

# The Incidence of Rheumatic Fever in Metropolitan Nashville, 1963-65

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THE INCIDENCE of rheumatic fever is difficult to establish even though the disease is reportable in most States. Reporting is far from complete, so that incidence based on official sources is highly inaccurate. The few attempts at rheumatic fever registry have been centered around casefinding, treatment, and streptococcal prophylaxis, rather than the collection of accurate data on incidence. One notable exception was the rheumatic fever registry in Miami, Fla., of Saslaw and Schwartzman (1) aimed toward recording all known and suspected active rheumatic fever episodes over the period 1955-58.

It is desirable for epidemiologic reasons to determine the incidence of rheumatic fever. Such data make it possible to estimate temporal and group variations in morbidity rates, as well as to learn the extent of underreporting. Incidence determinations also furnish information for evaluating the efficacy of streptococcal prophylaxis regimens for the prevention of recurrences. This report describes the methodology used to establish the incidence of rheu-

matic fever (the number of new cases occurring annually) in Metropolitan Nashville, Tenn., and presents findings of the first 3-year study period.

## Materials and Methods

Metropolitan Nashville comprises a city-county governmental unit having an estimated population in 1964 of 431,000, 20 percent of which is nonwhite. Located on the Cumberland River, it is surrounded by low-lying hills. The climate is subtropical and not characterized by great extremes; the normal average temperature is 60° with a January minimum of 30.9° and a July maximum of 90.7° F. Normal annual rainfall is 45.14 inches.

At the outset of the study it was assumed that all persons with cases of rheumatic fever having symptoms severe enough to cause them to seek medical care could be found by careful and continuous surveillance of all potential sources of care. The medical directors of hospitals and private and public clinics were informed by letter and in person of the study. The medical records librarians and their staffs in each institution were contacted and the study explained to them in detail.

Physicians and public health nurses in charge of school health services were instructed about the study. The survey physician gave an orientation lecture to the school health nursing staffs. The principals in the schools were also informed. Physicians responsible for patients in

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city and county educational and domicillary institutions were informed of the proposal. These institutions included day care centers, prisons, institutions for retarded, handicapped, or delinquent children, and schools for underprivileged children.

Local medical societies were briefed on the proposal and the cooperation and approval of their members secured. Some 500 physicians in the Nashville-Davidson County area were informed by mail of the purposes of the study. The study was explained to interns and resident staffs in pediatrics and medicine at local hospitals. Each of the 240 internists, pediatricians, surgeons, and general practitioners in Nashville and Davidson County was visited during the winter of 1963 by a fourth-year medical student. The student, a pleasant extrovert, was given careful briefing on the purposes and methods of the study in addition to specific information on rheumatic fever.

The student was able to describe the proposal to the physicians and define its purposes and methods, as well as to communicate current thought concerning rheumatic fever when this information was requested. During the initial interview he asked physicians the number of rheumatic fever cases they had seen in 1962. These cases were not documented since the actual collection of prospective data did not begin until January 1963. The student was able to gain the cooperation of the physician and apprise him of the routine inquiries which would be made by the study secretary regarding any new cases of acute rheumatic fever. The student also enlisted the aid of the physician's office personnel and explained the study to them. This initial orientation later proved helpful in obtaining maximum response from physicians.

One of the physicians attached to the study dealt with key persons on the pediatric and medical services of the hospitals. An initial visit was made to each hospital in Metropolitan Nashville. Subsequently, house staff for these institutions were contacted quarterly by the physician as a reminder of the continuing surveillance. After the first year, contacting public and private schools and institutions was dropped since it proved nonproductive as a measure for finding new cases.

The study secretary was responsible for rou-

tine periodic telephone contact with all private physicians. Most physicians asked that she talk with them personally and cooperation was excellent. The regular call served as a case-finding measure and a repeated reminder to the physician of the continued interest in his new cases of rheumatic fever. Each year pediatricians, internists, and general practitioners in private practice were called four times, surgeons twice, and other specialists once.

When cases were reported, one of the two study physicians visited the patient in the hospital or, if he had been discharged, studied the hospital medical record. If the patient was seen in the physician's office and not hospitalized, the information was obtained from his physician by one of the study physicians.

A list of physicians practicing in Nashville and Davidson County was kept up to date by periodic corrections and additions furnished by the Tennessee Department of Public Health, assuring that all practicing physicians were notified of the study.

Because of the 3-month interval between phone calls to the practicing physicians, there occasionally was a delay in learning of new cases. However, these delays were kept at a minimum because of the increasing cooperativeness of practicing physicians.

A reporting physician was asked whether he considered the diagnosis in each case of illness to be definite or suspect. After all available clinical and laboratory information about the patient was collected, these diagnostic criteria were classified according to whether they met the revised Jones criteria (2) for diagnosis of rheumatic fever.

The number of cases of rheumatic fever reported to the metropolitan health department was available from published reports (3). This information allowed comparison between the number of cases officially reported and the number of cases found through the study mechanism.

To establish the denominators for calculating age-specific rates by race and sex, the estimated population for the Nashville Metropolitan area in 1964 was used (4). To estimate population according to race, age, and sex, the 1964 estimate was prorated according to the proportions in these categories in the 1960 census. Since there

was little variation in the total population over the 3 years, the 1964 estimates were used as denominators for the rate calculations.

**Results**

Of the 162 cases reported over the 3-year period, the number of cases reported by practicing physicians was the same as the number reported from all other sources. The study secretary made the routine telephone calls to private physicians to discover new cases of illness.

| Reporting source           | Total      | Cases found by phone call |               |
|----------------------------|------------|---------------------------|---------------|
|                            |            | Total                     | by phone call |
| Practicing physicians..... | 81         | 67                        | 67            |
| General practitioners..... | 31         | 29                        | 29            |
| Pediatricians.....         | 18         | 14                        | 14            |
| Internists.....            | 28         | 21                        | 21            |
| Surgeons.....              | 3          | 2                         | 2             |
| Other.....                 | 1          | -----                     | -----         |
| House staff.....           | 52         | 29                        | 29            |
| Record rooms.....          | 27         | -----                     | -----         |
| Other.....                 | 2          | -----                     | -----         |
| <b>Total.....</b>          | <b>162</b> | <b>96</b>                 | <b>96</b>     |

Table 1 gives the number and percentage of cases meeting the revised Jones criteria according to the three major specialty groups reporting cases. The tabulation is given separately for those cases which physicians considered definite and those considered suspect. Seventy percent of those cases reported by practicing physicians satisfied the revised Jones criteria. Of the cases reported by sources other than practicing physicians, 89 percent were in hospitalized patients

**Table 2. Yearly incidence of rheumatic fever, Nashville, 1963-65**

| Year              | Initial attacks | Cases found by study | Cases listed in Tennessee Morbidity Statistics | Cases per 100,000 |
|-------------------|-----------------|----------------------|--|-------------------|
| 1963.....         | 41              | 55                   | 13   | 12. 8             |
| 1964.....         | 50              | 64                   | 24   | 14. 9             |
| 1965.....         | 37              | 43                   | 17   | 10. 0             |
| <b>Total.....</b> | <b>128</b>      | <b>162</b>           | <b>54</b>                                      | <b>12. 6</b>      |

for whom the diagnosis had been established. The proportions of patients who satisfied the Jones criteria were not significantly different for the 3 years studied.

Of cases classified as definite, 80 percent of those reported by practicing physicians met the Jones criteria, while 95 percent of the cases reported by hospitals met the criteria. Of cases classified as suspect, 58 percent of those reported by physicians met the Jones criteria, while 76 percent of those reported by hospitals did so. A significantly greater proportion of those reported through hospitals met the Jones criteria than did those reported by practicing physicians.

Differences among incidence rates for the 3 years or in the percentage of cases officially

**Table 1. Cases of rheumatic fever satisfying revised Jones criteria by type of diagnosis and specialty of reporting physician, Nashville, 1963-65**

| Diagnosis and specialty of diagnostician | Jones criteria satisfied |           | Jones criteria not satisfied |           | Total     |
|--|--------------------------|-----------|------------------------------|-----------|-----------|
|  | Number                   | Percent   | Number                       | Percent   |           |
| <b>Definite diagnosis.....</b>           | <b>35</b>                | <b>80</b> | <b>9</b>                     | <b>20</b> | <b>44</b> |
| General practitioner.....                | 12                       | 75        | 4                            | 25        | 16        |
| Pediatrician.....                        | 9                        | 69        | 4                            | 31        | 13        |
| Internist.....                           | 14                       | 93        | 1                            | 7         | 15        |
| <b>Suspect diagnosis.....</b>            | <b>19</b>                | <b>58</b> | <b>14</b>                    | <b>42</b> | <b>33</b> |
| General practitioner.....                | 10                       | 67        | 5                            | 33        | 15        |
| Pediatrician.....                        | 2                        | 40        | 3                            | 60        | 5         |
| Internist.....                           | 7                        | 54        | 6                            | 46        | 13        |
| <b>All cases.....</b>                    | <b>54</b>                | <b>70</b> | <b>23</b>                    | <b>30</b> | <b>77</b> |
| General practitioner.....                | 22                       | 71        | 9                            | 29        | 31        |
| Pediatrician.....                        | 11                       | 61        | 7                            | 39        | 18        |
| Internist.....                           | 21                       | 75        | 7                            | 25        | 28        |

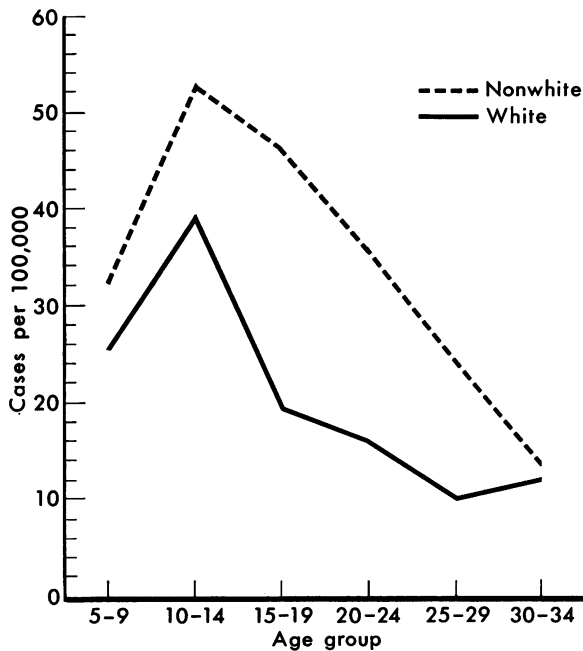
reported were not statistically significant. Initial attacks varied less from year to year than the total number of cases and, of course, yearly differences were not significant (table 2). What appears to be a large drop in the total number of cases between 1964 and 1965 was also seen for initial attacks, but to a lesser degree. The smaller decrease in initial cases in 1965 was a reflection of the fact that 12 cases in 1964 were recurrences, but only 5 were recurrences in 1965.

In comparing our incidence reports with those published by the State, the official reporting sys-

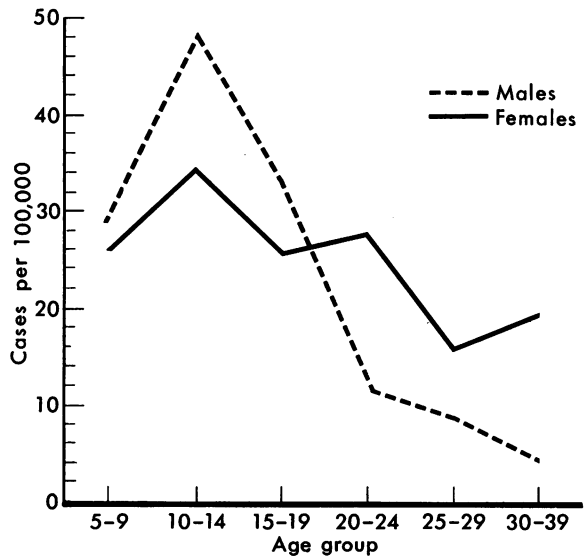
tem does not allow for specification of a case as an initial attack or a recurrence. However, these reports are reviewed in the division of statistical services, State department of health, to check for duplicate reports; that is, the report of a case by more than one physician. We are told by the director of the division that any case reported to be a recurrence by a physician is excluded from the published figures. There are three or four such cases a year.

The race, sex, and age of all patients, shown in table 3, reflects the expected age distribution of rheumatic fever cases which characterizes the disease as occurring most frequently in school age children and young adults. There

**Figure 1. Age-specific incidence rates of rheumatic fever by race, Nashville, 1963-65**



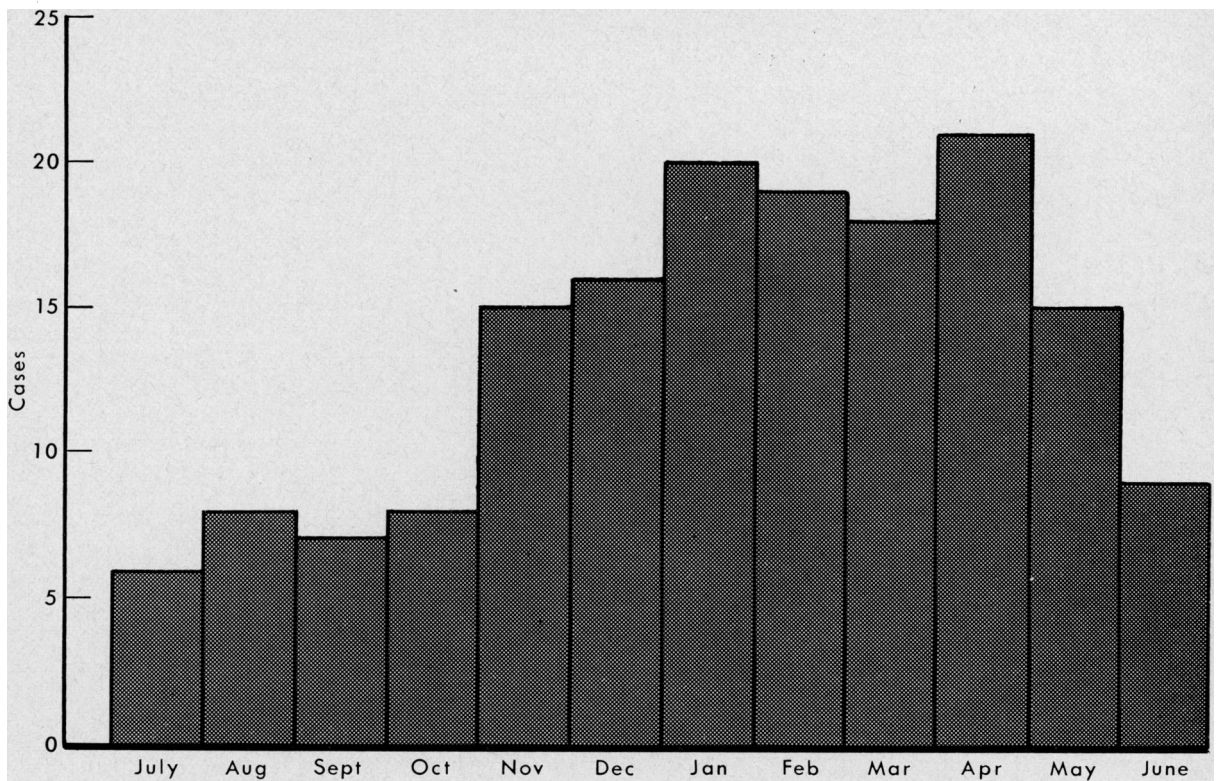
**Figure 2. Age-specific incidence rates of rheumatic fever by sex, Nashville, 1963-65**



**Table 3. Cases of rheumatic fever by race, sex, and age of patients, Nashville, 1963-65**

| Age (years)  | White |        | Nonwhite |        | Total |        |
|--------------|-------|--------|----------|--------|-------|--------|
|              | Male  | Female | Male     | Female | Male  | Female |
| Under 5..... | 1     | 0      | 0        | 0      | 1     | 0      |
| 5-9.....     | 15    | 12     | 4        | 5      | 19    | 17     |
| 10-14.....   | 25    | 11     | 3        | 8      | 28    | 19     |
| 15-19.....   | 8     | 7      | 3        | 6      | 11    | 13     |
| 20-24.....   | 5     | 7      | 0        | 7      | 5     | 14     |
| 25-29.....   | 2     | 5      | 2        | 2      | 4     | 7      |
| 30-34.....   | 0     | 6      | 0        | 1      | 0     | 7      |
| Over 35..... | 6     | 5      | 2        | 4      | 8     | 9      |
| Total.....   | 62    | 53     | 14       | 33     | 76    | 86     |

**Figure 3. Cases of rheumatic fever by month of occurrence, Nashville, 1963-65**



was a marked difference between white and nonwhite patients in the sex ratio. Among white patients, there were more cases among males than females, while among nonwhites, there were 33 cases of illness in females to 14 in males. The age-specific incidence rates were considerably and consistently higher among the nonwhite than the white population (fig. 1). The overall rates were 19.1 cases of rheumatic fever per 100,000 for nonwhites and 11.0 cases per 100,000 for the white population. The corresponding age-specific rates by sex were much higher for males 10-14 years of age, but rates

for males were consistently lower than those for females in each of the older age groups (fig. 2).

The highest seasonal incidence was during the winter and spring months, consistent with the usual seasonal occurrence of rheumatic fever in the North Temperate Zone (fig. 3).

Although there were no significant differences by year in the number of cases occurring, fewer recurrences were noted in the last year than in the preceding two. This observation is true in terms of the relative number of recurrences as well as the absolute number. The

**Table 4. Recurrences and initial attacks of rheumatic fever, Nashville, 1963-65**

| Year       | Recurrences | Initial attacks | Questionable history | Total | Percent of total with recurrences |
|------------|-------------|-----------------|----------------------|-------|-----------------------------------|
| 1963.....  | 13          | 41              | 1                    | 55    | 24                                |
| 1964.....  | 12          | 50              | 2                    | 64    | 19                                |
| 1965.....  | 5           | 37              | 1                    | 43    | 12                                |
| Total..... | 30          | 128             | 4                    | 162   | 19                                |

percentage of all cases known to be recurrences decreased in each of the 3 years of this study (table 4). The history of rheumatic fever in four patients was doubtful, so that the acute attack in question could not be adequately classified as either an initial attack or a recurrence.

Figure 4 illustrates the cumulative age distribution for patients with initial cases of illness relative to those with recurrences. Patients with recurrences were, on the average, approximately 6 years older than those with initial attacks.

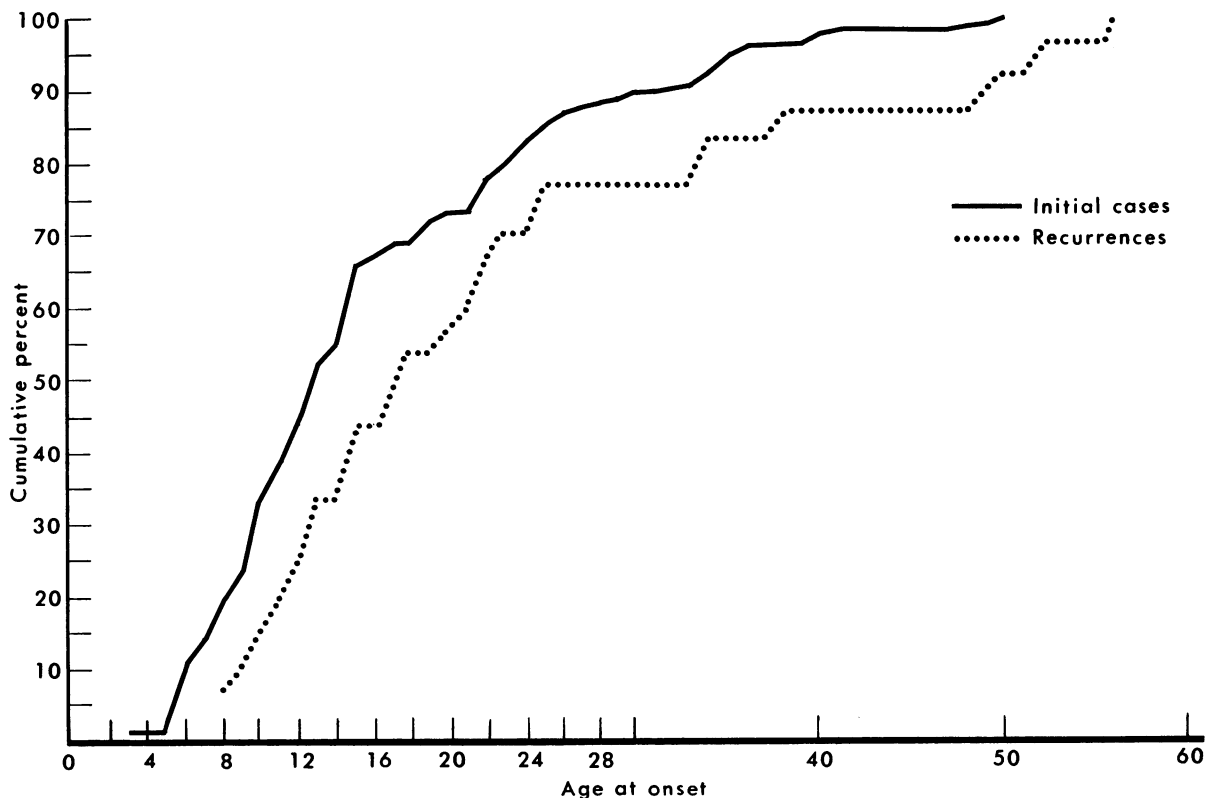
Of the 128 persons with initial attacks, 62 percent were judged by physicians to have a definite rather than suspected diagnosis; 87 percent of the persons with recurrences were considered to have definite diagnoses. The significantly different rates of definite diagnosis in the two groups probably is due in some degree to the helpfulness of a history of previous attack in making such a diagnosis.

Among patients with initial attacks and recurrences slightly more than 40 percent suffered carditis (table 5). Of those patients 20 years and over, 37 percent experienced carditis, while 44 percent of those under 20 had evidence of carditis (table 6). The carditis rates were not significantly different in these two age groups. Generally, the age distribution of those patients having carditis was not significantly different from those having no carditis.

The history of rheumatic fever in the families of patients was as follows.

| <i>Family member with rheumatic fever</i>          | <i>Number of patients</i> |
|--|---------------------------|
| None .....   | 133                       |
| Parent only.....                                   | 5                         |
| Sibling only.....                                  | 7                         |
| Aunt, uncle, or cousin only.....                   | 7                         |
| Parent and sibling.....                            | 1                         |
| Parent and aunt, uncle, or cousin.....             | 1                         |
| Parent and sibling and aunt, uncle, or cousin..... | 1                         |
| Unknown .....                                      | 7                         |
| <b>Total .....</b>                                 | <b>162</b>                |

**Figure 4. Cumulative age distribution for initial cases of rheumatic fever relative to recurrences, Nashville, 1963-65**



**Table 5. Carditis among persons with initial cases and recurrences of rheumatic fever, Nashville, 1963-65**

| Patients with—          | Car-ditis | No car-ditis | Total cases | Percent with carditis |
|-------------------------|-----------|--------------|-------------|-----------------------|
| Initial cases.....      | 54        | 74           | 128         | 42                    |
| Recurrences.....        | 13        | 17           | 30          | 43                    |
| Questionable history--- | 2         | 2            | 4           | 50                    |
| Total.....              | 69        | 93           | 162         | 43                    |

In the majority of the patients the preceding upper respiratory infection occurred within 18 days of the onset of rheumatic fever (table 7). Few patients with these infections were seen by a physician and therefore the infections were not documented as being streptococcal. In 55 patients, no history of a preceding upper respiratory infection could be obtained. This may have been due to inability of the patient to remember the event—either because it was of insignificant severity or it was not documented on the patient's record. Twenty-two patients reported to the physician on the first day of onset of rheumatic fever symptoms. The majority of the others reported within 18 days. It is noteworthy, however, that 22 delayed for more than 18 days before reporting to their physicians.

**Discussion**

The casefinding methods described were simple and easily accomplished. Those patients who did not seek medical care would not, of course, have been discovered by this or any other method. Many of the patients who were found to have rheumatic heart disease but had no history of rheumatic fever may have been among those who did not seek medical care, were not diagnosed correctly at the time they had rheumatic fever, or had rheumatic carditis without arthritis and did not feel ill enough to seek medical care. Within this study group, general practitioners treated most of the private patients with rheumatic fever, followed by internists and pediatricians. The fact that between two and three times as many cases were found through the study procedures as were reported by the health authorities is striking. Inadequacy of reporting is a continuing prob-

**Table 6. Carditis among persons with initial cases and recurrences of rheumatic fever by age, Nashville, 1963-65**

| Age (years)      | Car-ditis | No car-ditis | Total cases | Percent with carditis |
|------------------|-----------|--------------|-------------|-----------------------|
| Under 20.....    | 48        | 60           | 108         | 44                    |
| 20 and over..... | 21        | 33           | 54          | 37                    |
| Total.....       | 69        | 93           | 162         | 43                    |

lem for health authorities, medical educators, and researchers.

The 12.6 per 100,000 attack rate for the 3 study years was about three times that found by Saslaw and Schwartzman (1) in Miami (3.3 cases per 100,000) during the 3-year period 1955-58. The rates seem to substantiate the oft-repeated observation that rheumatic fever is more common in the northern parts of the Temperate Zone than the southern. However, reports concerning the frequency of rheumatic fever and rheumatic heart disease in the tropics suggest that factors other than latitude per se affect significantly the incidence of rheumatic fever and the prevalence of rheumatic heart disease.

The highest attack rates in the 10-14 year age group reinforce what is known of the age-

**Table 7. Intervals between preceding upper respiratory infection and onset of rheumatic fever, and onset of rheumatic fever and first visit to physician, Nashville, 1963-65**

| Intervals (days)  | Between infection and onset of fever | Between onset of fever and physician visit |
|-------------------|--------------------------------------|--|
| Unknown.....      | 14                                   | 14   |
| No history.....   | 55                                   | 22   |
| 1-3.....          | 4                                    | 36   |
| 4-6.....          | 15                                   | 25   |
| 7-9.....          | 16                                   | 17   |
| 10-12.....        | 7                                    | 7  |
| 13-15.....        | 23                                   | 11   |
| 16-18.....        | 8                                    | 8  |
| More than 18..... | 20                                   | 22   |
| Total.....        | 162                                  | 162  |

specific attack rates for rheumatic fever—it is a disease with onset rarely before the age of 5 years, gradually increasing to a peak from 7–12 years and then declining, with initial attacks occurring infrequently after age 25–30. The age-specific attack rates for initial attacks (fig. 2) resemble those reported by Hedley (5) for the percentage distribution by 5-year age periods of patients with rheumatic fever admitted to Philadelphia hospitals from January 1, 1930, to December 31, 1934, in which the highest admission rates were in the 5–9 and 10–14 year age groups.

The significantly higher incidence rates for nonwhite persons must be interpreted with caution since these higher rates could be strongly influenced by socioeconomic factors. Epidemiologic information, such as socioeconomic status, crowding in the home, and family size, is being collected for each patient but is not complete enough for analysis at this time. We plan to evaluate each case for evidence of rheumatic heart disease and recurrent attacks.

The highest seasonal incidence, during the winter and spring months, was in keeping with the usual seasonal occurrence of rheumatic fever for the North Temperate Zone; also it paralleled the highest seasonal incidence of streptococcal and many viral respiratory infections.

Information on the ratio of initial to recurrent attacks of rheumatic fever in an unselected civilian population is not available, but in this study the ratio was approximately 4:1. Massell and co-workers (6) were among the first to demonstrate the efficacy of penicillin in the prevention of recurrences of rheumatic fever. Antibiotics did not come into extensive use as a prophylactic for rheumatic fever recurrences in civilian populations until about 1950.

The age-specific recurrence rate reported by Wilson (7) for a clinic population in New York City was 25 percent for persons 6–13 years and 6.1 percent for persons aged 14–20 in the years 1921–43. Between 1944 and 1956, recurrence rates fell to 15.1 percent for persons in the 6–13 age group and to 2.8 percent for those in the 14–20 group. In a study in Philadelphia by Ash (8) of children whose initial attack occurred during the years 1923–37, recurrences were more frequent than in Wilson's patients; 40 percent of the group had developed recurrences within

2 years of the onset, 58 percent within 5 years, and 63 percent within 10 years. Recurrence ratios among U.S. Navy personnel in World War II during an epidemic of streptococcal infections was one recurrence to four initial attacks (9).

It is not possible to determine the recurrence rate in Nashville since the total number of susceptible rheumatics in the community is not known. One would expect recurrences to be much lower than in the pre-prophylaxis era, but even today they continue to occur despite the availability of prophylaxis. Of the 30 patients who had recurrent attacks, 25 were said to be taking prophylactic drugs continuously, 3 intermittently, and 2 not at all.

However, the validity of these statements is uncertain since it was not possible to talk to each patient; the fact that the physician's or hospital's record indicated that continuous prophylaxis had been prescribed did not necessarily mean that the patient actually took the drug or that the drug was the proper one. In spite of the availability of prophylactic drugs and apparent reasonable conscientiousness of some patients in taking them, recurrences continued to occur. Feinstein and Stern (10) have noted that despite antistreptococcal prophylactic regimens assigned to all 1,000 members of their study population, 78 patients had 105 recurrent attacks of rheumatic fever.

The Jones criteria are useful indices by which to classify rheumatic fever cases. As might be expected, a somewhat higher percentage of those in which the diagnosis was definite satisfied these criteria when compared with those in which the diagnosis was suspected. However, patients with recurrent attacks met the Jones criteria more frequently than those with initial attacks, a finding of unproven significance because of the small numbers. Perhaps the most important clinical finding was that demonstrable carditis occurred with about equal frequency in patients with initial and recurrent attacks and only slightly more often in patients under age 20 than in those age 20 and over. This finding suggests that the initial attack was not more likely to result in carditis than recurrent attacks regardless of the age when either occurred.

The higher percent of definite diagnoses and agreement with the Jones criteria of the cases



reported from house staff and hospital record rooms probably was an indication that a patient was not likely to be admitted to a hospital until the diagnosis was relatively well established, whereas in the physicians' practices there were more nonhospitalized patients for whom the diagnosis was not established and who were still undergoing diagnostic studies.

The small number of patients with respiratory infections preceding the onset of rheumatic fever which could be documented as being streptococcal with reasonable certainty was not surprising considering the difficulty of obtaining all the diagnostic information necessary, that is, that the patient has the usually accepted symptoms and signs, a throat culture positive for group A  $\beta$ -hemolytic streptococci, and a significant increase in streptococcal antibody titers. Even under controlled research conditions these are difficult data to obtain as shown in a recent study in Metropolitan Nashville in which only a small percent of streptococcal infections could be documented by these three criteria (11).

The large number of patients in whom the respiratory infection preceded the onset of rheumatic fever by 12 days or less is unusual. The usual sequence is an upper respiratory infection due to the group A  $\beta$ -hemolytic streptococci followed in 2 or 3 weeks by rheumatic fever. Rammelkamp and Stolzer (12) determined the mean latent period between the onset of the streptococcal infection and the onset of acute rheumatic fever to be 18.6 days. The onset of rheumatic fever frequently is accompanied by a sore throat, perhaps severe enough that the patient remembers it but cannot remember the milder preceding respiratory infection.

Some of the gaps in our knowledge of rheumatic fever might be filled by the results of continuous studies and patient followup. What should be studied is the incidence of rheumatic fever, not solely among those under medical care, but in an unselected population of a medium-sized U.S. city. Such a study could yield, in addition to epidemiologic data, recurrence rates for a population for which incidence of primary attacks is known, and the percentage of persons who subsequently develop valvular heart disease among those who have had rheumatic fever.

## Summary

In a survey of the incidence of rheumatic fever in Metropolitan Nashville, Tenn., during the period 1963-65, three times as many cases of illness were found by the study methods as were reported by the official health agency.

The average annual incidence of rheumatic fever in Nashville during that period was 12.6 cases per 100,000 population. There was no significant difference in the rate for any of the 3 years, but the seasonal incidence was highest in the winter and spring months.

The incidence of rheumatic fever was nearly twice as high among nonwhite as among white persons. No significant differences in incidence were noted between the sexes; age-specific rates were highest in the age group 10-14 years.

Four persons had both initial attacks and recurrences. Among all cases, 79.7 percent had initial attacks and 18.3 percent had recurrences. Patients with initial attacks were, on the average, 6 years younger than those with recurrent attacks.

The Jones criteria for the diagnosis of rheumatic fever were satisfied by 70 percent of the cases. Clinical evidence of carditis was present in more than 40 percent of initial and recurrent attacks. It was present in 37 percent of those patients under age 20 and in 43 percent of those age 20 and over.

Despite the availability of effective prophylaxis, recurrent attacks of rheumatic fever continued to occur.

## REFERENCES

- (1) Saslaw, M. S., and Schwartzman, M. N.: Case registry for rheumatic fever in greater Miami, Florida. *Public Health Rep* 77: 17-28 (1962).
- (2) American Heart Association: Jones criteria (revised). New York, 1965.
- (3) Tennessee Department of Public Health: Tennessee morbidity statistics 1965. Nashville, 1966.
- (4) Bureau of Business and Economic Research, University of Tennessee: Tennessee survey of business, vol. 1, No. 5, January 1966.
- (5) Hedley, O. F.: Rheumatic heart disease in Philadelphia hospitals. II. Age, race, and sex distribution. *Public Health Rep* 55: 1647-1691 (1940).
- (6) Massell, B. F., Dow, J. W., and Jones, T. D.: Orally administered penicillin in patients with rheumatic fever. *JAMA* 138: 1030-1036 (1948).

- (7) Wilson, M. G.: *Advances in rheumatic fever 1948-1961*. Hoeber Medical Division, Harper and Row, Publishers, New York, 1960.
- (8) Ash, R.: The first ten years of rheumatic infection in childhood. *Amer Heart J* 36: 89-97 (1948).
- (9) Quinn, R. W.: Epidemiologic study of seven hundred and fifty-seven cases of rheumatic fever. *Arch Intern Med (Chicago)* 80: 709-727 (1947).
- (10) Feinstein, A. R., and Stern, E. B.: Clinical effects of recurrent attacks of acute rheumatic fever. *J Chronic Dis* 20: 13-27 (1967).
- (11) Quinn, R. W., and Federspiel, C. F.: Rheumatic fever and rheumatic heart disease: A five-year study of rheumatic and non-rheumatic families. *Amer J Epidem* 85: 120-136 (1967).
- (12) Rammelkamp, C. H., and Stolzer, B. L.: The latent period before the onset of acute rheumatic fever. *In Virology and epidemiology*, edited by D. M. Horstmann. Archon Books, Hamden, Conn., 1962, pp. 226-238.

## Public Health Service Staff Appointments

**Dr. Charles H. Boettner** has been appointed associate director of the Bureau of Health Manpower. His new rank is Assistant Surgeon General.

The Bureau acts as a national focus for manpower information. It also makes grants to colleges and universities for construction of more and better teaching facilities, upgrading curriculums, research in the use of health manpower, training or retraining health personnel, and scholarships and loans to students.

A native of Cumberland, Md., Dr. Boettner received his medical degree from the Bowman Gray School of Medicine in 1952 and served his internship at the Public Health Service Hospital at Staten Island, N.Y. His residency, after which he remained as assistant chief of surgery, was served at the Public Health Service Hospital at San Francisco.

In 1960 Dr. Boettner transferred to the Public Health Service Hospital in New Orleans as deputy chief of surgery, and a year later he became chief of surgery at the Public Health Service Hospital in Chicago.

Dr. Boettner was promoted to medical director in 1963 when he was appointed chief of professional medical assignment and training services of the Division of Indian Health.

After receiving the degree of diploma in public health from the London (England) School of Hygiene and Tropical Medicine in 1966, Dr. Boettner served as executive director of health programs of the Appalachian Regional Commission.

He is a fellow of the American College of Surgeons, a diplomate of the American Board of Surgery, and a member of the American

Medical Association and the American Public Health Association.

**Dr. Sherman N. Kieffer** has been appointed associate director for patient care in the National Institute of Mental Health. Holding the rank of Assistant Surgeon General, he will be principal staff adviser to the NIMH bureau director for all patient care activities throughout the Bureau and will serve also as director of the Institute's Division of Field Investigations.

Dr. Kieffer will be in charge of national demonstration community mental health centers, operation of clinical research facilities in Public Health Service Hospitals at Lexington, Ky., and Fort Worth, Tex., and operation of the Institute's Center for Epidemiologic Studies. In addition he will direct a program providing inpatient care and aftercare rehabilitation services for narcotic addicts eligible for treatment under provisions of the Narcotic Addict Rehabilitation Act of 1966.

A member of the Public Health Service Commissioned Corps since 1950, Dr. Kieffer received his M.D. degree from the University of Minnesota Medical School and completed his psychiatric residency at the Public Health Service Hospital at Lexington in 1954.

Dr. Kieffer has been with the National Institute of Mental Health since September 1966, when he was named special assistant to the director. He is a diplomate in psychiatry of the American Board of Psychiatry and Neurology, a member of the American Medical Association and the Washington Psychiatric Society, and a fellow of the American Psychiatric Association.