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VITAL and HEALTH STATISTICS
DATA FROM THE NATIONAL HEALTH SURVEY

Prevalence of Osteoarthritis in Adults

by Age, Sex, Race, and Geographic Area

United States - 1960-1962

Diagnosis of osteoarthritis as determined from evidence of degenerative changes in the joints on radiographs of hands and feet only.

Washington, D.C. June 1966

U.S. DEPARTMENT OF
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COOPERATION OF THE BUREAU OF THE CENSUS

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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CONTENTS

IN THIS REPORT are presented prevalence estimates for osteoarthritis among American adults which are based on findings from X-rays of hands and feet obtained in the Health Examination Survey during 1960-62. Data by age, sex, race, region, and severity of the disease are shown. In addition, standards for the diagnostic criteria, rating methods, and the content of the examination for osteoarthritis used in the Survey are discussed.

The national probability sample of 7,710 persons was drawn for the Survey to represent the 111 million adults in the civilian, noninstitutional population of the United States 18-79 years of age. Of this group, 6,672 adults or more than 85 percent were examined.

An estimated 40.5 million American adults—37 out of every 100 persons—have an osteoarthritic condition in which at least the hands and feet are involved. Prevalence among young adults is low but the rate increases steadily with advancing age until by 75 years of age some 85 percent are affected.

Under the age of 45 years nearly all cases are mild. By age 75, moderate and severe degrees of involvement are found as frequently as the mild cases. Younger men, under the age of 45, are more frequently affected than women but from 55 years of age on the prevalence among women is greater.

Comparison is made with the relatively few surveys in this country—among the Indians and the Eskimos—and with those in Britain and in Finland where diagnoses were based on radiographic findings.

SYMBOLS

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OSTEOARTHRITIS PREVALENCE IN ADULTS

BY AGE, SEX, RACE, AND GEOGRAPHIC AREA

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INTRODUCTION

The prevalence of osteoarthritis in adults as determined from X-ray evidence in the hands and feet of examinees in the first cycle of the Health Examination Survey is presented in this report.

The Health Examination Survey is one of three programs of the National Health Survey designed to secure statistics on the health status of the population of the United States. Medical examinations, tests, and measurements on a scientifically selected random sample of the population comprise the sources of data for this program. For the other two programs, data are secured by household interviews and from available hospital and other medical records.

In the first cycle, the Health Examination Survey was limited to civilian adults living outside of institutions. Its purpose was to determine the prevalence of certain chronic diseases, the status of dental health, and the distributions of auditory and visual acuity and certain anthropometric measurements. During the Survey, which extended from October 1959 through December 1962, 6,672 sample persons were examined out of the 7,710 persons 18-79 years of age selected in the nationwide probability sample. Medical and other Survey staff performed the standard examination, which lasted about 2 hours, in mobile clinics especially designed for this purpose.

Previous publications describe the general plan and initial program of the Health Examination Survey [1], as well as, the sample population, the response, and the effect of nonresponse on the findings.[2] Data available from the examination, the household interview preceding the examination, and a subsequent followup of a subsample of respondents and nonrespondents indicate that no major feature of the adult population of the United States is seriously distorted and the effect of nonresponse on the demographic picture is not serious.

Standards for the diagnostic criteria and 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. Grading of the X-rays of the hands and feet for arthritis and the bentonite flocculation test used for the diagnosis of rheumatoid arthritis were performed at the Institute under his direction.

SURVEY DIAGNOSIS OF OSTEOARTHRITIS

Degenerative joint disease, usually called osteoarthritis or osteoarthrosis, is a common progressive disorder characterized pathologically by deterioration of cartilage around the joints or a bony overgrowth in these regions. The sites most frequently affected are the terminal joints of the hands and feet,[3] although involvement of the spine, hips, elbows, wrists, ankles, knees, and other joints is not uncommon.

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.[4] Clinical criteria such as bony enlargements, joint effusions without soft tissue swelling, normal sedimentation rate, morning stiffness, pain in motion, and stiffness for a short period after rest could, according to Laine,[4] lead to a diagnosis at an acceptable level. However, there is no general agreement on this and no international standardization of clinical diagnostic criteria for osteoarthritis has yet been attempted. Consequently, the diagnosis of osteoarthritis used in the Survey was based solely on X-ray evidence, although a clinical examination for arthritis was also performed.

Each person was examined by the Survey physician for physical evidence of arthritis. Included were tests for limitation of motion, pain on movement, and compression at the joints. Swelling, deformities, Heberden's nodes and subcutaneous nodules were also noted. Before starting the examinations, each physician was trained by the Survey advisory medical staff in the predetermined standard procedures which were to be followed as consistently and uniformly as possible. This was essential to minimizing the variability in observations among the 62 physicians employed during the cycle as well as the day-to-day variations in the techniques of any one of them.

For the diagnosis of osteoarthritis, radiographs of the hands and feet were taken at 36 inches with a 200 milliampere General Electric Mobile X-ray machine with an average exposure of 30 MAS (milliampere-seconds) on Ansco nonscreen monopack film—10 x 12 inch film for the hands and feet and 11 x 14 inch film as needed for larger feet. In each instance adequate lead rubber shielding was used to protect the examinee. The film was processed immediately and checked during the washing stage so that, if unsatisfactory, the radiograph could be repeated before the examinee left the Survey mobile examining center.

A standard bone which consisted of a normal metacarpal for an adult and its corresponding first phalangeal bone imbedded in plastic was placed between the hands and feet for each radiograph as a check on the radiographic technique and for evaluation of osteoporosis. The films were examined independently by three specialists from the National Institute of Arthritis and Metabolic Diseases—Dr. Bunim and his collaborators, Dr. R. L. Black, and Dr. Burch—who had no knowledge of the age, sex, or clinical status of the subjects.

The extent of osteoarthritic changes was graded in accordance with the method of Kellgren and Lawrence[5] in which the features considered to be evidence of osteoarthritis are:

1. the formation of osteophytes (spurs) on the joint margins,
2. periarticular ossicles (fraying of the bone around the joints),
3. narrowing of joint cartilage associated with sclerosis of the subchondral bone (hardening of the underlying bone),
4. small pseudocystic areas with sclerotic walls situated usually in subchondral bone, and
5. altered shape of the bone heads.

The degree of osteoarthritis was divided into the following five grades:

None	0	Moderate	3
Doubtful	1	Severe	4
Minimal	2		

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. Published photographs from Kellgren and Lawrence[5] illustrating these changes were used for reference while reading the films, in addition to a similar set prepared by one of the readers (RLB) using films from the Clinical Center, National Institutes of Health shown in Appendix I.

The degree assigned the hands corresponded to the grade of the most severely affected joint of the hands (but excluding any single isolated joint where the involvement was rated at least two grades more severe than the other joints in the hand), with similar criteria being applied for the feet. The higher of these two ratings was the final degree of severity of osteoarthritis assigned the two ratings.

When osteoarthritic and rheumatoid arthritic changes coexisted in the same individual, the grade given for osteoarthritis was based only on those joints not affected by rheumatoid arthritis, since the former changes were considered secondary to the destructive changes of rheumatoid arthritis. Under the age of 55 years, this would have little, if any, effect on the prevalence of osteoarthritis as reported here. Among older persons, however, it may be understated to some extent by this exclusion. For a further description of the rating methods used and the extent of agreement among the readers, see Appendix I.

FINDINGS

An estimated 40.5 million or 37 persons among each 100 adult civilians in the United States living outside of institutions had osteoarthritis in some degree where at least the extremities (hands or feet) were involved, as shown in findings from the Health Examination Survey. The rate increased steadily with advancing age from 4 per 100 among persons 18-24 years to 85 per 100 among those 75-79 years of age (tables 1 and 2).

About 23 percent of those adults with osteoarthritis, or 9 per 100 persons in the general population, had a moderate or severe stage of this disease. Under the age of 45 years nearly all cases were mild in form. For those 45 years and over, however, the rates for the moderate and severe cases mounted steadily until by age 75 these were found as frequently as the mild.

The feet were more frequently affected than the hands for those under 35 years of age with mild osteoarthritis. By 45 years, a marked shift was noted. Here half of the mild cases involved only the hands, a ratio fairly consistently maintained throughout the rest of the age span. Involvement of both hands and feet with mild degrees of arthritis increased steadily with age until by 75 years both extremities were affected about as frequently as were the hands alone.

In moderate and severe cases, while the rate of multiple involvement increased with age, three-fourths were found to have osteoarthritis of the most severe grades in the hands. Roughly half of those with the moderate to severe involvement in the hands had a mild condition in the feet; while for the remainder, the feet were normal. When moderate to severe grades were found in the feet but not the hands, the hands were quite likely to have a mild stage of the disease (80 percent of such cases).

By Sex

Among both men and women, the prevalence of this disease increased with age. When all ages are considered, men are as frequently affected as women, although the pattern by age differs. The rate for men under the age of 45 was roughly twice that for women (table 2 and fig. 1). For those 55 years and over, the prevalence among women exceeded that among men, although in the oldest age group the difference was too small to have significance.

Mild stages of osteoarthritis were found more frequently among men than women under the age of 45 years. After age 45, the rates for both sexes were similar except that the peak rate was reached some 10 years earlier for women than men—55-64 years for women, 65-74 years for men.

Moderate to severe grades of the disease were manifest to a greater extent among women, the sex difference widening after 45 years where the rates ranged from half again as much to twice as much as those for men. The excess prevalence for women was due largely to the more severe involvement in the upper extremities. Men as frequently as women had these grades of osteoarthritis affecting the lower extremities primarily. For these grades of osteoarthritis there was a continuous increase in prevalence with advancing age but not the drop off in the rates as noted for the older age groups with mild osteoarthritis.

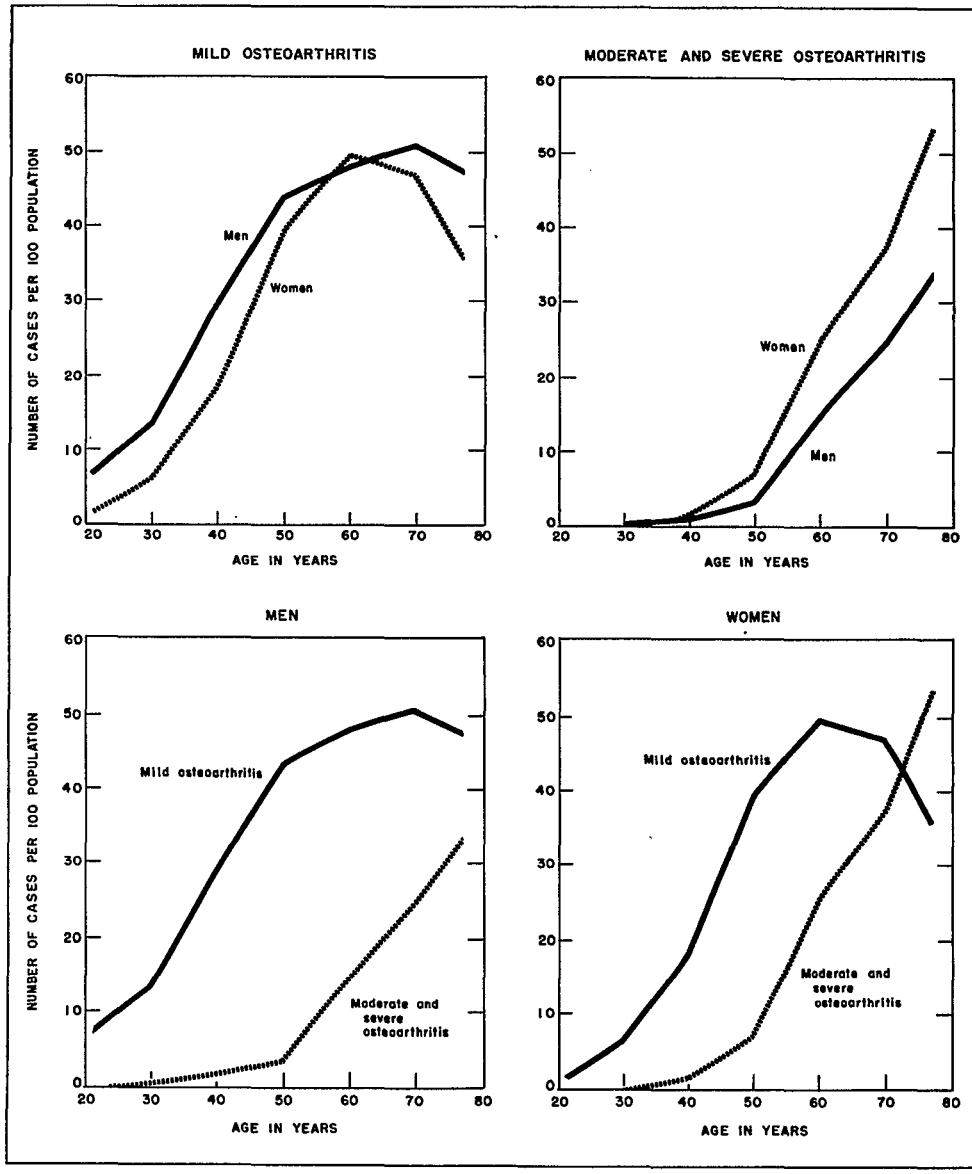

Figure 1. Age-specific prevalence rates of osteoarthritis for men and women, by severity of disease.

By Race

Comparison is made here among the white, Negro, and other racial groups insofar as the confidence limits based on the Survey sampling errors permit (Appendix II). However, it is recognized that the sample upon which the Survey findings are based is too small to be adequately representative of the "other" racial groups which are predominantly American Indians and Orientals. About 88 percent of the adult population (and hence the sample on which these

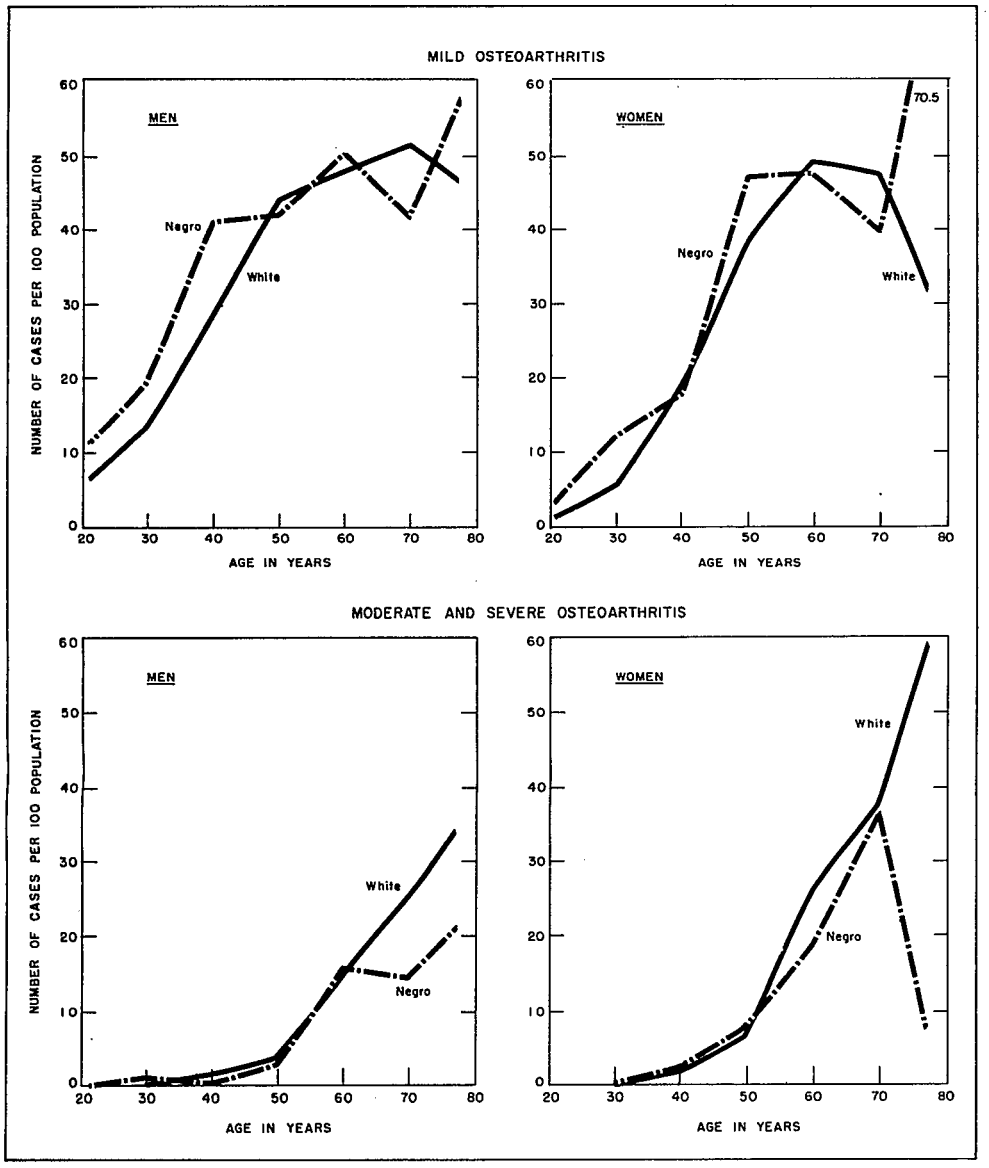

Figure 2. Age-specific prevalence rates of osteoarthritis for men and women, by race.

findings are based, since it is unbiased) are white, 10 percent Negro, and 2 percent of other races. Those classified as white include Mexicans not known to be Indian or of another nonwhite race.

Mild stages of osteoarthritis were found as frequently among white as Negro adults but less often in persons of other races.

As shown in table 3 and figure 2, the prevalence among Negro men reached the high level of middle age some 10 years sooner than for white men—the rates for Negro men of 35-44 years being as great as those for white men aged 45-54 years. A similar pattern was not found among Negro women.

By the age of 75 years, the mild stages of the disease were found more frequently among Negro than white men and women. The lower rate for Negro men and women in the age range 65-74 years which preceded the substantial rise in the oldest age group, a pattern not found among white persons, probably is at least partly a reflection of sampling error rather than indicative of any real racial difference in prevalence at that age.

The rates for the mild conditions in both Negro and white adults exceeded those for other racial groups among men between the ages of 45 and 64 years and among women 45-54 years. However, the number in the latter group was too small to give a reliable indication of the actual prevalence among this group.

Moderate and severe degrees of osteoarthritis were slightly, but not significantly, more prevalent among white than Negro adults. The rates in the other racial groups were lower than for the white, although there were too few persons with such conditions among the other racial groups to give assurance that this difference would actually exist in the total population.

Only among older persons—men 65-79 years and women 75-79 years—did the rates for moderate and severe osteoarthritis among Negro and white adults differ significantly, the prevalence among white persons being the greater.

By Region

The sample used for the Health Examination Survey, as previously indicated, was selected at random with proportionate representation on the basis of population from the three geographic areas into which the United States was divided for this Survey. These three areas are as follows:

Region	*States Included*
Northeast	Maine, Vermont, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Pennsylvania, Ohio, and Michigan
South	Delaware, Maryland, District of Columbia, West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas
West	Washington, Oregon, California, Idaho, Nevada, Montana, Utah, Arizona, Wyoming, Colorado, New Mexico, North Dakota, South Dakota, Nebraska, Kansas, Minnesota, Iowa, Missouri, Wisconsin, Illinois, and Indiana

The prevalence of the mild stages of osteoarthritis among adults was similar in all three regions—28 cases per 100 in the adult population of the Northeast, 27 in the South, and 31 in the West (table 4 and fig. 3). By age, the pattern of prevalence for men and women was similar in all three regions with the exception of the higher rate for the oldest age group of men in the South.

For moderate and severe stages of osteoarthritis among adults of all ages, the prevalence rates were lower in the South than in either the Northeast or the West, reflecting the substantially lower rates for women 55-79 years of age and men 75-79 years in the South.

An inspection of the regional rates among white and Negro adults (table 5), shows no really consistent pattern of differences between the two racial groups among the three regions. Proportionately somewhat fewer white than Negro men and women under the age of 55 years were found to have this disease in the South than in the other two regions. A higher than expected rate was found among white and Negro adults in the age group 65-74 years of the Northeast. However, most of these and the other scattered deviations are attributable to sampling error, with the small number of cases in the various age groups when the sample is so finely subdivided.

If only the more severe grades (3 and 4) of this disease are considered, no substantive racial differences are noted in the prevalence for either the South or the West. The prevalence among Negroes in the Northeast was unusually low. Rates for white adults in the South were lower than for this race in either the Northeast or the West.

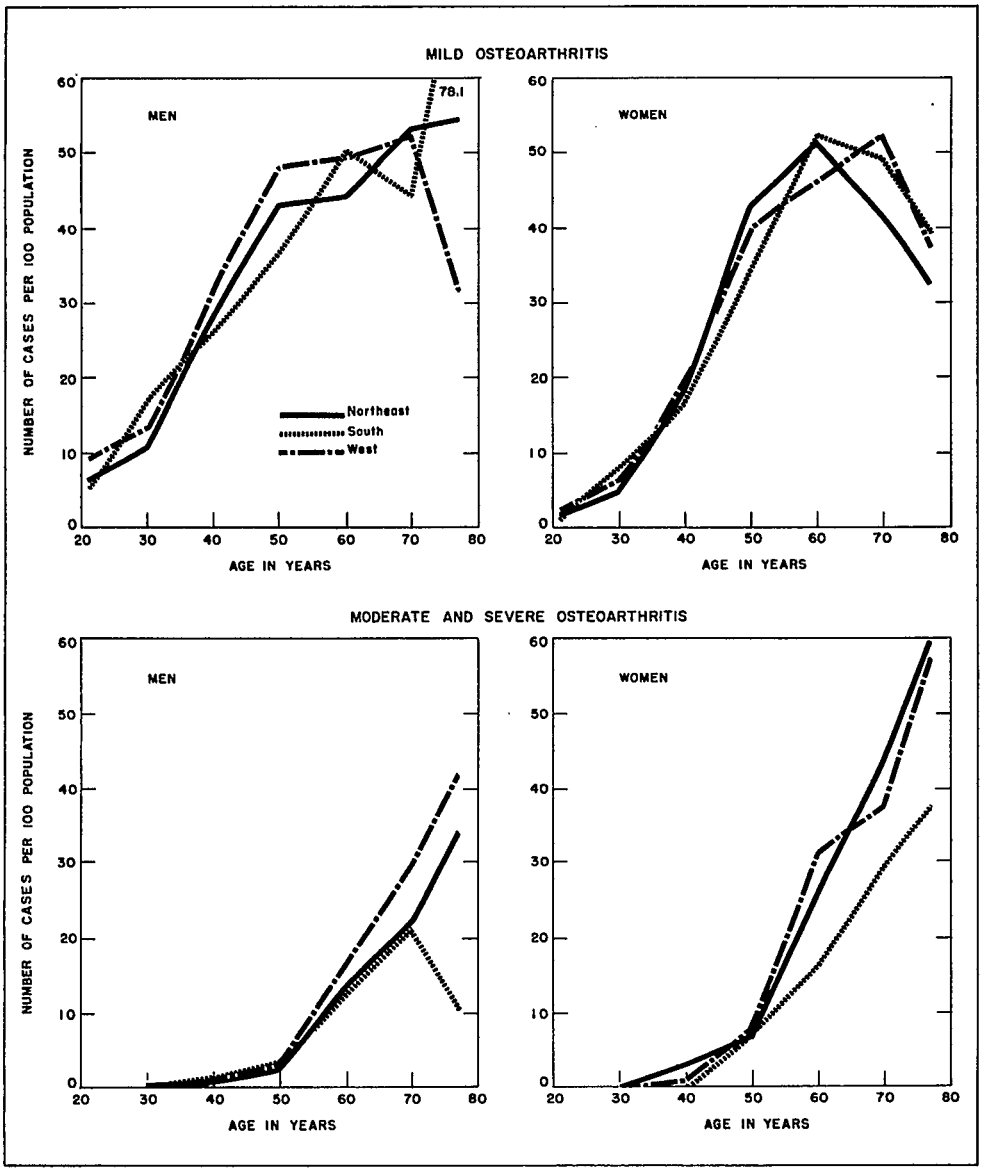

Figure 3. Age-specific prevalence rates of osteoarthritis for men and women, by region.

Urban-Rural Differences

The prevalence of osteoarthritis among the population in rural areas and those in urban areas was similar (tables 6 and 7, and fig. 4). For the mild stages, the urban rate was 29 per 100 adults compared with 28 in the rural areas. In moderate and severe stages, the rates were both 9. Nor was there any consistent pattern of differences between Negro and white persons in either type of area.

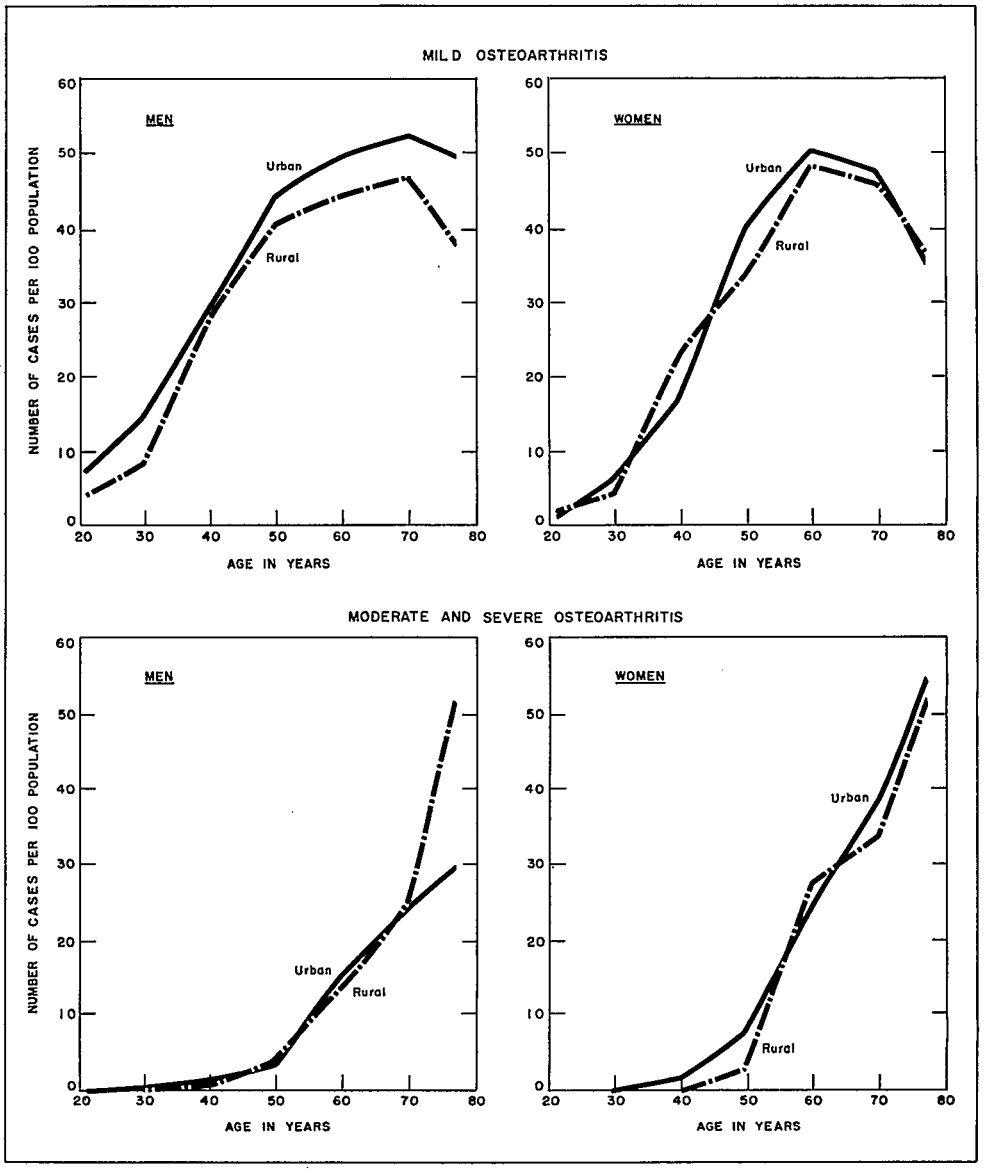

Figure 4. Age-specific prevalence rates of osteoarthritis for men and women, by urban and rural areas.

An examination of urban-rural rates within the three geographic regions in table 8 also shows no consistent pattern of differences. The urban and rural prevalence is similar in all three regions both being somewhat greater in the West than the South. The spotty differences within the age groups again probably reflect sampling error rather than being indicative of real differences in prevalence.

Information on the prevalence of osteoarthritis in table 9 also shows no consistent pattern of differences by size of urban place.

COMPARISON WITH OTHER SURVEYS

Most of the reports in the literature on osteoarthritis in different population groups are based only on clinical evaluation. The rates vary from 2 per 100 affected in Sweden[6] to 8 per 100 in England.[7]

Only a few investigators have published data on the prevalence of osteoarthritis based on radiographic evidence. Laine[8] reported a survey in an urban population of Finland showing that 30 out of 233 males and 45 out of 306 females—rates the equivalent of 13 and 15 per 100, respectively—had moderate to severe osteoarthritic changes. This can be compared with the somewhat lower rates of 6 and 11 per 100 found in the present study, respectively, for men and women in the United States. Laine did not report on the number with milder stages of osteoarthritis nor did he give a breakdown by age. Kellgren and Lawrence[9] reported on osteoarthritic findings from X-ray by age and sex among a group in England with rheumatic complaints but did not separate the mild from the moderate and severe grades. They reported rates of 83 and 88 per 100 with mild, moderate, or severe grades among men and women, respectively, aged 55-64 years. These are somewhat higher than the 63 and 75 per 100 observed among men and women, respectively, in the general population of this age in the United States, as determined in the present study. Somewhat higher rates would be expected from the British study since the study group was limited to persons with rheumatic complaints. (Cobb et al.[10] has estimated that only about 30 percent of persons with radiological evidence of degenerative changes in their joints complained of pain at the relevant sites.)

In a survey among adults 30 years of age and over, from two tribes of American Indians, Burch[11] reported on the prevalence of osteoarthritis based on radiographic evidence in the hands and feet. Among the 1,101 Blackfoot Indians, age-adjusted rates of 74 and 61 per 100 for men and women, respectively, were found to have mild, moderate, or severe grades of the disease; while the corresponding rates among the 969 Pima Indians were 74 and 56. The rates for moderate and severe grades only were approximately 28 and 18 per 100, respectively, among men and women for both groups combined. The age-specific rates among these tribes of American Indians were significantly higher than for the general population of the United States, more so for men than for women (fig. 5).

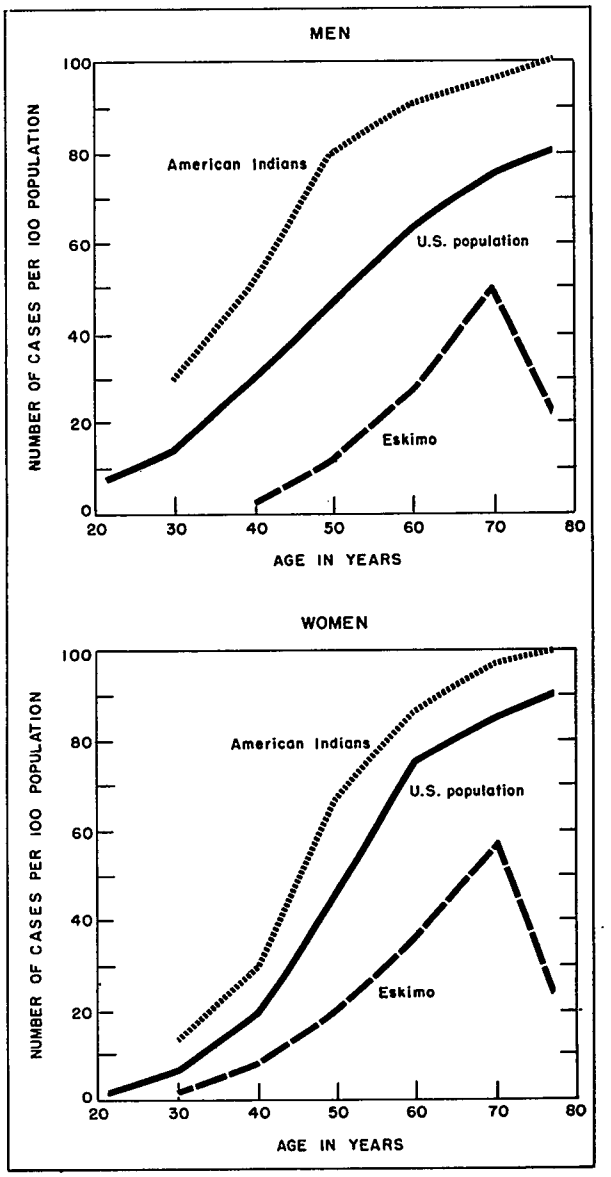

Figure 5. Age-specific prevalence rates of osteoarthritis for two tribes of American Indians (Blackfoot and Pima-1965), Eskimo (1961), and U.S. population (1960-62).

Blumberg et al.[12] reported rates the equivalent of 22 and 24 per 100 among Eskimo men and women, respectively, based on X-rays of the hands only for the 247 adults of that race aged 40 years and over. If it could be assumed that, as in the present Survey, about 80 percent of those showing degenerative joint disease in the hands or feet have such evidence in the hands alone, rates of 28 and 31 respectively, for these groups would be expected had both hands and feet been x-rayed. These rates, in contrast to the findings among the Indians, are significantly lower than those found among the general population of the United States (fig. 5).

Some of the variation may be attributed to environmental, cultural, or genetic differences in the examined population. However, some is undoubtedly due to interobserver variation in the grading of films even though all observers in these studies used the same diagnostic criteria (those of Kellgren and Lawrence) and members of the team that graded the films in the present study also graded those for the American Indians (TAB) and Eskimos (RLB). Both the findings of Kellgren and Lawrence and those from the present study (Appendix I) indicate less than perfect inter- and intra-observer agreement with correlations of the order of 80 to 90 using these criteria.

SUMMARY

Health Examination Survey findings on the prevalence of osteoarthritis among American adults in 1960-62 show that:

1. An estimated 40.5 million or 37 persons among each 100 adult civilians in the United States living outside of institutions had osteoarthritis in some degree. About 23 percent of these cases were in the moderate or severe stages.
2. The rate increased steadily with advancing age from 4 per 100 among young adults to 85 per 100 in the oldest age group.
3. Under the age of 45 years nearly all cases were mild in form. From 45 years, the rates for moderate and severe cases mounted steadily until by 75 years of age these were found as frequently as the mild stages.
4. Men were as frequently affected as women, although the pattern by age differs. Under 45 years of age the prevalence among men was greater; while from 55 years on, women were more frequently affected.
5. No significant pattern of racial, regional, or urban-rural differences in the prevalence of this disease was found.
6. Comparison with other surveys in which diagnoses were also based on radiographic evidence indicates that the American rates from the present study are somewhat lower than those reported by Laine from the Finnish survey and those obtained for an older group by Kellgren and Lawrence in the British survey. In this country, the rates among the Blackfoot and Pima Indians, as reported by Burch, were substantially higher than the general population while Blumberg's findings among the Eskimos were somewhat lower, due to the limitation of the diagnostic radiographs among the latter to those for the hands.

REFERENCES

[1]National Center for Health Statistics: Plan and initial program of the Health Examination Survey. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 1-No. 4. Public Health Service. Washington. U.S. Government Printing Office, July 1965.

[2]National Center for Health Statistics: Cycle I of the Health Examination Survey, sample and response, United States, 1960-1962. *Vital and Health Statistics*. PHS Pub. No. 1000-Series 11-No. 1. Public Health Service. Washington. U.S. Government Printing Office, Apr. 1964.

[3]American Rheumatism Association: Primer on the rheumatic diseases, Part II. *J.A.M.A.* 190(5):441-444, Nov. 1964.

[4]Laine, V. A.: International standardization of the diagnosis of rheumatoid arthritis and osteoarthritis, clinical aspects. *Milbank Mem.Fund Quart.* XLIII(2):133-141, Apr. 1965.

[5]Kellgren, J. H., and Lawrence, J. S.: Radiological assessment of osteoarthritis. *Ann.Rheumat.Dis.* 16:494-502, 1957. (Incorporated in *Epidemiology of Chronic Rheumatism,* edited by J. H. Kellgren, Vol. 2 of *Atlas of Standard Radiographs of Arthritis,* Oxford, England, Blackwell Scientific Publications, 1965.)

[6]Edstrom, G.: Rheumatism as a public health problem in Sweden; field studies of population in certain districts during summer 1943, Upsala. *Uppsala läkareförenings förhandlingar* 49:303-358, Upsala, Sweden, 1944.

[7]Kellgren, J. H., Lawrence, J. S., and Aiken-Swan, J.: Rheumatic complaints in urban populations. *Ann.Rheumat. Dis.* 12:5-15, Mar. 1953.

[8]Laine, V. A. I.: Rheumatic complaints in an urban population in Finland. *Acta rheumat.scand.* 8:81-88, 1962.

[9]Kellgren, J. H., and Lawrence, J. S.: Osteoarthrosis and disk degeneration in an urban population. *Ann.Rheumat.Dis.* 17:388-397, 1958.

[10]Cobbs, S., Merchant, W. R., and Rubin, T.: The relation of symptoms to osteoarthritis. *J.Chronic Dis.* 5:197-204, Feb. 1957.

[11]Burch, T. A.: Epidemiological Studies on Rheumatic Diseases. Paper presented before the Association of Military Surgeons of the United States, Washington, D.C., Nov. 17, 1965.

[12]Blumberg, B. S., and others: A study of the prevalence of arthritis in Alaskan Eskimos. *Arthritis Rheum.* IV(4):325-341, Aug. 1961.

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DETAILED TABLES

Table 1. Number of adults with osteoarthritis showing severity and site of disease, by sex and age: United States, 1960-62

Sex and age	Osteo-arthritis, all degrees (grades 2-4)	Mild (grade 2)				Moderate and severe[1] (grades 3, 4)			
		Total	Hands only	Feet only	Both hands and feet	Total	Hands	Feet	Both hands and feet
	Number of adults in thousands								
Both sexes									
Total, 18-79 years	40,481	31,158	14,949	7,916	8,293	9,323	6,941	1,061	1,321
Men									
Total, 18-79 years	19,721	16,472	8,171	4,148	4,153	3,249	2,446	455	348
18-24 years	512	512	188	311	13	-	-	-	-
25-34 years	1,400	1,393	404	906	83	7	7	-	-
35-44 years	3,426	3,312	1,419	1,402	491	114	69	45	-
45-54 years	4,712	4,406	2,330	767	1,309	306	161	122	23
55-64 years	4,747	3,633	2,214	492	927	1,114	856	166	92
65-74 years	3,770	2,535	1,297	239	999	1,235	948	122	165
75-79 years	1,154	681	319	31	331	473	405	-	68
Women									
Total, 18-79 years	20,760	14,686	6,778	3,768	4,140	6,074	4,495	606	973
18-24 years	134	134	36	98	-	-	-	-	-
25-34 years	693	693	194	454	45	-	-	-	-
35-44 years	2,416	2,235	921	986	328	181	128	53	-
45-54 years	4,878	4,148	2,014	1,254	880	730	531	157	42
55-64 years	6,101	4,048	2,020	483	1,545	2,053	1,497	310	246
65-74 years	5,243	2,910	1,317	473	1,120	2,333	1,773	45	515
75-79 years	1,295	518	276	20	222	777	566	41	170

[1]Moderate or severe grades in site(s) indicated. Where only one site is shown (hands or feet), the other extremity will have a mild or no involvement.

Table 2. Prevalence rates of osteoarthritis in adults showing severity and site of disease, by sex and age: United States, 1960-62

Sex and age	Osteo-arthritis, all degrees	Mild				Moderate and severe [1]			
		Total	Hands only	Feet only	Both hands and feet	Total	Hands	Feet	Both hands and feet
	Number of adults per 100 population								
Both sexes									
Total, 18-79 years---	37.4	28.7	13.8	7.2	7.7	8.7	6.5	1.0	1.2
Men									
Total, 18-79 years---	37.4	31.2	15.4	7.9	7.9	6.2	4.6	0.9	0.7
18-24 years---	7.2	7.2	2.6	4.4	0.2	-	-	-	-
25-34 years---	13.6	13.5	3.9	8.8	0.8	0.1	0.1	-	-
35-44 years---	30.2	29.2	12.6	12.3	4.3	1.0	0.6	0.4	-
45-54 years---	47.0	43.9	23.3	7.6	13.0	3.1	1.7	1.2	0.2
55-64 years---	63.2	48.4	29.5	6.6	12.3	14.8	11.4	2.2	1.2
65-74 years---	75.8	51.0	26.1	4.8	20.1	24.8	19.0	2.5	3.3
75-79 years---	80.9	47.7	22.3	2.2	23.2	33.2	28.4	-	4.8
Women									
Total, 18-79 years---	37.3	26.3	12.2	6.6	7.5	11.0	8.1	1.1	1.8
18-24 years---	1.6	1.6	0.4	1.2	-	-	-	-	-
25-34 years---	6.2	6.2	1.8	4.0	0.4	-	-	-	-
35-44 years---	19.6	18.1	7.5	8.0	2.6	1.5	1.1	0.4	-
45-54 years---	46.3	39.3	19.0	11.9	8.4	7.0	5.1	1.5	0.4
55-64 years---	75.2	49.9	24.9	6.0	19.0	25.3	18.5	3.8	3.0
65-74 years---	84.7	47.0	21.3	7.6	18.1	37.7	28.7	0.7	8.3
75-79 years---	89.8	35.9	19.1	1.4	15.4	53.9	39.2	2.9	11.8

[1] Moderate or severe grades in site(s) indicated. Where only one site is shown (hands and feet), the other extremity will have a mild or no involvement.

Table 3. Prevalence rates oi osteoarthritis in adults, by race, severity of disease, sex,and age: United States, 1960-62

Sex and age	White			Negro			Other races		
	All degrees	Mild	Moderate and severe	All degrees	Mild	Moderate and severe	All degrees	Mild	Moderate and severe
Both sexes	Number of adults per 100 population								
Total, 18-79 years--	37.8	28.7	9.1	36.8	30.9	5.9	17.4	14.5	2.9
Men									
Total, 18-79 years--	37.8	31.3	6.5	39.4	35.0	4.4	11.2	11.2	-
18-24 years----------	6.6	6.6	-	11.4	11.4	-	*	*	*
25-34 years----------	13.5	13.5	-	20.0	19.2	0.8	*	*	*
35-44 years----------	29.1	28.0	1.1	41.2	41.2	-	*	*	*
45-54 years----------	47.8	44.6	3.2	44.7	42.1	2.6	*	*	*
55-64 years----------	63.4	48.4	15.0	66.3	50.8	15.5	*	*	*
65-74 years----------	77.5	51.8	25.7	55.6	41.2	14.4	*	*	*
75-79 years----------	81.1	47.0	34.1	78.6	57.4	21.2	*	*	*
Women									
Total, 18-79 years--	37.8	26.2	11.6	34.5	27.2	7.3	24.4	18.2	6.2
18-24 years----------	1.4	1.4	-	3.4	3.4	-	*	*	*
25-34 years----------	5.4	5.4	-	12.0	12.0	-	*	*	*
35-44 years----------	19.8	18.3	1.5	19.3	17.6	1.7	*	*	*
45-54 years----------	45.1	38.5	6.6	55.0	47.6	7.4	*	*	*
55-64 years----------	75.9	49.7	26.2	66.4	47.7	18.7	*	*	*
65-74 years----------	85.7	47.6	38.1	75.9	39.3	36.6	*	*	*
75-79 years----------	90.6	31.9	58.7	78.0	70.5	7.5	*	*	*

Table 4. Prevalence rates of osteoarthritis in adults, by region, severity of disease, sex, and age: United States, 1960-62

Sex and age	Northeast			South			West		
	All degrees	Mild	Moderate and severe	All degrees	Mild	Moderate and severe	All degrees	Mild	Moderate and severe
	Number of adults per 100 population								
Both sexes									
Total, 18-79 years--	37.3	28.1	9.2	33.3	27.1	6.2	40.6	30.6	10.0
Men									
Total, 18-79 years--	35.6	30.1	5.5	34.4	29.5	4.9	41.4	33.6	7.8
18-24 years----------	6.4	6.4	-	5.3	5.3	-	9.6	9.6	-
25-34 years----------	10.8	10.8	-	17.5	17.2	0.3	13.6	13.6	-
35-44 years----------	29.4	28.4	1.0	27.6	26.5	1.1	33.2	32.3	0.9
45-54 years----------	45.9	43.5	2.4	40.4	36.6	3.8	52.0	48.8	3.2
55-64 years----------	58.3	44.4	13.9	63.2	50.3	12.9	67.1	49.9	17.2
65-74 years----------	75.1	53.0	22.1	65.4	44.2	21.2	82.4	52.7	29.7
75-79 years----------	88.1	54.3	33.8	88.5	78.1	10.4	73.3	31.6	41.7
Women									
Total, 18-79 years--	39.0	26.2	12.8	32.4	25.0	7.4	39.8	27.4	12.4
18-24 years----------	1.5	1.5	-	1.4	1.4	-	1.9	1.9	-
25-34 years----------	4.6	4.6	-	8.0	8.0	-	6.1	6.1	-
35-44 years----------	21.7	18.4	3.3	16.4	16.4	-	19.8	19.2	0.6
45-54 years----------	49.6	43.2	6.4	41.2	34.6	6.6	47.9	40.2	7.7
55-64 years----------	77.9	51.7	26.2	68.7	52.4	16.3	77.6	46.2	31.4
65-74 years----------	84.7	41.5	43.2	78.5	49.0	29.5	90.0	52.4	37.6
75-79 years----------	91.7	32.3	59.4	76.6	39.6	37.0	95.1	37.5	57.6

Table 5. Prevalence rates of osteoarthritis in white and Negro adults, by region, sex, and age: United States, 1960-62

Sex and age	Northeast		South		West	
	White	Negro	White	Negro	White	Negro
	Number of adults per 100 population					
Both sexes						
Total, 18-79 years	37.6	36.8	32.2	37.5	42.0	35.1
Men						
Total, 18-79 years	36.0	34.5	32.8	41.6	42.7	38.9
18-24 years	5.5	21.5	4.3	9.2	9.5	8.7
25-34 years	10.2	21.0	16.6	22.9	14.8	8.1
35-44 years	29.8	26.4	26.2	34.4	30.6	63.2
45-54 years	46.2	46.8	36.0	54.7	55.5	27.6
55-64 years	57.7	65.5	61.8	69.0	69.1	57.8
65-74 years	77.8	23.4	65.0	66.6	82.8	65.0
75-79 years	87.6	100.0	95.3	68.9	72.8	100.0
Women						
Total, 18-79 years	39.1	38.8	31.8	33.9	41.2	31.0
18-24 years	1.6	-	0.4	5.5	2.3	-
25-34 years	4.3	7.9	7.2	11.4	4.8	19.3
35-44 years	21.2	26.8	15.4	17.1	21.1	12.4
45-54 years	47.3	76.4	39.1	47.6	47.8	53.7
55-64 years	78.2	74.9	71.0	57.8	77.0	79.9
65-74 years	85.2	64.5	78.7	77.9	91.5	76.6
75-79 years	91.3	100.0	78.5	72.8	94.7	-

Table 6. Prevalence rates of osteoarthritis in adults in urban areas, by severity of disease, race, sex, and age: United States, 1960-62

Sex and age	All degrees			Mild			Moderate and severe		
	All races	White	Negro	All races	White	Negro	All races	White	Negro
	Number of adults per 100 population								
Both sexes									
Total, 18-79 years	37.5	37.7	37.3	29.0	28.8	31.2	8.5	8.9	6.1
Men									
Total, 18-79 years	37.8	38.0	39.2	31.8	31.8	35.1	6.0	6.2	4.1
18-24 years	7.9	7.7	10.0	7.9	7.7	10.0	-	-	-
25-34 years	14.8	14.5	20.6	14.7	14.5	19.6	0.1	-	1.0
35-44 years	30.4	30.6	30.8	29.3	29.3	30.8	1.1	1.3	-
45-54 years	47.8	47.4	53.6	44.7	44.3	50.8	3.1	3.1	2.8
55-64 years	64.8	64.6	69.1	49.6	48.9	57.7	15.2	15.7	11.4
65-74 years	77.1	78.5	56.7	52.3	53.1	42.0	24.8	25.4	14.7
75-79 years	79.2	79.4	76.2	49.6	49.3	52.6	29.6	30.1	23.6
Women									
Total, 18-79 years	37.3	37.5	35.8	26.3	26.1	28.0	11.0	11.4	7.8
18-24 years	1.5	1.3	3.1	1.5	1.3	3.1	-	-	-
25-34 years	6.6	5.7	13.8	6.6	5.7	13.8	-	-	-
35-44 years	19.0	18.6	20.2	17.2	16.9	18.1	1.8	1.7	2.1
45-54 years	48.5	47.0	60.5	40.6	39.4	52.1	7.9	7.6	8.4
55-64 years	75.0	75.6	67.9	50.2	50.3	48.8	24.8	25.3	19.1
65-74 years	86.2	86.4	82.1	47.4	47.8	41.4	38.8	38.6	40.7
75-79 years	90.5	91.8	75.9	35.7	33.4	63.2	54.8	58.4	12.7

Table 7. Prevalence rates of osteoarthritis in adults in rural areas, by severity of disease, race, sex, and age: United States, 1960-62

Sex and age	All degrees			Mild			Moderate and severe		
	All races	White	Negro	All races	White	Negro	All races	White	Negro
	Number of adults per 100 population								
Both sexes									
Total, 18-79 years	36.6	38.1	35.4	27.6	28.0	29.9	9.0	10.1	5.5
Men									
Total, 18-79 years	36.0	36.8	39.9	29.0	29.0	34.8	7.0	7.8	5.1
18-24 years	4.5	1.8	15.4	4.5	1.8	15.4	-	-	-
25-34 years	8.5	8.6	17.2	8.5	8.6	17.2	-	-	-
35-44 years	28.7	19.6	59.2	28.2	19.0	59.2	0.4	0.6	-
45-54 years	44.2	49.1	27.2	41.0	45.6	25.0	3.2	3.5	2.2
55-64 years	57.8	59.2	53.9	44.2	46.6	20.9	13.6	12.6	33.0
65-74 years	71.8	74.3	53.6	46.6	47.6	39.8	25.1	26.7	13.8
75-79 years	89.7	89.2	100.0	38.1	35.2	100.0	51.6	54.0	-
Women									
Total, 18-79 years	37.3	39.5	30.6	26.1	27.1	24.7	11.2	12.4	5.9
18-24 years	2.0	1.9	4.1	2.0	1.9	4.1	-	-	-
25-34 years	4.2	3.7	4.1	4.2	3.7	4.1	-	-	-
35-44 years	23.1	26.4	15.2	23.1	26.4	15.2	-	-	-
45-54 years	36.8	36.1	40.5	33.8	34.3	35.8	3.0	1.8	4.7
55-64 years	75.9	76.8	62.2	48.4	46.8	44.5	27.5	30.0	17.7
65-74 years	78.8	82.3	59.6	45.5	46.8	33.9	33.3	35.5	25.7
75-79 years	88.2	87.9	81.0	36.4	28.3	81.0	51.8	59.6	-

Table 8. Prevalence rates of osteoarthritis in adults in urban and rural areas, by region, sex, and age: United States, 1960-62

Sex and age	Northeast		South		West	
	Urban	Rural	Urban	Rural	Urban	Rural
	Number of adults per 100 population					
Both sexes						
Total, 18-79 years	37.4	37.0	33.9	31.5	40.7	40.2
Men						
Total, 18-79 years	36.6	24.2	35.5	31.0	41.0	42.2
18-24 years	7.0	-	5.3	5.3	11.1	5.6
25-34 years	11.6	5.0	19.0	9.7	15.1	9.4
35-44 years	29.9	23.1	29.7	20.3	31.9	37.9
45-54 years	45.2	54.5	38.2	49.3	58.6	40.3
55-64 years	62.9	-	67.0	52.3	65.0	71.1
65-74 years	75.5	71.4	70.7	56.1	82.5	82.1
75-79 years	88.1	-	91.4	52.0	64.6	93.2
Women						
Total, 18-79 years	38.0	49.1	32.5	31.8	40.5	37.8
18-24 years	1.6	-	1.0	2.7	1.9	1.8
25-34 years	4.1	9.5	9.8	1.4	6.6	4.1
35-44 years	20.6	41.7	17.3	12.7	18.2	25.4
45-54 years	51.2	33.3	41.9	39.1	51.5	36.0
55-64 years	75.7	100.0	70.2	65.3	77.6	77.6
65-74 years	84.4	87.5	82.0	70.5	92.0	83.2
75-79 years	89.3	100.0	89.7	58.3	92.3	100.0

Table 9. Prevalence rates of osteoarthritis in adults in urban areas, by size of urban place, sex, and age: United States, 1960-62

Sex and age	Giant metropolitan areas	Other very large metropolitan areas	Other standard metropolitan statistical areas	Other urban areas
	Number of adults per 100 population			
Both sexes				
Total, 18-79 years	42.0	34.8	34.8	37.0
Men				
Total, 18-79 years	40.7	33.8	35.7	39.5
18-24 years	7.1	9.8	6.9	8.2
25-34 years	12.6	15.7	12.7	20.1
35-44 years	30.2	27.0	30.0	34.1
45-54 years	53.4	35.3	50.1	45.7
55-64 years	64.8	56.1	67.6	67.5
65-74 years	81.3	72.7	72.5	79.0
75-79 years	94.8	90.7	58.8	77.5
Women				
Total, 18-79 years	43.2	35.7	34.1	34.5
18-24 years	4.5	-	-	1.4
25-34 years	6.4	5.2	5.1	9.4
35-44 years	21.9	14.0	15.6	23.4
45-54 years	59.1	47.3	39.3	45.4
55-64 years	78.2	77.0	77.2	62.7
65-74 years	89.5	80.4	83.7	88.4
75-79 years	100.0	85.9	87.5	83.0

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.

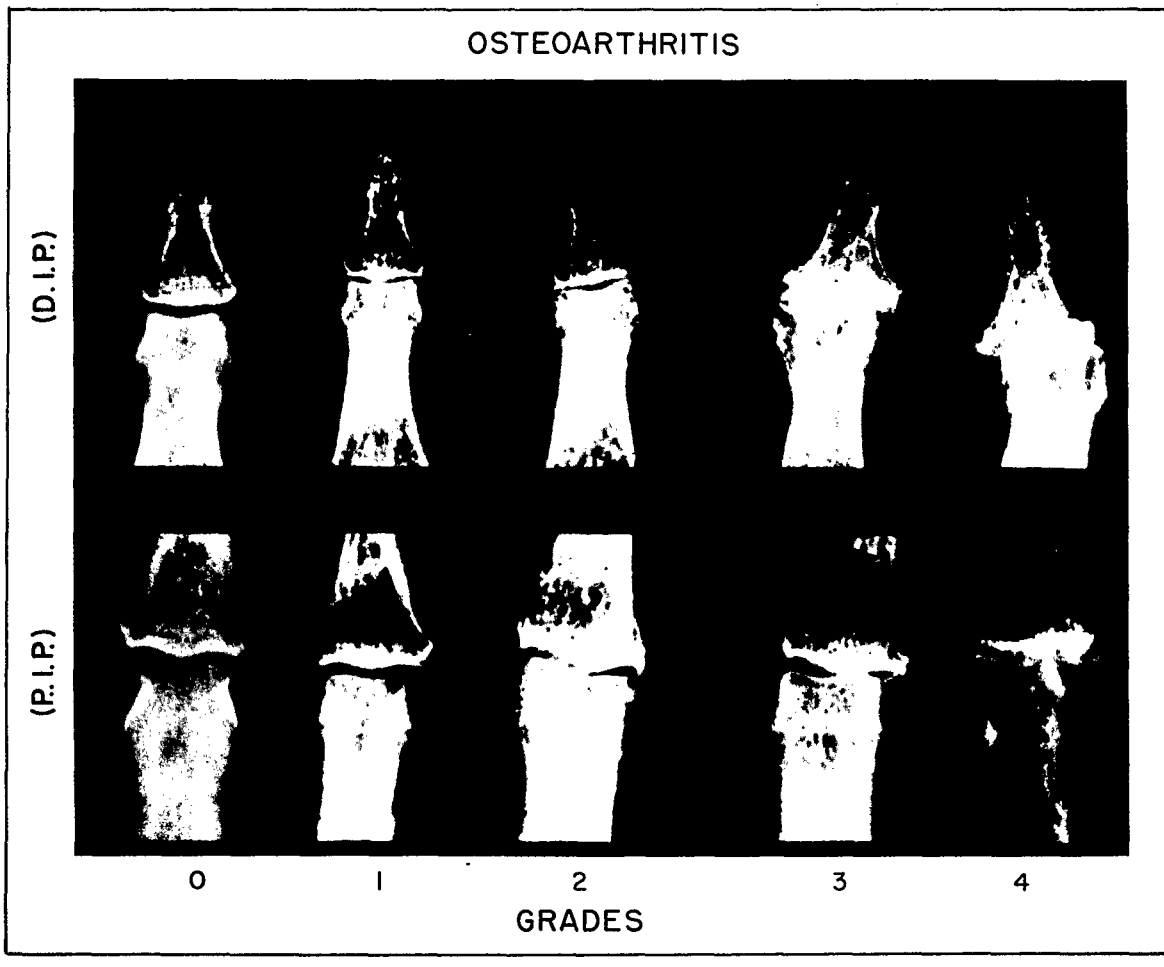

Figure 1. Gradings of osteoarthritis in distal-interphalangeal (D.I.P.) and proximal-interphalangeal (P.I.P.) joints of the hands. Radiograph series from the Clinical Center, National Institutes of Health used in the Health Examination Survey, Cycle I.

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 Kellgren and Lawrence [5] and the films from the Clinical Center, National Institutes of Health shown in figures I and II. 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 rheumatoid 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.

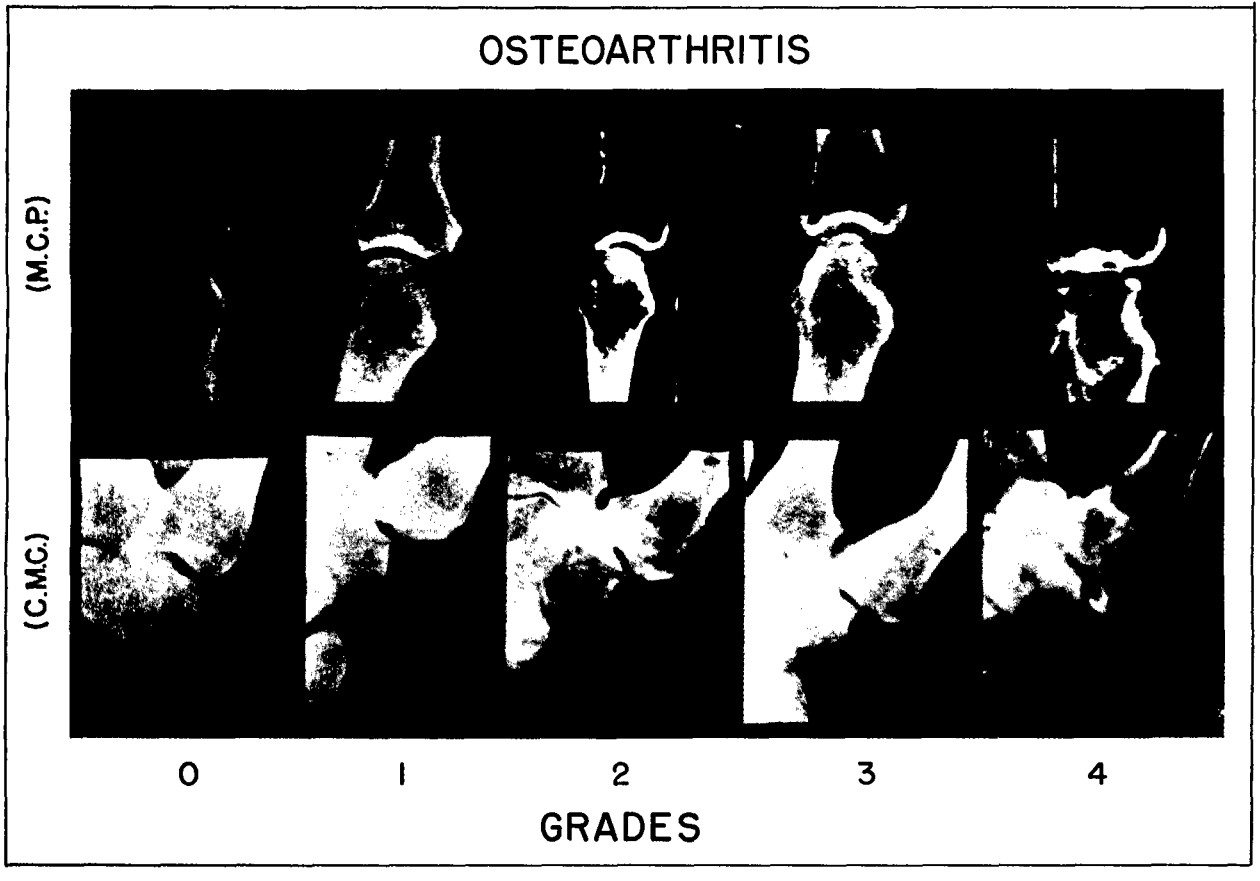

Figure II. Gradings of osteoarthritis in metacarpophalangeal (M.C.P.) and carpometacarpal (C.M.C.) joints of the hands. Radiograph series from the Clinical Center, National Institutes of Health used in the Health Examination Survey, Cycle I.

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 Kellgren and Lawrence[5] (+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 Kellgren and Lawrence.[5]

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

APPENDIX II

STATISTICAL NOTES

The Survey Design

The first cycle of the Health Examination Survey employed a highly stratified multistage probability design in which a sample of the civilian, noninstitutional population of the conterminous United States 18-79 years of age was selected. At the first stage, a sample of 42 primary sampling units (PSU's) was drawn from among the 1,900 geographic units into which the United States was divided. Random selection was controlled within regional and size-of-urban-place strata into which the units were classified. As used here a PSU is a standard metropolitan statistical area or one to three contiguous counties. Later stages result in the random selection of clusters of typically about four persons from a neighborhood within the PSU. The total sample included some 7,700 persons in 29 different States. The detailed structure of the design and the conduct of the Survey have been described in previous reports.[1, 2]

Reliability

The methodological strength of the Survey derives especially from its use of scientific probability sampling techniques and highly standardized and closely controlled measurement processes. This does not imply that statistics from the Survey are exact or without error. Data from the Survey are imperfect for three major reasons: (1) results are subject to sampling error, (2) the actual conduct of a survey never agrees perfectly with the design, and (3) the measurement processes themselves are inexact even though standardized and controlled.

The first-stage evaluation of the Survey was reported in reference 2, which dealt principally with an analysis of the faithfulness with which the sampling design was carried out. This study notes that out of the 7,700 sample persons the 6,670 who were examined—a response rate of over 86 percent—gave evidence that they were a highly representative sample of the civilian, noninstitutional population of the United States. Imputation of nonrespondents was accomplished by attributing to nonexamined persons the characteristics of comparable examined persons as described in reference 2. The specific procedure used amounted to inflating the sampling weight for each examined person in order to compensate for sample persons at that stand of the same age-sex group who were not examined.

In addition to persons not examined at all, there were some whose examination was incomplete in one procedure or another. Age, sex, and race were known for every examined person, but for a number of the examinees, the X-rays of the hands or feet or both were not available. The extent of these missing data is indicated in table III.

It was a policy in the Survey not to X-ray pregnant women for their protection. Thus X-rays were not taken of 210 such women. In addition X-rays of 49 men and women were unsatisfactory for interpretation or were not taken for a variety of other reasons.

For an additional three persons only partial X-ray data were available. In these cases the ratings for the missing X-rays of the feet were assumed to be the same as those for the hands, which were available.

When no X-ray information was available, it was assumed that the distribution of characteristics and X-ray findings would parallel those for persons of the same age, sex, and race.

Table III. Age and sex distribution of persons for whom hands and feet X-rays were not available: Health Examination Survey, 1960-62

Age	Number with X-ray missing	
	Men	Women
Total, 18-79 years---	27	232
18-24 years---	3	103
25-34 years---	9	78
35-44 years---	4	36
45-54 years---	6	8
55-64 years---	2	7
65-74 years---	3	-
75-79 years---	-	-

Sampling and Measurement Error

In the present report, reference has been made to efforts to minimize bias and variability of the measurement techniques.

The probability design of the Survey makes possible the calculation of sampling errors. Traditionally the role of the sampling error has been the determination of how imprecise the survey results may be because they come from a sample rather than from the measurement of all elements in the universe.

The estimation of sampling errors for a study of the type of the Health Examination Survey is difficult for at least three reasons: (1) measurement error and "pure" sampling error are confounded in the data—it is not easy to find a procedure which will either completely include both or treat one or the other separately, (2) the Survey design and estimation procedure are complex and, accordingly, require computationally involved techniques for the calculation of variances, and (3) from the Survey are coming thousands of statistics, many for subclasses of the population for which there are a small number of sample cases. Estimates of sampling error are obtained from the sample data and are themselves subject to sampling error when the number of cases in a cell is small or, even occasionally, when the number of cases is substantial.

Estimates of approximate sampling variability for selected statistics used in this report are presented in table IV. These estimates have been prepared by a replication technique which yields overall variability through observation of variability among random subsamples of the total sample. The method reflects both "pure" sampling variance and a part of the measurement variance.

In accordance with usual practice, the interval estimate for any statistic may be considered the range within one standard error of the tabulated statistic, with 68 percent confidence; or the range within two standard errors of the tabulated statistic, with 95 percent confidence.

An overestimate of the standard error of a difference $d = x - y$ of two statistics x and y is generally given by the formula:

$$s_d = (x^2 v_x^2 + y^2 v_y^2)^{1/2}$$

where v_x and v_y are the relative sampling errors of x and y and xv_x and yv_y are the sampling or standard errors of x and y.

Small Numbers

In some tables magnitudes are shown for cells for which the sample size is so small that the sampling error may be several times as great as the statistic itself. Obviously in such instances the statistic has no meaning in itself except to indicate that the true quantity is small. Such numbers, if shown, have been included in the belief that they will help to convey an impression of the overall story of the table.

Table IV. Relative standard error of prevalence rates for osteoarthritis (grades 2-4) among specified groups of the population: United States, 1960-62

Sex and age	Total	Race			Region			Area	
		White	Negro	Other	North-east	South	West	Urban	Rural
Both sexes	Relative standard error of rate								
Total, 18-79 years	0.04	0.04	0.07	0.28	0.06	0.08	0.05	0.04	0.07
Men									
Total, 18-79 years	0.04	0.04	0.06	0.39	0.07	0.10	0.05	0.05	0.10
18-24 years	0.14	0.16	0.31	0.45	0.30	0.27	0.16	0.18	0.31
25-34 years	0.11	0.15	0.23	*	0.14	0.21	0.21	0.13	0.13
35-44 years	0.13	0.14	0.16	0.36	0.14	0.17	0.13	0.12	0.13
45-54 years	0.04	0.05	0.15	0.25	0.10	0.10	0.09	0.05	0.12
55-64 years	0.04	0.05	0.06	0.19	0.11	0.07	0.06	0.05	0.10
65-74 years	0.04	0.04	0.07	*	0.08	0.08	0.05	0.04	0.06
75-79 years	0.04	0.04	0.08	*	0.06	0.07	0.09	0.05	0.05
Women									
Total, 18-79 years	0.04	0.03	0.09	0.23	0.06	0.08	0.05	0.04	0.08
18-24 years	0.37	0.44	0.62	*	0.67	0.59	0.80	0.44	0.77
25-34 years	0.14	0.15	0.34	0.81	0.31	0.24	0.13	0.15	0.38
35-44 years	0.12	0.15	0.30	0.09	0.15	0.22	0.20	0.12	0.28
45-54 years	0.05	0.06	0.09	0.03	0.07	0.13	0.08	0.06	0.12
55-64 years	0.03	0.03	0.06	*	0.06	0.07	0.04	0.03	0.06
65-74 years	0.04	0.04	0.06	*	0.05	0.07	0.04	0.04	0.06
75-79 years	0.04	0.02	0.08	*	0.06	0.08	0.05	0.06	0.04

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