THE FREQUENCY OF SURGICAL PROCEDURES IN A GENERAL POPULATION GROUP[1]

BASED ON RECORDS FOR 9,000 FAMILIES IN EIGHTEEN STATES VISITED PERIODICALLY FOR TWELVE CONSECUTIVE MONTHS, 1928-1931

by SELWYN D. COLLINS

SURGICAL treatment of wounds and fractures is as old as civilization (19). There were some famous surgeons in the middle ages, but most operations were of a minor character and were done by barbers (18). The body cavities and the internal organs were rarely invaded by the surgeon before the development of aseptic procedures and the successful use of general anaesthetics. Joseph Lister, the great English surgeon, first used antiseptic procedures in 1865 (16), but it was several decades before surgery on the internal organs became the common practice that it is today (17).

Surgical operations have increased greatly in the present century; United States Army and Navy records indicate that there are now about twice as many operations per 1,000 men in those organizations as in 1910; that there are nearly three times as many appendectomies; and that there are approximately ten times as many tonsillectomies per 1,000 men as in 1910.

The Army and Navy medical departments are about the only organizations that give practically all medical service to the personnel under their care and observation; however, these groups are highly selected with respect to age, sex, and the availability of medical service. Because of the lack of a population base to which operations may be related, no physician or hospital can arrive at an estimate of surgical operation rates per 1,000 population from their own records of surgical cases, no matter how carefully they may have been kept.

[1] From Statistical Investigations, Division of Public Health Methods, National Institute of Health, United States Public Health Service. The author is indebted to Dr. Mary Gover for assistance in the preparation of this paper.

SOURCE AND CHARACTER OF DATA

In the study of illness in canvassed white families in 130 localities in eighteen states that was made by the Committee on the Costs of Medical Care (15) and the United States Public Health Service, all service received from physicians and other practitioners was recorded, including the nature of surgical procedures used. This record of all surgical operations for persons in the observed population affords data on the frequency of these procedures during the twelve months covered by periodic canvasses.

The composition and characteristics of the group of 8,758 families which were kept under observation for twelve consecutive months in the years 1928-1931 have been considered in some detail in the first report in the series (1). These families, including a total of 39,185 individuals, resided in eighteen states representing all geographic sections. Every size of community was included, from metropolitan districts to small industrial and agricultural towns and rural unincorporated areas.[2] With respect to income, the distribution was reasonably similar to the estimated distribution of the general population of the United States at the time of the survey.

Definition of Illness and of a Surgical Procedure. An illness, for the purpose of this study, was defined as any symptom, disorder, or affection which persisted for one or more days or for which medical service[3] was received or medicine purchased. In general the illness record covers the ailments which the family informant remembered and designated as illness.

Provision was made for recording all surgical procedures that were done during the study year in connection with any illness. Since nurses made the periodic canvasses, it may be assumed that a more complete record of operations was obtained than would have been secured by visitors with no knowledge of surgical procedures.

[2] Every community that was included in the study had either a local health department or some other organization employing a visiting nurse; possibly the rural communities of this kind may have had somewhat more operations than those with no such organizations.

[3] Exclusive of dental service, eye refractions, immunizations, and health examinations rendered when no symptoms were present.

The entry as made by the nurse was accepted without correction, except to use as surgical any case in which the diagnosis itself indicated that an operation had been done but not recorded as such on the schedule. Examples of these diagnoses are boil lanced, abscess drained, and fracture of the leg or other part of the body which would involve the setting of a bone or placing of a cast. The definition of a surgical procedure was necessarily inexact but in general it was the common conception of any treatment which involves the cutting of tissue or suturing of wounds, plus the setting of a bone or placing of a cast; while these latter procedures are seldom included in the definition of an operation, they are surgical in nature. Accidental injuries and childbirth were not considered surgical unless some specific surgical procedure was reported on the case; the use of forceps was not considered a surgical procedure. Operations and surgical cases as used in this study refer always to cases which actually had surgical treatment and do not include those sometimes designated as surgical even though no operation is performed.

FREQUENCY OF SURGICAL PROCEDURES IN THE WHOLE GROUP OBSERVED

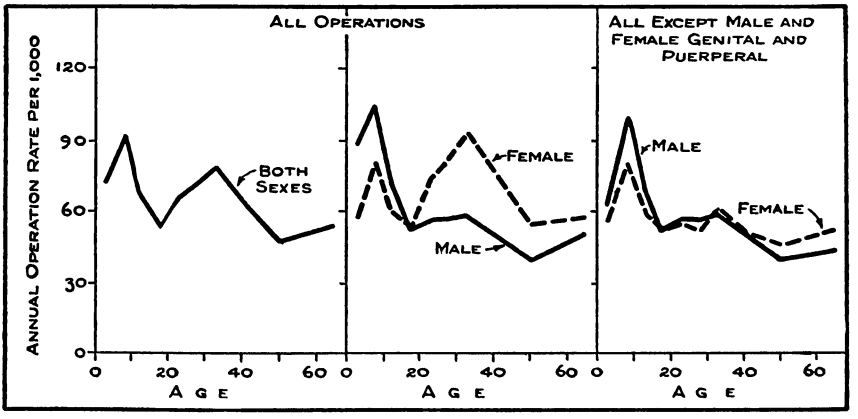
The frequency of surgical procedures in a given population group may be expressed, (a) as the annual number of operations per 1,000 persons under observation, or (b) as the percentage of cases that were treated surgically. This paper will be concerned chiefly, but not exclusively, with operation rates per 1,000 persons.

For the total of 38,544 person-years of observation there were 2,623 surgical operations, an annual rate (adjusted for age) of 65.0 operations per 1,000 persons. This includes surgery in connection with both primary and contributory causes of illness and in a few instances two or more operations in connection with the same diagnosis. The annual rate for sole or primary diagnoses that had surgery in connection with them was 60 per 1,000 (age corrected).

Of the total of 34,287 diagnoses (sole, primary, and contribu-

tory),[4] 2,607, or 7.6 per cent, had surgery in connection with them. No surgery would occur on cases not attended by a doctor; the 2,607 cases treated surgically amounted to 9.7 per cent of the cases that had the care of a doctor. Of the total diagnoses, 13,259 were on illnesses that caused no loss of time from school, work, or other usual activities. In this group of nondisabling illnesses, only 372, or 2.8 per cent, of the cases were treated surgically. In the group of 21,028 disabling illnesses, 2,235 cases, or 10.6 per cent, were treated surgically; of the 17,003 disabling cases that were attended by a doctor, 13.1 per cent were treated surgically. The great majority of the disabling illnesses were also in bed for one or more days; of the group of 17,753 bed cases, 2,060, or 11.6 per cent, were treated surgically; of the 14,713 bed cases that were attended by a doctor, 14.0 per cent were treated surgically. Among the bed cases there were 2,661 that were hospitalized and of this group 1,596 or 60 per cent, were treated surgically. Looking at the matter from another viewpoint, 61 per cent of all surgical cases had hospital service and presumably the operation was done in a hospital.

Fig. 1. Frequency of all surgical operations among males and females of specific ages, 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931.



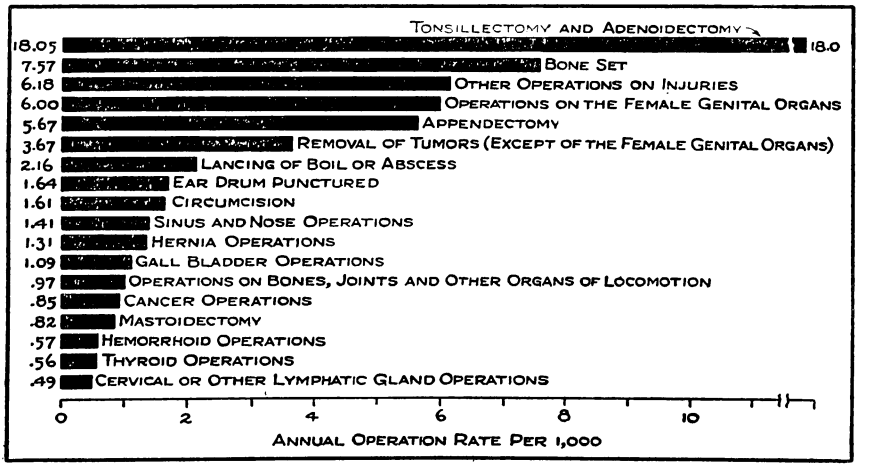
4 Throughout this paper the frequency of surgery is measured by the total number of operations regardless of whether the diagnoses on which they were done were sole, primary, or contributory. Duration and other items that measure severity, however, are based on sole diagnoses only.

Age and Sex. Figure 1 shows the age and sex incidence of all surgical operations. The adjusted rates are 62 and 68 per 1,000 for males and females, respectively. Since a considerable number of operations are done in connection with diseases and conditions not common to the two sexes, rates are shown also for all operations except those in connection with male genital and female genital and puerperal diagnoses. For all operations except those diagnoses the rates are nearly the same for the two sexes, 58 and 56 per 1,000 for males and females, respectively.

The age incidence of surgical operations shows two distinct peaks, at 5-9 and at 30-34 years. The earlier peak is largely accounted for by tonsillectomy and the latter by operations in connection with female genital and puerperal conditions; the adult peak in the curve for males is very small. When male and female genital[5] and the puerperal conditions are eliminated from the comparison, the frequency of operations is almost identical for corresponding adult ages of the two sexes.

Surgical procedures include everything from a major abdominal

Fig. 2. Frequency of certain surgical operations among 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931. (Rates adjusted to the age distribution of the white population of the Registration States in 1930.)

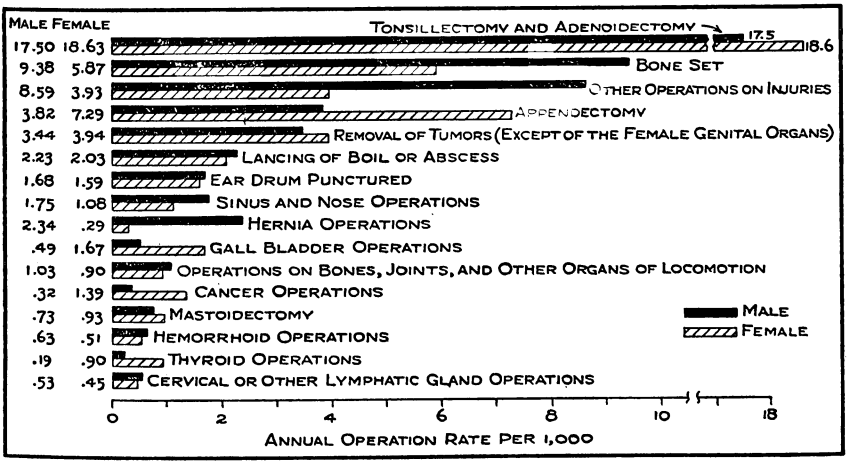


5 Female breast is classified in this study as a part of the female genital organs.

operation to the lancing of a boil or the removal of a wart. It is necessary to consider the various kinds of operations before the curves in Figure 1 have much meaning. Rates (adjusted for age) for different kinds of operations are shown in Figure 2. Tonsillectomy is by far the most frequent operation, constituting nearly one-third of the total number reported. The next two most frequent surgical procedures are the setting of a bone, and other operations in connection with injuries. If these two groups of surgical accident cases are considered as a unit, they amount to 20.3 per cent of all operations; when added to tonsillectomy (32.2 per cent), female genital and puerperal operations (8.3 per cent), and appendectomy (7.7 per cent), these four classes constitute about two-thirds of all operations. Figure 2 arrays thirteen other fairly specific kinds of operations.

It was noted earlier that the rate for all operations was about the same for adult males and females when those diagnoses that were not common to the two sexes were eliminated. Figure 3 shows rates (adjusted for age) for specific kinds of surgery among males and females. It is seen that there are wide differences between the

Fig. 3. Frequency of certain surgical operations among males and females in 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931. (Rates adjusted to the age distribution of the white population of the Registration States in 1930.)



sexes in the frequency of certain surgical procedures. The operations that show the largest relative differences between the sexes are hernia and sinus operations, and surgically treated accidents with higher rates for males; and appendectomy, gall bladder, cancer, and thyroid operations with higher rates for females. The rates for all cases (surgical and nonsurgical) of the last four diagnoses and also for sinusitis are higher for females than males, but hernia and accidents are definitely higher for males.

Table 1 and Figure 4 show for the more frequent surgical operations the age incidence for males and females separately. It is here seen that the similarity in age incidence in the two sexes for all operations common to both groups is also misleading; an extremely high rate of appendectomy among females of the young adult ages is balanced by high rates for operations in connection with injuries among males of those ages. The high operation rate for males in connection with injuries might be expected, in view of the greater incidence of industrial accidents among men and the greater frequency of accidents of all kinds among boys than among girls (14).

Appendectomy has its peak in the young adult ages for both males and females, but the rates are much higher for females. The excess of appendectomies among women is greatest at 20-24 years, but the relative difference is large at all ages above 5 years. One immediately thinks of the common practice of removing the appendix in connection with other abdominal operations, such as those on the female genital organs. Of the 136 appendectomies on females, thirty-seven had some other operation at the same time and twenty-six of these were in connection with female genital diseases; seventeen of these female genital operations would probably involve an abdominal incision, so the appendix may have been removed without clinical appendicitis. Even if it be assumed that the whole twenty-six cases were appendectomies without clinical appendicitis and are excluded, the reported appendectomy rate

Nature of Operation and Sex	All Ages[1]			Age								
	No. of Operations	Adjusted[2]	Crude	Under 5	5–9	10–14	15–19	20–24	25–34	35–44	45–54	55 and Over
		Annual Operation Rate per 1,000										
All Operations												
Both Sexes	2,623	64.97	68.05	72.2	93.1	65.0	52.1	66.1	75.3	63.1	46.3	53.4
Male	1,263	61.76	66.84	88.3	105.7	70.0	51.7	55.9	57.8	50.3	40.1	50.0
Female	1,360	67.57	69.29	55.9	80.8	60.0	52.5	73.5	88.3	75.9	53.8	56.9
All Operations Except Male and Female Genital[3] and Puerperal												
Both Sexes	2,300	56.86	59.67	57.9	91.2	64.1	51.1	55.2	57.3	50.9	42.1	48.5
Male	1,159	57.62	61.34	60.9	101.8	68.2	51.1	55.9	57.5	50.3	39.0	43.2
Female	1,141	56.24	58.13	55.1	80.8	60.0	51.2	54.7	57.1	51.5	45.8	52.9
Tonsillectomy and Adenoidectomy												
Both Sexes	845	18.05	21.92	27.0	55.1	31.1	15.4	14.2	13.1	9.9	6.0	2.4
Male	404	17.50	21.38	23.9	58.2	27.8	14.4	13.4	12.9	11.1	4.9	1.6
Female	441	18.63	22.47	30.6	52.2	34.4	16.4	14.7	13.3	8.8	7.3	3.2
Ear and Mastoid Operations												
Both Sexes	123	2.46	3.19	8.7	7.2	2.2	2.3	1.9	.9	1.0	.3	.4
Male	63	2.41	3.33	10.7	6.4	3.5	1.3	2.2	.4	.7	—	—
Female	60	2.52	3.06	6.7	7.9	.9	3.3	1.6	1.2	1.4	.7	.8
Appendectomy												
Both Sexes	202	5.67	5.24	.5	2.5	6.8	9.8	11.3	9.6	5.4	.9	3.6
Male	66	3.82	3.49	.7	1.8	5.2	5.9	6.7	7.1	3.7	.5	2.4
Female	136	7.29	6.93	.4	3.1	8.4	13.8	15.5	11.4	7.1	1.3	4.9
Miscellaneous Other Abdominal Operations												
Both Sexes	140	4.47	3.63	1.1	.9	.7	1.3	5.7	4.8	5.6	7.2	10.5
Male	71	4.81	3.76	1.1	1.8	1.3	2.0	3.4	5.4	3.0	7.6	14.5
Female	69	4.12	3.52	1.1	—	—	.7	7.4	4.3	8.1	6.6	6.5
Lancing of Boil or Abscess												
Both Sexes	83	2.16	2.15	2.5	1.2	1.3	3.9	.9	3.5	2.2	1.2	1.6
Male	39	2.23	2.06	2.1	1.1	1.3	3.3	1.1	2.5	2.7	1.6	3.2
Female	44	2.03	2.24	3.0	1.4	1.3	4.6	.8	4.3	1.7	.7	—
Removal of Tumors (Except Female Genital)												
Both Sexes	125	3.67	3.24	1.3	1.7	1.1	2.9	2.4	3.5	5.4	7.2	5.3
Male	58	3.44	3.07	1.1	2.1	.9	3.3	2.2	3.8	5.4	4.3	5.6
Female	67	3.94	3.41	1.5	1.4	1.3	2.6	2.4	3.4	5.4	10.6	4.9
Operations on Female Genital[3] Organs												
Both Sexes	219	6.00	5.68	.4	—	—	.7	10.9	17.9	12.1	3.6	2.0
Female	219	11.32	11.16	.8	—	—	1.3	18.8	31.2	24.4	8.0	4.1
Circumcision												
Both Sexes	94	1.61	2.44	14.0	1.9	.9	—	—	.2	—	.3	—
Male	94	3.17	4.97	27.4	3.9	1.7	—	—	.4	—	.5	—
Bone Set												
Both Sexes	296	7.57	7.68	6.5	12.1	11.4	6.6	5.7	4.6	6.4	4.8	10.9
Male	192	9.38	10.16	8.9	17.4	16.1	11.1	10.1	5.8	8.1	5.4	5.6
Female	104	5.87	5.30	4.1	6.9	6.6	2.0	2.4	3.7	4.7	4.0	16.3
Other Operations on Injuries												
Both Sexes	236	6.18	6.13	4.7	6.1	5.5	4.9	7.1	8.0	6.1	6.6	6.1
Male	157	8.59	8.31	5.7	8.2	6.5	6.6	12.3	11.2	8.7	9.8	8.1
Female	79	3.93	4.03	3.7	4.2	4.4	3.3	3.3	5.6	3.4	2.7	4.1
Miscellaneous Other Operations												
Both Sexes	260	7.13	6.75	5.4	4.4	4.1	4.3	5.7	9.2	8.9	8.3	10.5
Male	119	6.45	6.31	6.8	5.0	5.6	4.0	4.5	8.3	7.0	5.4	8.9
Female	141	7.92	7.17	4.1	3.8	2.6	4.6	6.5	9.9	10.8	12.0	12.2

[1] "All ages" includes a few of unknown age; "both sexes" includes a few of unknown sex.

[2] Adjusted by the *direct* method to the age distribution of the white population of the Registration States in 1930. Age adjustments of rates shown in the charts by income, size of city and other sub-groups used in this paper are made by the *indirect* method; for details see Tables 1 and 8 of preceding paper (11).

[3] Female breast is classified in this study as a part of the female genital organs.

Table 1. Frequency of certain surgical operations among males and females of specific ages, 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931.

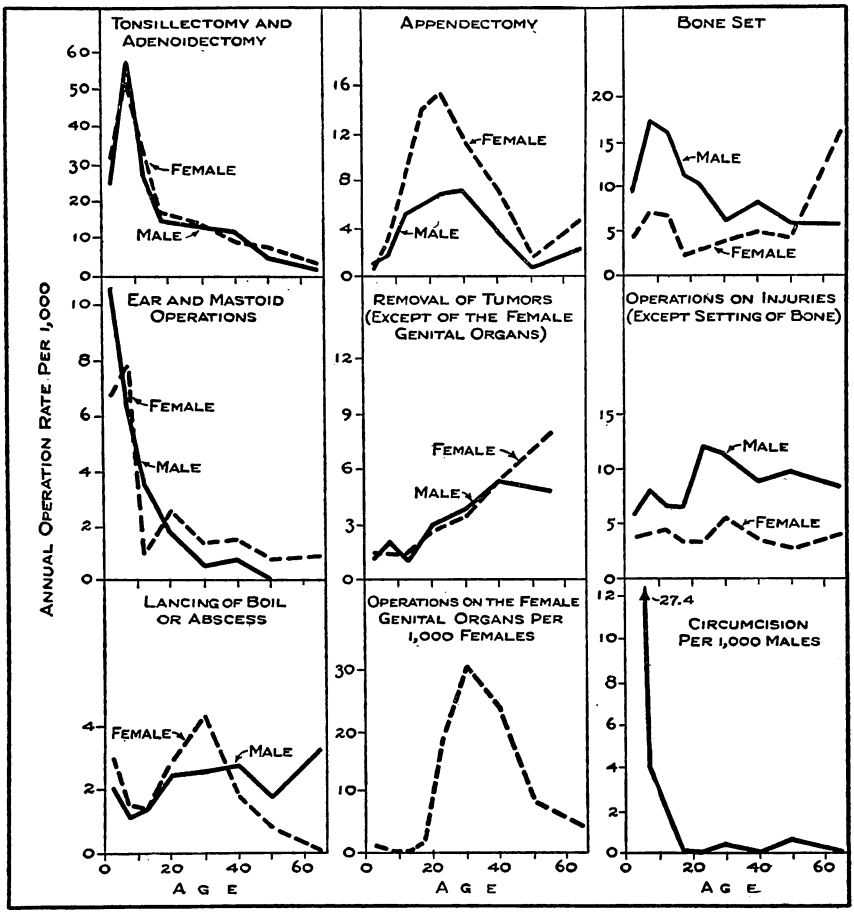


Fig. 4. Frequency of certain surgical operations among males and females of specific ages, 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931. (Scales are so made that the adjusted rate for all ages of both sexes represents an interval on the vertical rate scale that corresponds to 20 years on the horizontal age scale. In some instances the ages 15 to 24 are plotted as one group but shown in the table as two groups.)

for females would still be 60 per cent above that for males. If the removal of the appendix in connection with other operations is important in the excess of the recorded appendectomy rate for females, a considerable number of such removals must have been reported with no mention of the primary disease or operation.

Fractures are high among boys from 5 to 15 years but decrease

among men as age increases. Although on a lower level, there is also a peak for girls at 5 to 15 years but among women fractures increase with age, the rate being particularly high among women of the oldest ages. The relative age curves for other operations in connection with injuries are similar for males and females, but the rates for males are all much higher than for females.

The age curves for tonsillectomy, ear and mastoid operations, and removal of tumors are essentially the same for males and females. Tonsillectomy pertains chiefly to the late preschool and early school ages, the peak being at 6 years. Ear and mastoid operations are high in the preschool ages with markedly declining rates as age increases. Removal of benign tumors increases rather regularly with age. Operations in connection with female genital and puerperal conditions are concentrated largely in the childbearing ages.

A large part of the circumcisions were done under one year of age, the rate for that group being 116 per 1,000 males as compared with a rate of 12 for those who were one year of age, and rates under 10 per 1,000 for every other age group. Circumcisions under one month of age amounted to 110 per 1,000 male live births; if circumcisions continued at this frequency in the succeeding months of life, practically all male infants would be circumcised by the time they reached nine months of age.

In general the percentage of cases of a given diagnosis that were treated surgically varies relatively less with age and sex than the incidence of all cases or of surgical cases. For example, the percentage of appendicitis cases that were treated surgically is about the same for males and females of corresponding ages, although the incidence of all appendicitis and of appendectomy differs greatly for men and women. Otitis media and mastoid cases and operations are exceptionally high for children under 10 years of age, but the percentage of such cases that were surgically treated is about the same for young children as among young adults.

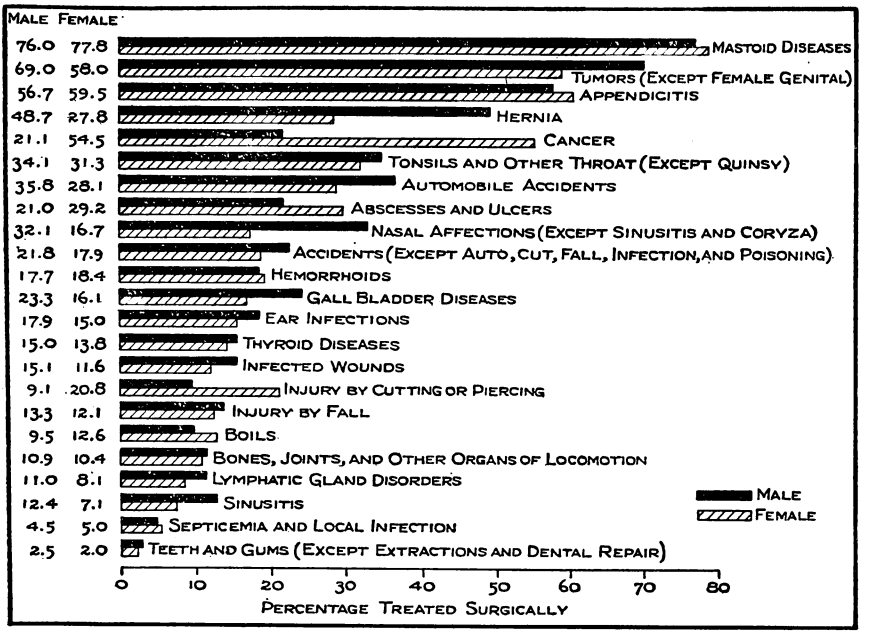


Fig. 5. Percentage of certain diagnoses that were treated surgically, males and females in 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931.

Figure 5 shows for males and females separately, the proportion of cases of twenty-three more or less specific diagnoses that were treated surgically. The incidence of all cases of hernia and of accidents of the various kinds is considerably greater among males than females, and in this chart it is seen that the proportion of these cases that are surgically treated is also greater for males, except for injury by cuts and lacerations. The excess for males is particularly large for hernia, a considerable proportion of which illnesses must be compensation cases. There are several diagnoses which show a high proportion with surgical treatment for males but not a high incidence of the total cases; among these are benign tumors, gall bladder, sinus infections and other nasal affections. There are several diagnoses with an especially high proportion of cases surgically treated for females, namely, cancer, abscesses, boils, and injuries by cuts and lacerations.

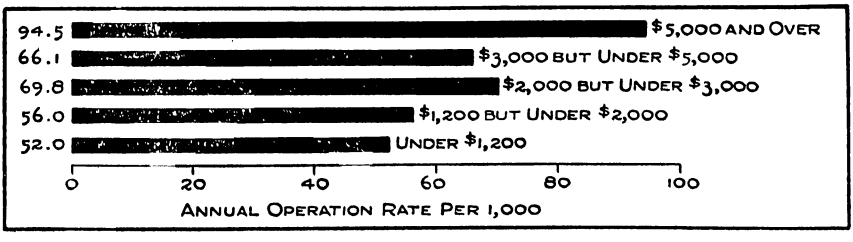
VARIATION IN THE FREQUENCY OF SURGICAL PROCEDURES WITH ECONOMIC STATUS

The proportion of operations done in an emergency that demands immediate action to save life is not large; probably the majority are planned leisurely and done at a previously scheduled time. Because of the large number of nonemergency operations, one would expect more surgical procedures among the higher income families where funds are available for medical care that is not immediately necessary.

Data were obtained on the family's total income during the approximate year of the study. Figure 6 shows the frequency of operations in each of five income groups, with adjustment of the rates for age differences among the various groups. The rates vary from 52 operations per 1,000 persons in families with annual incomes of less than $1,200 to 94 in families with $5,000 or more income. Between these extremes there is a gradual increase with income in the frequency of operations, except for a slightly smaller rate in the $3,000-$5,000 class than in the next lower group. The percentage of cases that were treated surgically shows the same increase with income, from 6.6 per cent for the under $1,200 group to 8.8 per cent for families with incomes of $5,000 or more. The increase with income in the frequency of operations persists when the data are considered for cities of different sizes.

Figure 7 shows operation rates for persons of specific ages for

Fig. 6. Frequency of all surgical operations among persons classified according to total annual family income, 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931. (Rates adjusted to the age distribution of the white population of the Registration States in 1930.)



the lowest and highest income groups. The differences between these two extreme groups are large and consistent in the various ages and the general tendency toward more surgery in the higher income brackets is fairly clear. The percentage of cases of specific ages that were treated surgically gives a similar picture but the relative differences between the two income groups are not as great as in the actual operation rates.

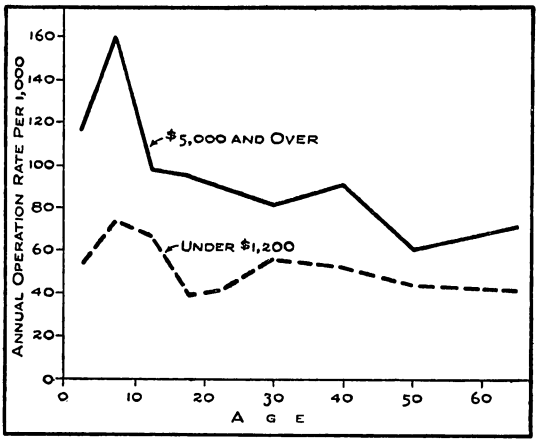


Fig. 7. Frequency of all surgical operations at specific ages among persons with high and with low total annual family income, 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931.

Figure 8 shows rates for each income group for eight fairly specific types of operations; in the lower half of the figure the rates are plotted on an actual basis, and in the upper half on a relative basis as ratios to the rate for the group with less than $1,200 annual income. Most of the operations show some tendency toward greater frequencies in the higher income groups. The operations that show the largest and most definite differences are tonsillectomy, removal of tumors, ear and mastoid operations, and lancing of boils. These surgical procedures are not usually done as emergencies; the tumor category is predominated by minor external tumors that do not endanger life, and the mastoid cases are a small part of the ear group. Moreover, the rupture of the ear drum in otitis media is a frequent outcome when surgical procedures are not used; by this outcome, the emergency is ended without surgery, although the result may be a permanent impairment.

Bone setting was more frequent in the lower income groups. Every fracture carries with it the implication of the setting of the

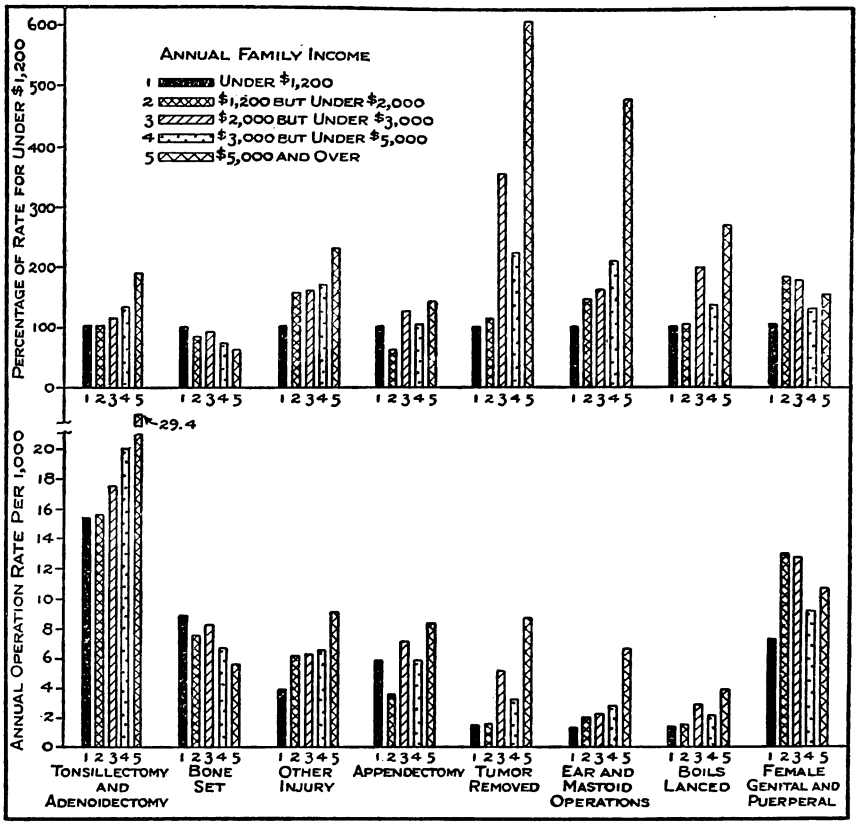


Fig. 8. Frequency of certain surgical operations among persons classified according to total annual family income, 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931. (Rates adjusted to the age distribution of the white population of the Registration States in 1930.)

bone or the placing of a cast, so the frequency of this operation really represents the frequency of accidents involving a fracture. Since accidents, particularly industrial accidents, occur more frequently in the lower income groups, the incidence of this operation might be expected to be less in the higher income brackets. Operations in connection with injuries that do not involve fractures are more frequent in the higher income groups but when all surgery on injuries is considered together, there is not much variation with income in the rate for all ages; among children under 20 years there are more operations in the higher income groups.

The percentage of cases of the various diagnoses that were treated surgically shows about the same picture, but with relatively less variation with income.

VARIATION IN THE FREQUENCY OF SURGICAL PROCEDURES WITH SIZE OF CITY AND GEOGRAPHIC AREA

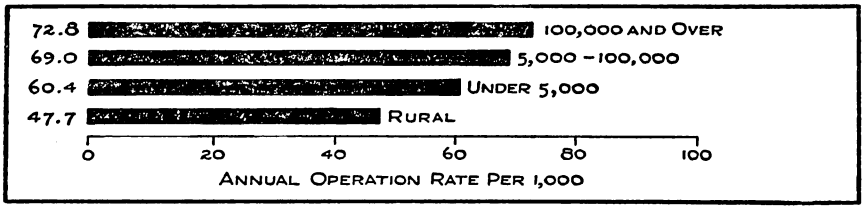
Physicians are more concentrated in large cities than the general population; a study of ten states by Peebles (20) indicated that 53 per cent of the physicians were practicing in cities over 100,000 in population, whereas only about 40 per cent of the population of these states lived in cities of that size. In addition it was found that the percentage of practicing physicians who limited themselves to a specialty increased regularly with size of city; the percentage who were specialists in cities over 100,000 was more than four times what it was in places under 10,000.

Hospital beds are also concentrated in large cities with corresponding scarcity in the rural districts. Thus surgeon specialists and hospital facilities are more plentiful and more convenient to the inhabitants of large cities.

Geographically, both physicians and hospital beds are less plentiful (in proportion to population) throughout the South than in other sections.

Size of City. Figure 9 shows operation rates for cities classified according to size.[6] Considering this chart for the whole group of

Fig. 9. Frequency of all surgical operations in cities of different sizes and in rural areas, 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931. (Rates adjusted to the age distribution of the white population of the Registration States in 1930.)

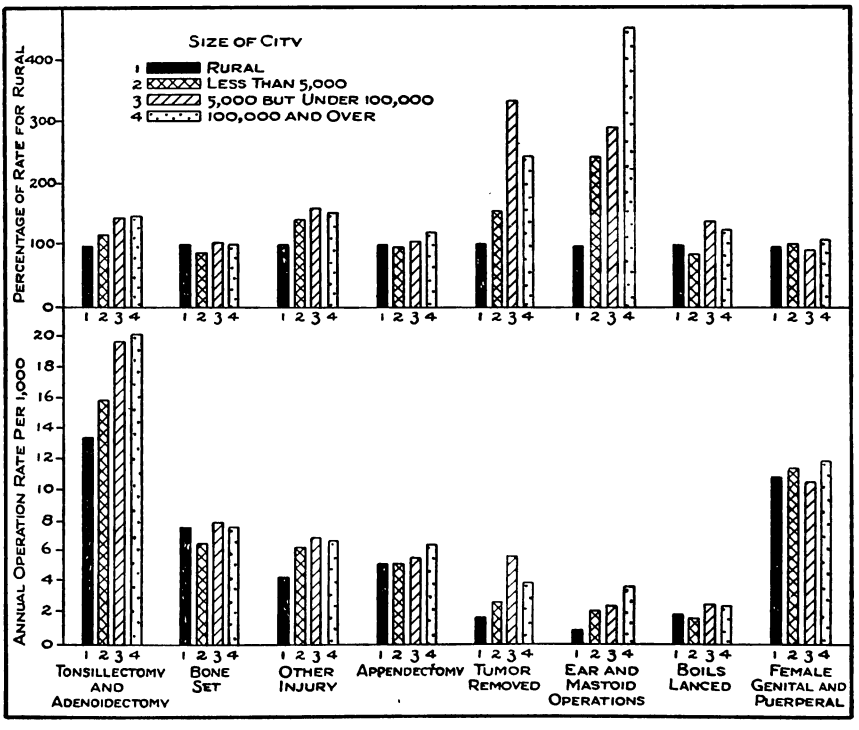


[6] In a survey of this kind no error arises from the place of the operation being different from the place of the patient's residence, because all the data about a given family are classified according to the place of the family's residence.

families there is a regular progression from an operation rate of 48 in the rural areas to 73 per 1,000 in cities of 100,000 or over in population. The percentage of cases that were treated surgically also increases regularly from 6.0 per cent for rural families to 9.0 for those living in cities of 100,000 or over. When one compares the surgical operation rates per 1,000 in cities of 100,000 or over with those for corresponding ages in rural areas, the differences are large for every age group.

Figure 10 shows rates for specific kinds of operations in the several types of communities. Most of the operations show tendencies toward higher rates in large cities, but the variations are not equally large and consistent for the several diagnoses. Ton-

Fig. 10. Frequency of certain surgical operations in cities of different sizes and in rural areas, 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931. (Rates adjusted to the age distribution of the white population of the Registration States in 1930.)



sillectomy shows a regular progression from 13 in the rural areas to 20 per 1,000 in large cities, but for appendectomy there is much less difference between the country and the city. Possibly appendicitis represents an emergency which must be taken care of, but tonsillectomies are performed more frequently when facilities are available and convenient. The sizable excess in cities for operations to remove benign tumors, cysts, and warts seems to bear out this hypothesis, since such chronic conditions rarely come up as emergency situations. On the other hand, operations in connection with ear diseases show a large relative excess for cities and one would think that many of these operations would be done as emergencies. It is an emergency, however, that is frequently overlooked and the eardrum left to rupture without surgical interference.

Operations on the female genital organs are often done in connection with conditions resulting from childbirth; because the birth rate is higher in rural areas the need for such operations is probably greater there, but the rates show little variation with size of city.

The increase in the frequency of operations with size of city is fairly consistent for each geographic area; however, the differences between city and rural rates are greater in the South and West than in the North Central and Northeast.

SEVERITY AND MEDICAL CARE OF SURGICAL CASES

Hospital, Clinic, and Specialist Services. Considering all operations, 61 per cent of the cases had some hospital service and presumably the operation was done in the hospital. Of the 39 per cent that had no hospital service, 30 per cent of all operations had only office or clinic calls with no home calls, so the operation must have been done in the office or clinic; the other 9 per cent had home calls but no hospital service, so the operation was done either at home or in the office or clinic. All operations for gall bladder, hernia, and thyroid, and 99 per cent of the appendectomies were hospital cases.

The figure of 61 per cent of all surgical cases that were hospitalized may be contrasted with 3.4 per cent of all nonsurgical cases; 4.4 per cent of nonsurgical cases that had a doctor in attendance were hospitalized. Of interest also is the fact that 60 per cent of all hospital cases had surgical operations, as compared with 3.2 per cent of all nonhospital cases; 4.2 per cent of all nonhospital cases that had a doctor in attendance had an operation. Hospitalization is frequent in surgical practice and surgery looms larger in hospital than in nonhospital medical practice.

Of all surgical cases, 10.1 per cent received some service from a public clinic in connection with the illness, as compared with 3.3 per cent for all nonsurgical cases; 4.3 per cent of the attended nonsurgical cases had public clinic service.

In 43 per cent of all the operations the surgical work was reported as done by a specialist, in comparison with only 10 per cent of nonsurgical attended cases that had a specialist as a medical attendant. The other 57 per cent of the operations were done by physicians not designated as specialists, including 12 per cent that were done by hospitals or clinics with no other information about the person who operated. Fifty-three per cent of all operations in hospitals were done by specialists, as compared with 27 per cent of those done outside of hospitals.

Nursing Service. Twenty-five per cent of the hospital surgical cases had one or more special nurses for at least one day, and 9 per cent had two or more special nurses (day and night) for one or more days. These percentages may be contrasted with 17 per cent of nonsurgical hospital cases that had one or more special nurses, and 6 per cent that had two or more.

The mean duration of special nursing in the hospital was 2.9 days per hospital surgical case and 11.5 days per hospital surgical case with a special nurse.[7] The proportion of hospital surgical cases

[7] In both of these averages a day refers to the work of one nurse during a day or night or both; two nurses (day and night) on the same case were counted as two days of nursing, but one nurse said to be on duty both day and night was counted as only one day of nursing.

that had a special nurse varies from 5 per cent for circumcisions and 10 per cent for tonsillectomies to 36 per cent for operations on the female genital organs, and 52 per cent for appendectomies.

Considering all cases[8] without respect to hospitalization, 16.3 per cent of surgical cases had a full-time bedside nurse (graduate or practical) for one or more days, as compared with 2.1 per cent of all nonsurgical cases. However, the services of the regular floor nurse in the hospital should be taken into account; of the total surgical cases 61.7 per cent were either in a hospital (and therefore had nursing care) or had the services of a full-time bedside nurse outside of the hospital, as contrasted with 4.9 per cent for all nonsurgical cases.

Of all surgical cases, 5.0 per cent had one or more visits from a visiting nurse; this may be compared with 3.7 per cent of nonsurgical cases that had such service. The service on surgical cases amounted to 0.42 visits per total case and 8.5 visits per case with a visiting nurse. Nursing visits as here defined include visits for any purpose and from all types of organizations.

Durations of Illness and of Hospital Service. Average durations[9] in the hospital and in bed were computed for illnesses that had surgical treatment. Since the duration of the case may have been materially increased by complicating affections, the means here shown are for illnesses with only a single diagnosis.

Considering all hospital operations with only one diagnosis, the average duration in the hospital was 8.2 days. At the top of the list

[8] Inasmuch as the operations included sole, primary, and contributory diagnoses, the percentages here and in other paragraphs for nonsurgical cases also refer to all three kinds of diagnoses; the results are not essentially different when contributory diagnoses are eliminated.

[9] Theoretically, statistics on the duration of illness should exclude all incomplete cases and be based only on those closed either by death, recovery, or other discharge from the hospital or discontinuance of confinement to bed. In this study, however, the only available records were durations during the twelve-month period of observation; in such data the incomplete cases represent a selected group with longer than average durations because the longer the duration the more probable it is that the case will still be sick on the closing date of the study year. On the other hand, some illnesses of short duration may represent cases with onset prior to the beginning of the study that extended only a short time within the study year.

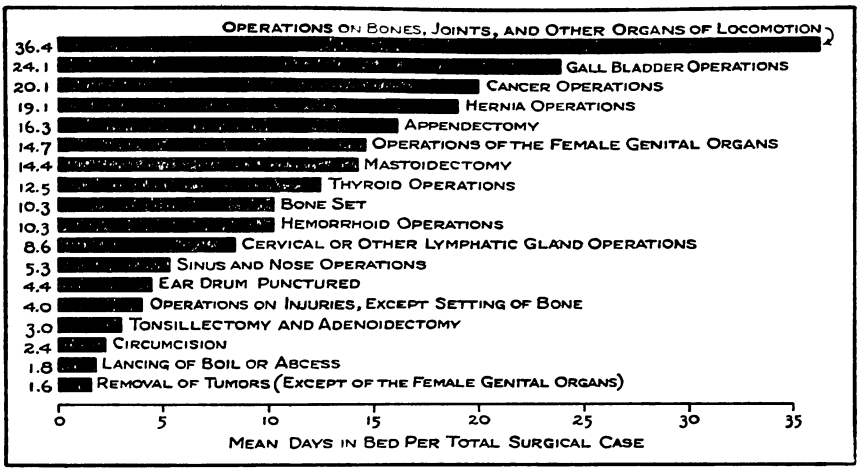


Fig. 11. Average days in bed on account of illness in connection with certain surgical operations, 8,758 canvassed white families in eighteen states during twelve consecutive months, 1928-1931. (These means represent the average time in bed both before and after operation for all cases with only one diagnosis, including those not in bed at all.)

are operations on the bones, joints, and organs of locomotion, 27 days; cancer, 25 days; gall bladder, 22 days; and at the bottom is tonsillectomy with 1.7 hospital days per hospitalized case although 75 per cent were done in a hospital.

Figure 11 shows for eighteen more or less specific kinds of operations the mean time in bed for all cases, including those not in bed as well as those confined to bed. It thus represents the average severity of all cases of a given operation with only one diagnosis. At the head of the list with an average of 36 days in bed are operations on the bones, joints, and other organs of locomotion. Following this comes gall bladder operations with a mean of 24 days in bed; cancer, 20 days; hernia, 19 days; and appendectomy, 16 days in bed. At the other end of the list are the minor operations that cause little or no time in bed, including the removal of benign tumors, except of the female genital organs, 1.6 days; and lancing of a boil or abscess, 1.8 days in bed. The most frequent of the short duration cases are tonsillectomies with an average of 3.0 days in bed; since this operation constitutes nearly one-third of the total, the duration for all operations combined is short, 7.7 days in bed.

SUMMARY

Records of all surgical operations were obtained for 8,758 white families in 130 localities in eighteen states for a period of twelve consecutive months between 1928 and 1931. Each family was visited at intervals of two to four months to obtain the data.

The surveyed families include representation from nearly all geographic sections, from rural, urban, and metropolitan areas, from all income classes, and of both native and foreign-born persons. The distribution by income was reasonably similar to the estimated distribution of the general population at the time of the survey.

Considering the whole surveyed group there were 65 surgical operations per 1,000 persons per year. The rates for males and females were 62 and 68 per 1,000, respectively. The highest rates occurred at 5-9 and 30-34 years of age. The first peak is largely accounted for by tonsillectomy and the second by female genital and puerperal conditions (Fig. 1).

Tonsillectomy constituted nearly one-third of all operations. The setting of a fractured bone was second in frequency; other operations in connection with injuries, third; operations on the female genital organs, fourth; and appendectomy fifth in frequency (Fig. 2). The age curves of the various types of operations differ radically (Fig. 4).

The setting of a fractured bone, other operations in connection with injuries, hernia, and sinus operations were all definitely higher among males than females. Appendectomy, gall bladder, cancer, and thyroid operations were higher among females (Fig. 3).

The frequency of operations increased definitely with income (Fig. 6). The largest relative variations with income occurred in the removal of tumors and ear and mastoid operations (Fig. 8).

Operations were more frequent in large cities than in rural districts (Fig. 9).

Sixty-one per cent of all operations had some hospital service; the other 39 per cent were done in the office or clinic or at home.

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