.0	0.0	0.0	
25-34 years-----	2.0	4.0	7.1	5.2	0.7	1.2	6.4	2.2	
35-44 years-----	3.7	12.1	12.5	24.8	6.3	9.5	15.3	17.1	
45-54 years-----	26.3	32.2	39.1	50.3	17.5	29.2	39.0	46.8	
55-64 years-----	38.9	52.2	59.8	63.2	63.2	63.2	71.6	67.3	
65-74 years-----	71.4	65.3	70.4	67.7	80.0	75.3	73.3	80.7	
Actual/expected-----	0.75	0.88	1.01	1.19	0.73	0.93	1.10	1.16	
<u>OA feet</u>									
18-24 years-----	4.3	3.6	4.6	8.1	1.2	2.1	3.7	0.0	
25-34 years-----	4.0	10.9	7.1	11.2	3.0	5.4	3.8	8.9	
35-44 years-----	11.1	14.0	17.8	17.4	11.1	8.6	8.7	18.3	
45-54 years-----	0.0	24.8	18.7	28.7	20.0	20.6	21.9	35.8	
55-64 years-----	5.6	24.6	31.4	27.4	47.4	34.9	41.9	40.8	
65-74 years-----	28.6	34.7	39.8	38.5	32.0	39.2	44.2	50.9	
Actual/expected-----	0.49	0.98	1.01	1.13	0.92	0.90	1.00	1.28	

Table 32. Number of adults in sample, by sex, elbow-to-elbow breadth, and age: Health Examination Survey, 1960-62

Age	Men--elbow-to-elbow breadth in inches					Women--elbow-to-elbow breadth in inches				
	Total	12-13	14-15	16-17	18-25	Total	12-13	14-15	16-17	18-25
All ages, 18-74 years-	2,992	198	1,004	1,173	617	3,279	925	1,241	710	403
18-24 years-----	408	70	192	109	37	432	251	142	27	12
25-34 years-----	666	50	247	253	116	667	302	242	78	45
35-44 years-----	699	27	207	304	161	748	189	327	150	82
45-54 years-----	541	19	149	230	143	697	120	281	187	109
55-64 years-----	416	18	134	169	95	436	38	152	148	98
65-74 years-----	262	14	75	108	65	299	25	97	120	57

Table 33. Prevalence rates of osteoarthritis in adults, by sex, elbow rest height, site, and age: Health Examination Survey, 1960-62

Site and age	Men Elbow rest height in inches				Women Elbow rest height in inches			
	5-7	8	9	10-12	4-7	8	9	10-12
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	3.0	6.0	2.7	1.4	0.0	0.0	0.0	1.5
25-34 years-----	3.3	6.6	5.5	4.5	1.6	1.6	1.2	2.4
35-44 years-----	11.1	9.6	15.1	17.9	6.7	12.4	10.4	11.3
45-54 years-----	29.7	38.6	41.6	40.3	28.6	35.8	30.2	34.5
55-64 years-----	59.0	58.7	58.3	53.8	59.3	68.1	67.5	73.1
65-74 years-----	70.6	64.2	75.3	61.2	76.0	70.7	81.5	80.0
Actual/expected-----	0.96	0.97	1.04	0.99	1.06	1.02	0.99	1.08
<u>OA feet</u>								
18-24 years-----	15.2	2.4	4.8	2.8	2.7	2.2	1.3	0.0
25-34 years-----	10.0	8.1	8.5	9.8	3.2	4.3	3.9	5.4
35-44 years-----	24.4	14.0	11.8	20.1	6.7	12.4	8.4	12.7
45-54 years-----	8.1	16.7	28.7	21.5	23.1	21.6	25.3	22.2
55-64 years-----	27.9	28.8	26.5	26.1	30.8	41.1	43.7	41.0
65-74 years-----	31.4	39.5	32.1	49.0	40.4	43.4	43.2	53.3
Actual/expected-----	0.99	0.92	0.98	1.08	0.88	1.02	1.02	1.06

Table 34. Number of adults in sample, by sex, elbow rest height, and age: Health Examination Survey, 1960-62

Age	Men Elbow rest height in inches				Women Elbow rest height in inches					
	Total	5-7	8	9	10-12	Total	4-7	8	9	10-12
All ages, 18-74 years-	2,992	257	655	1,049	1,031	3,279	499	921	1,158	701
18-24 years-----	408	33	84	146	145	432	75	137	153	67
25-34 years-----	666	30	136	236	264	667	63	184	254	166
35-44 years-----	699	45	136	245	273	748	75	170	299	204
45-54 years-----	541	37	114	209	181	697	91	190	245	171
55-64 years-----	418	61	104	132	119	436	91	141	126	78
65-74 years-----	262	51	81	81	49	299	10	99	81	15

Table 35. Prevalence rates of osteoarthritis in adults, by sex, ponderal index, site, and age: Health Examination Survey, 1960-62

Site and age	Men--ponderal index in inches				Women--ponderal index in inches			
	9.6-11.9	12.0-12.7	12.8-13.5	13.6-15.1	8.8-11.1	11.2-11.9	12.0-12.7	12.8-15.1
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	0.0	3.1	3.5	3.3	0.0	0.0	0.0	0.5
25-34 years-----	6.1	6.0	4.3	0.0	7.0	1.7	0.8	1.6
35-44 years-----	20.2	14.0	10.8	11.8	11.8	19.0	8.6	4.9
45-54 years-----	49.1	37.6	32.2	30.8	43.6	36.8	29.7	18.7
55-64 years-----	63.4	54.8	52.3	57.9	72.6	66.3	65.4	61.9
65-74 years-----	71.4	72.8	64.5	45.0	77.3	72.4	77.4	83.3
Actual/expected-----	1.15	0.98	0.87	0.78	1.14	1.07	0.94	0.76
<u>OA feet</u>								
18-24 years-----	8.5	2.5	4.1	10.0	0.0	4.9	0.6	1.8
25-34 years-----	12.2	7.8	8.5	8.0	11.6	5.9	3.9	2.8
35-44 years-----	19.7	15.7	14.9	5.9	16.5	12.7	8.6	7.7
45-54 years-----	28.8	20.8	19.1	0.0	34.5	22.5	22.5	15.0
55-64 years-----	34.3	24.9	20.9	26.3	49.5	38.0	36.1	35.7
65-74 years-----	45.5	33.0	35.5	35.0	51.5	41.4	43.0	25.0
Actual/expected-----	1.27	0.91	0.89	0.82	1.35	1.01	0.93	0.73

Table 36. Number of adults in sample, by sex, ponderal index, and age: Health Examination Survey, 1960-62

Age	Men--ponderal index in inches				Women--ponderal index in inches					
	Total	9.6-11.9	12.0-12.7	12.8-13.5	13.6-15.1	Total	8.8-11.1	11.2-11.9	12.0-12.7	12.8-15.1
All ages, 18-74 years-	2,992	746	1,330	792	124	3,279	415	861	1,174	829
18-24 years-----	408	47	161	170	30	432	16	41	153	222
25-34 years-----	666	147	283	211	25	667	43	118	254	252
35-44 years-----	699	178	356	148	17	748	85	189	292	182
45-54 years-----	541	163	250	115	13	697	110	231	249	107
55-64 years-----	416	134	177	86	19	436	95	166	133	42
65-74 years-----	262	77	103	62	20	299	66	116	93	24

Table 37. Prevalence rates of osteoarthritis in adults, by sex, sum of skinfolds, site, and age: Health Examination Survey, 1960-62

Site and age	Men—sum of skinfolds in centimeters				Women—sum of skinfolds in centimeters			
	0.5-1	2	3	4-11	0.5-2	3	4	5-11
<u>OA hands</u>	Rate per 100 adults							
18-24 years-----	3.5	4.3	0.0	0.0	0.4	0.0	0.0	0.0
25-34 years-----	4.2	5.4	6.0	6.3	1.4	0.6	0.9	4.7
35-44 years-----	11.5	15.6	16.0	17.0	5.8	10.2	11.6	15.4
45-54 years-----	37.3	36.9	42.1	44.7	18.9	27.5	36.3	40.7
55-64 years-----	57.6	58.9	57.8	50.9	66.0	62.7	63.9	72.2
65-74 years-----	60.8	75.3	79.5	61.4	76.3	80.6	72.6	75.5
Actual/expected-----	0.93	1.03	1.06	1.01	0.80	0.93	0.99	1.14
<u>OA feet</u>								
18-24 years-----	4.3	3.3	7.5	4.4	2.1	0.0	1.9	3.1
25-34 years-----	8.0	9.0	9.7	10.2	2.9	3.4	4.6	9.3
35-44 years-----	16.9	15.6	14.5	18.4	8.7	9.1	11.6	12.0
45-54 years-----	18.4	23.5	20.7	29.8	17.4	21.3	21.0	29.0
55-64 years-----	23.2	27.4	37.8	18.2	22.0	43.1	36.9	45.1
65-74 years-----	32.0	39.0	40.9	43.2	37.3	40.3	46.4	44.7
Actual/expected-----	0.89	1.00	1.08	1.10	0.77	0.95	0.99	1.18

Table 38. Number of adults in sample, by sex, sum of skinfolds, and age: Health Examination Survey, 1960-62

Age	Men—sum of skinfolds in centimeters					Women—sum of skinfolds in centimeters				
	Total	0.5-1	2	3	4-11	Total	0.5-2	3	4	5-11
All ages, 18-74 years-	2,992	1,031	875	579	507	3,279	961	794	673	851
18-24 years-----	408	231	92	40	45	432	236	110	54	32
25-34 years-----	666	237	167	134	128	667	277	174	109	107
35-44 years-----	699	183	244	131	141	748	207	186	147	208
45-54 years-----	541	158	149	140	94	697	132	160	157	248
55-64 years-----	416	125	146	90	55	436	50	102	122	162
65-74 years-----	262	97	77	44	44	299	59	62	84	94

APPENDIX I

RATING METHODS AND READER AGREEMENT ON X-RAY DIAGNOSIS

With the decision to base the diagnosis of osteoarthritis solely on X-ray evidence, the need to ensure maximum uniformity in the grading for all 6,413 sets of films from the survey examination was critical. The ratings, as previously indicated, were done independently by members of a team of three skilled specialists in arthritic diseases to minimize the possibility of underreporting of degenerative changes. Disagreements obtained were later resolved by consultation.

For rating purposes, the X-rays of the hands and feet contained no identification other than the survey number and the date to obviate possible bias from a knowledge of age and sex.

Radiographs of the hands and feet of each examinee were treated as a unit and filed in the same envelope. The envelopes from two stands were placed in random order and the films examined independently by the three specialists from the National Institute of Arthritis and Metabolic Diseases.

The rating, as previously indicated, was done in accordance with the method and published photographs of Kelgren and Lawrence¹⁵ and the films from the Clinical Center, National Institutes of Health shown in a previous report.⁶ The degree was classed into the five grades: 0—none; 1—doubtful; 2—minimal; 3—moderate; and 4—severe.

The readers rated independently of each other, examining either the film of the hands or feet first and, where necessary, referring back to the film which had first been read before entering the final grades. After the final grades were determined by the reader, the films were returned to their envelopes and no further revision in rating was permitted.

When the radiographic changes observed in any single joint of the hands (or feet) exceeded the grade of any other joint on the same film by two grade points or more, the grades were recorded in the form of a fraction with the grade of the more severely affected joint as the denominator and the maximum grade of the others as the numerator. The grade of such isolated joints was not used in determining the severity of osteoarthritis as reported herein. Furthermore, as previously indicated, when osteoarthritis and rheuma-

toid arthritis evidence coexisted on the same film the grading given for osteoarthritis was based only on those joints not affected by rheumatoid arthritis, since these changes were considered secondary to the destructive changes of rheumatoid arthritis.

Other than the above exceptions, the grade given for the hands or for the feet was the grade of the most severely affected joint of that extremity. When the grades given by the three observers for a single film were within one point of each other, the majority ruled.

When the grades differed by two or more points, the three observers reread the film together. They first regraded the film independently without consultation and if this second grading was within one point, the majority ruled. If, however, the grading still differed by two or more points, the difference was discussed and a final grade determined.

The higher of the two ratings—for hands or feet—was considered to be the degree of severity of osteoarthritis in the examinee for the purpose of the survey diagnosis.

As shown in table I, the level of agreement among the three readers was significantly better on the X-rays of the hands than those of the feet. While all three readers had about the same level of agreement on the X-rays of the hand—correlations ranging from +0.75 to +0.77 for pairs of readers—one of the readers (RLB) agreed more closely with another reader (TAB) ($r = +0.64$) than with the third reader (JJB) ($r = +0.59$). The level of agreement for films of the hands was of approximately the same order of magnitude as that cited by Kelgren and Lawrence¹⁵ (+0.78) for replicate readings by two observers in a series of 85 films in which the first carpometacarpal joints were rated.

The level of intraobserver correlations shown in table II for one stand of examinees was of essentially the same order of magnitude as the interobserver correlations obtained in the survey. It also did not differ significantly from the intraobserver correlations obtained on replicate readings for the metacarpophalangeal and first carpometacarpal joints of +0.88 and +0.81, respectively, in the study cited by Kelgren and Lawrence.¹⁵

Table I. Interobserver correlations on osteoarthritis gradings among pairs of readers of the 6,413 X-ray films for hands and feet: Cycle I of the Health Examination Survey, 1960-62

Reader	Correlations for films of	
	Hands	Feet
JJB and TAB-----	+0.76	+0.61
TAB and RLB-----	+0.77	+0.64
JJB and RLB-----	+0.75	+0.59
JJB and final reading-----	+0.81	+0.73
TAB and final reading-----	+0.82	+0.78
RLB and final reading-----	+0.78	+0.75

Table II. Inter-and intra-observer correlations on osteoarthritis gradings among pairs of readers for one stand (150 sets of film): Cycle I of the Health Examination Survey, 1960-62

Reader	Correlations for films of	
	Hands	Feet
JJB and TAB-----	+0.69	+0.68
TAB and RLB-----	+0.81	+0.71
JJB and RLB-----	+0.40	+0.62
JJB (1st and 2d reading)--	+0.86	+0.67
TAB (1st and 2d reading)--	+0.77	+0.77
RBL (1st and 2d reading)--	+0.81	+0.77



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