

# Mortality Rates for Rheumatic Fever and Rheumatic Heart Disease, 1940–65

ROBERT W. QUINN, M.D., HOMER A. SPRAGUE, M.P.H., and JULIA P. QUINN, M.S.S.

REPORTS based on mortality statistics for rheumatic fever (RF) and rheumatic heart disease (RHD) within this country have indicated a declining rate over the past four decades (1, 2). The accuracy of data based on cause-of-death statements on death certificates has been a matter of considerable speculation but relatively little investigation. Some inquiries into the accuracy of medical certification have been limited to autopsy findings, while others have been based on supplementary clinical reports from hospital charts (3) and attending physicians' records. This study was designed to collect and evaluate all existing diagnostic evidence from autopsies and clinical sources which might support or reveal inaccuracies in the medical certifications of death due to RF or RHD during the two and a half decades before 1966 in Nashville, Tenn.

Since the influence of certain epidemiologic factors such as race, sex, age, and socioeconomic status on rheumatic heart disease mortality has been the subject of conjecture and study, such information was tabulated and analyzed for both reported and verified deaths due to RF and RHD.

## Method

All deaths attributed to rheumatic fever and rheumatic heart disease from 1940 through 1965 in Nashville and Davidson County were selected for study. With the cooperation of the Division of Vital Statistics and Statistical Serv-

ices of the Tennessee Department of Public Health, the necessary information was recorded directly from each of the selected certificates.

For the first 9 years, 1940 through 1948, causes of death were classified according to the fifth revision of the International Statistical Classification of Diseases, Injuries, and Causes of Death, issued in 1938. Categories designating RF were 58, 58(a), (c), (d), (e), and (f), chronic RHD 90(a), and chronic rheumatic pericarditis 92(b), (c), 93(c), and 95(b). The sixth revision, adopted in 1948, was in use in Tennessee from 1949 until 1958 when the seventh revision was put into use. Changes between the fifth and sixth revisions were marked, those between the sixth and seventh minimal. In the fifth revision, chronic rheumatic heart disease took precedence over rheumatic fever, whereas in the sixth revision, deaths were assigned to RF if reported as the underlying cause of chronic RHD. However, the rheumatic fever category included only deaths in which rheumatic fever was present or active at the time of death. Therefore, total numbers assigned either to RF or RHD were not affected, since all deaths from these causes were to be

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*Dr. Quinn is professor and chairman of the department of preventive medicine and public health, Vanderbilt University School of Medicine, Nashville, Tenn. Mr. Sprague is an instructor in biostatistics in the department's division of biostatistics. Mrs. Quinn served on this project as a special research assistant.*

found in one or the other category. Classifications used from the sixth revision were rheumatic fever 400-402 and chronic rheumatic heart disease 410-416.

Each death certificate within the selected categories for RF and RHD was scrutinized carefully for additional clinical or pathological data, for information necessary to locate attending physicians or hospital reports, and for home addresses at time of death to aid in classification of the deceased person by socioeconomic group. After comprehensive evaluation of all available hospital charts, autopsy reports, and physicians' office records by R.W.Q., using the diagnostic criteria of the New York Heart Association (4), each cause of death was either verified or reclassified. In the absence of supplementary records, the diagnosis on the certificate was accepted at face value unless there were obvious errors in classification. For example, knowledge of the natural history of rheumatic fever argues against the possibility that the cause of death in the eighth decade of life would be acute rheumatic endocarditis, a diagnosis which was recorded on several death certificates. Accuracy of RHD or RF listed under contributing or other conditions was evaluated in an effort to discover any misclassified cases in which rheumatic heart disease actually had been the primary cause of death.

Following a review of all cases and pertinent supplementary information, the recorded causes of deaths were either verified or reclassified according to the criteria listed on page 1093. These criteria, used by the reviewer to evaluate the diagnosis on the death certificate, were adapted from Moriyama's (5) study of ante mortem diagnoses but were modified to apply more specifically to the problems associated with the RF and RHD categories. All deaths classified under criteria I and IV.1. were considered solidly established cases of RF and RHD; those classified under II, III, and IV.2. were in doubt or probably wrong diagnoses.

Using the methods recommended by Serfling and Sherman (6), all deaths were assigned to upper, middle, or lower socioeconomic areas. These socioeconomic areas were composed of census tracts graded as similar according to soundness of the housing units, number of persons per room, and education of the head of the

household. The top 20 percent were assigned to the upper socioeconomic group, the lowest 20 percent to the lower, and the remainder to the middle socioeconomic group.

The data were analyzed separately for three time periods, 1940-45, 1946-55, and 1956-65. There were few Negroes in the upper socioeconomic groups in any period. The lower socioeconomic group was approximately half Negro during the study years.

The rates were recorded by race, sex, age group, and socioeconomic class for each period. Census data for 1940, 1950, and 1960 were used as population data for the three periods.

Statistical analyses were done on the data in table 1. The table shows rates by race, sex, and socioeconomic class for all reported deaths, verified deaths, and unverified deaths if the dead person's address was within a census-traced area of Nashville or Davidson County. Only the deaths of persons who could be assigned to a specific census tract were analyzed statistically. Specifically, the data were examined to determine if differences existed over time, between sexes, and between races. Crude rates were used to test differences since numbers in some cells became too small to age-adjust the verified and unverified categories.

To test the differences among the three periods, the rate for each particular race and sex combination for the first period was compared with that of the second and that of the second with that of third. To test differences in rates for the sexes, the rates for males and females were compared within each time and race combination. Similarly, race differences were compared for each time and sex combination. Consequently, a great deal of multiple testing was done. Objections to this procedure may be overcome if a number of significant differences are found in the same direction; that is, if a pattern of significance develops.

The socioeconomic characteristics were tested for significant differences only for the white population since there were few Negroes in the upper socioeconomic areas, and it was thought that most Negro homes which were classified middle class were merely located in such a census tract and would not, in reality, meet middle class criteria. This opinion concurs with that of Negro sociologists in Nashville. The socioeco-

nomie variable was examined only in terms of trends because numbers in the unverified category became too small in the later periods to test even crude rates.

## Results

The total number of reported deaths per year due to RF and RHD along with the verified number of such deaths is shown in figure 1. The

first year in which substantially more than half of the deaths were verified as correct diagnoses was 1948, the year that the sixth revision of the International Statistical Classification of Diseases was adopted. However, the sixth revision was not used in Tennessee until 1949. From 1948 on, the percent of all reported deaths which was verified increased gradually. The percent of deaths which could be verified increased from

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## Criteria for Verification or Rejection of RF or RHD as the Recorded Cause of Death

### I. Most probable diagnosis

1. Most probable diagnosis from hospital chart, autopsy, or physicians' office records
2. Most probable diagnosis based on cause registration on death certificate, age, and reporting source
3. Rheumatic heart disease correct but should not have been listed as primary cause
4. Rheumatic heart disease correct but should have been listed as active rheumatic heart disease
5. Rheumatic heart disease correct but should not have been listed as active
6. Rheumatic heart disease and myocardial infarction concomitantly

### II. Another diagnosis as probable based on hospital chart, autopsy, or physicians' records

1. Some other diagnosis as probable
2. Disease of the mitral valve not specified as rheumatic but classified rheumatic
3. Aortic stenosis called rheumatic but no history of rheumatic fever and no pathological evidence of rheumatic heart disease at autopsy
4. No way of telling whether right or wrong because of inadequate information—no records available
5. Myocarditis not specified rheumatic but classified rheumatic
6. Chronic valvular heart disease not specified as rheumatic but classified rheumatic

### III. Another diagnosis more probable based on hospital chart, autopsy, or physicians' records

1. Another diagnosis more probable and rheumatic heart disease most likely wrong
2. Recorded primary cause wrong based on autopsy findings
3. Recorded primary cause wrong based on hospital record
4. Mitral insufficiency or mitral regurgitation not specified as rheumatic in origin but classified rheumatic
5. Pericarditis not stated as rheumatic but classified rheumatic
6. Clinical diagnosis rheumatic heart disease, but autopsy showed no rheumatic heart disease
7. Chronic articular rheumatism and no evidence of rheumatic heart disease but classified as rheumatic heart disease

### IV. Rheumatic heart disease or rheumatic fever listed under contributing or other conditions

1. Rheumatic fever or rheumatic heart disease correct as listed under contributing or other conditions
  - a. Rheumatic heart disease correct but should have been listed as the primary cause
  - b. Rheumatic heart disease or rheumatic fever correct but should have been classified active
  - c. Myocardial infarct or coronary occlusion and rheumatic heart disease
2. Rheumatic heart disease probably wrong and should not have been listed as rheumatic on death certificate
  - a. Recorded contributory cause wrong based on autopsy
  - b. Recorded contributory cause wrong based on hospital record
  - c. Mitral insufficiency, mitral regurgitation, or myocarditis not specified rheumatic in origin but classified rheumatic
  - d. Pericarditis not rheumatic but classified rheumatic
  - e. Disease of the mitral valve not specified rheumatic but classified rheumatic
  - f. Aortic stenosis classified as rheumatic but no history of rheumatic fever and no pathological evidence

38.72 percent in 1940-45 to 61.72 percent in 1946-55 to 78.25 percent in 1956-65.

The data for all reported deaths (table 1) indicate that only the comparison of white females in 1940-45 with the same group in 1946-55 did not show a significant decrease ( $P=.05$ ); however, the change was downward. Comparisons between the sexes showed mixed directions

and none were significant. All six possible race comparisons showed Negroes to have significantly higher rates than whites.

As previously noted, socioeconomic investigations were limited to a search for trends in the white population. Rates for the three socioeconomic classes changed in a direction inverse to class in 10 of the 12 possible comparisons. The

**Table 1. Crude death rates per 100,000 for all deaths caused by rheumatic fever and rheumatic heart disease reported on death certificates, for verified deaths, and for unverified deaths, by race, sex, and socioeconomic class of the deceased and by time period**

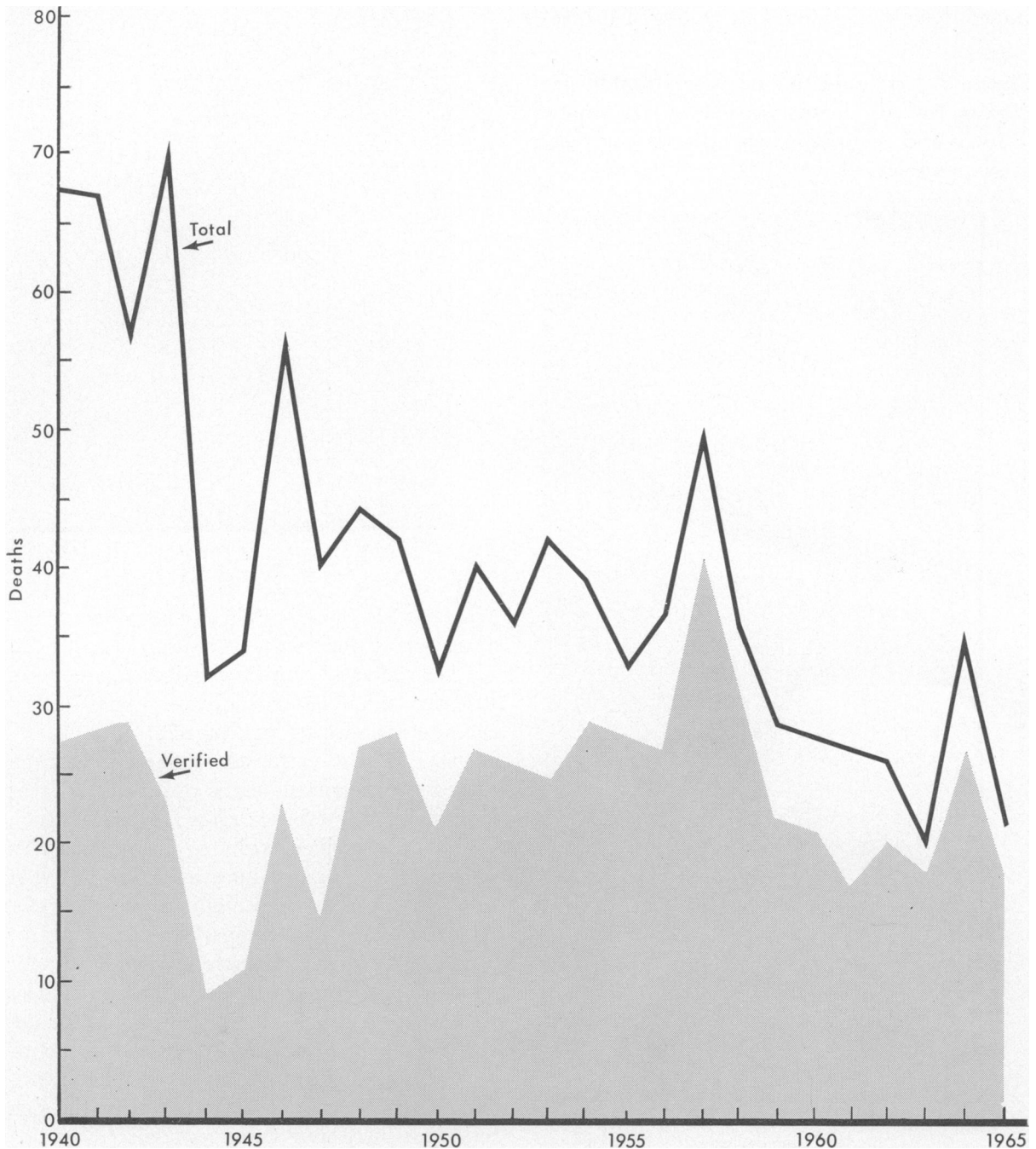
Period and socioeconomic class	White male		White female		Negro male		Negro female	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
All reported deaths	253		275		139		161	
1940-45	64	19.01	56	14.59	59	45.97	51	32.77
Upper	10	11.03	17	14.80	1	( <sup>1</sup> )	0	
Middle	34	18.05	28	13.52	46	52.87	33	32.16
Lower	20	33.82	11	17.79	12	30.19	18	37.86
1946-55	94	9.38	113	10.35	45	16.23	65	20.20
Upper	20	8.31	29	10.14	0		0	
Middle	60	9.38	70	9.91	18	13.84	34	23.17
Lower	14	13.79	14	13.15	27	18.68	31	18.09
1956-65	95	6.12	106	6.33	35	9.68	45	11.06
Upper	14	3.85	21	5.16	0		1	( <sup>1</sup> )
Middle	62	6.24	67	6.29	18	9.90	25	12.34
Lower	19	9.67	18	8.86	17	9.42	19	9.51
Verified deaths	177		214		51		64	
1940-45	33	9.80	30	7.82	11	8.57	14	9.00
Upper	7	7.72	9	7.83	0		0	
Middle	19	10.08	18	8.69	7	8.30	9	8.77
Lower	7	11.84	3	4.84	4	10.07	5	10.52
1946-55	60	6.11	86	7.88	21	7.57	25	7.77
Upper	9	3.74	25	8.74	0		0	
Middle	44	6.88	54	7.65	7	5.38	10	6.32
Lower	7	6.89	7	6.58	14	9.69	15	8.76
1956-65	84	5.41	98	5.85	19	5.25	25	6.14
Upper	12	3.30	20	4.92	0		0	
Middle	56	5.64	61	5.73	10	5.50	17	8.40
Lower	16	8.15	17	8.37	9	4.49	8	4.00
Unverified deaths	76		61		88		97	
1940-45	31	9.20	26	6.77	48	37.40	37	23.77
Upper	3	3.31	8	6.97	1	( <sup>1</sup> )	0	
Middle	15	7.97	10	4.83	39	44.57	24	23.39
Lower	13	21.98	8	12.95	8	20.12	13	27.34
1946-55	34	3.47	27	2.47	24	8.66	40	12.43
Upper	11	4.57	4	1.40	0		0	
Middle	16	2.50	16	2.26	11	8.46	24	16.85
Lower	7	6.90	7	6.57	13	8.99	16	9.33
1956-65	11	.71	8	.48	16	4.42	20	4.92
Upper	2	.55	1	.24	0		1	( <sup>1</sup> )
Middle	6	.60	6	.56	8	4.40	8	3.94
Lower	3	1.52	1	.49	8	4.93	11	5.51

<sup>1</sup> Rate not shown for single death among Negroes in the upper socioeconomic class.

two exceptions to this trend were upper and middle class white females for the first and second periods. These results are shown to be significant by a sign test ( $P=.04$ ). Thus the data for all reported deaths show significant decreases over time, by race, and by socioeconomic class, but not by sex.

In relation to the data for verified deaths (table 1), all of the significant differences found for reported deaths have disappeared. In fact, none of the comparisons for race, sex, or time are significantly different. Four of the 12 socioeconomic comparisons are not in a direction inverse to class. However, seven of the eight com-

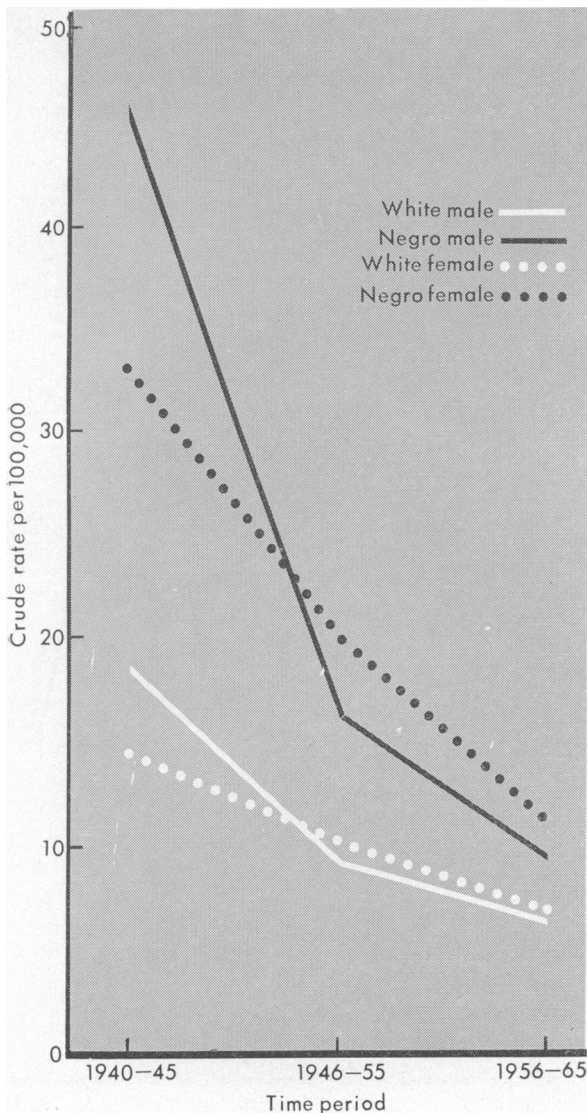
**Figure 1. Deaths caused by rheumatic fever and rheumatic heart disease 1940-65, Nashville and Davidson County, Tenn.**



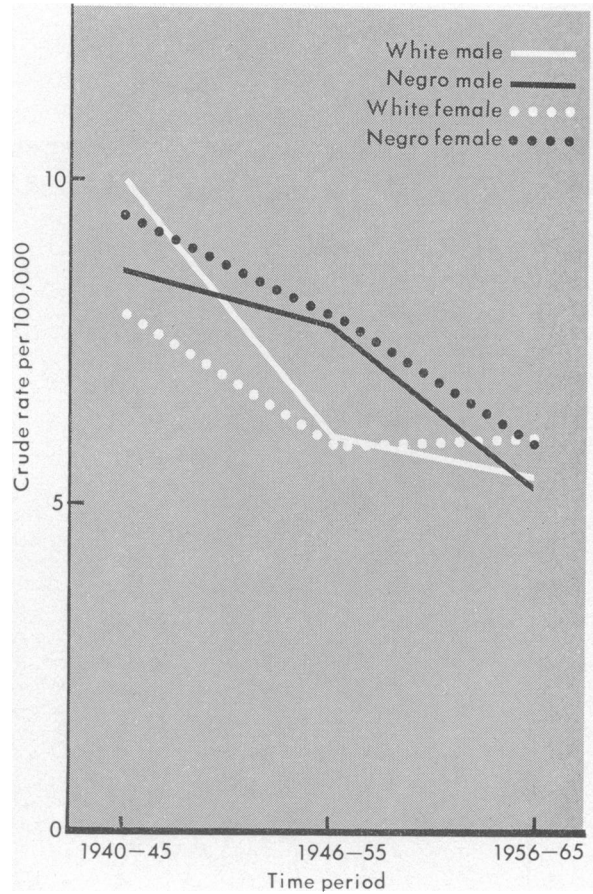
parisons over time did decrease. The data on verified deaths did not support the conclusion that there had been a significant decrease in death rates, although there was a slight downward trend.

Combining the rates for all three socioeconomic classes for all reported deaths (fig. 2) revealed marked decreases in crude death rates per 100,000 from 1940 through 1965, especially for Negroes. Crude death rates for all reported deaths due to RF and RHD declined threefold among female and fourfold among male Ne-

**Figure 2. Crude death rates per 100,000 per year for all deaths caused by rheumatic fever and rheumatic heart disease, by race, sex, and period**



**Figure 3. Death rates per 100,000 per year for verified deaths caused by rheumatic fever and rheumatic heart disease, by race, sex, and period**



groes but less than twofold among whites. Combined rates for verified deaths (fig. 3), in marked contrast, showed very little change from 1940 through 1965 and only very small differences between whites and Negroes.

One explanation for the difference between rates for all reported deaths and verified deaths is pinpointed in table 1; rates for deaths which could not be verified exhibited the same pattern as those for all reported deaths. All eight tested time comparisons were significantly different. Also in all six racial comparisons, the rates for Negroes were significantly higher than for whites, but there were no statistical differences between the rates for sexes. The results for unverified deaths of whites for socioeconomic effect were similar to those observed for the verified deaths, but were not significant by the sign test since there were three reversals (table 1).

Age-specific rates for persons 0-29 years and 30 and older by time period, race, and sex are shown in table 2 for all reported deaths and in figure 4 for verified deaths. The table indicates that most unverified deaths occurring in the older two age groups decreased with time. Age-specific death rates per 100,000 for ages 0-29 inclusive showed a decline from an average of 6.56 in 1940-45 to 1.60 in 1946-55, declining even further to 0.09 in 1956-65. Among Negro females there was a slight increase from 1.92 per 100,000 to 3.26 per 100,000 in 1956-65. For the entire 26 years the reported death rates per 100,000 for RF and RHD were 11.59 for whites and 13.79 for Negroes. There was no significant change in verified age-specific rates for ages 30 and older by time period, sex, or race. Overall rates per 100,000 for both races and sexes combined, changed from 11.10 in 1940-45 to 12.51

in 1946-55 to 10.23 in 1956-65. The combined death rates per 100,000 for verified deaths for both sexes for whites from 1940 through 1965 was 10.88; for Negroes, both sexes, 11.49.

In reference to the verified deaths, the death rates in the 0-29 age group were much lower than in the older age groups and lower in the 1946-55 and 1956-65 periods than in the 1940-45 span. Death rates in the 0-29 age group diminished strikingly in the two later periods with the exception of Negro females, for whom the rate increased during the last 10 years. Age-specific death rates for all decedents in the three older age groups 30-49, 50-69, and 70 or older decreased markedly during the three periods, but verified age-specific death rates for the three oldest age groups did not change greatly for either sex (table 2).

Age-adjusted rates for the entire 26 years

**Table 2. Combined age-specific death rates per 100,000 for all deaths caused by rheumatic fever and rheumatic heart disease reported on death certificates and for verified deaths, by race and sex of the deceased and by time period**

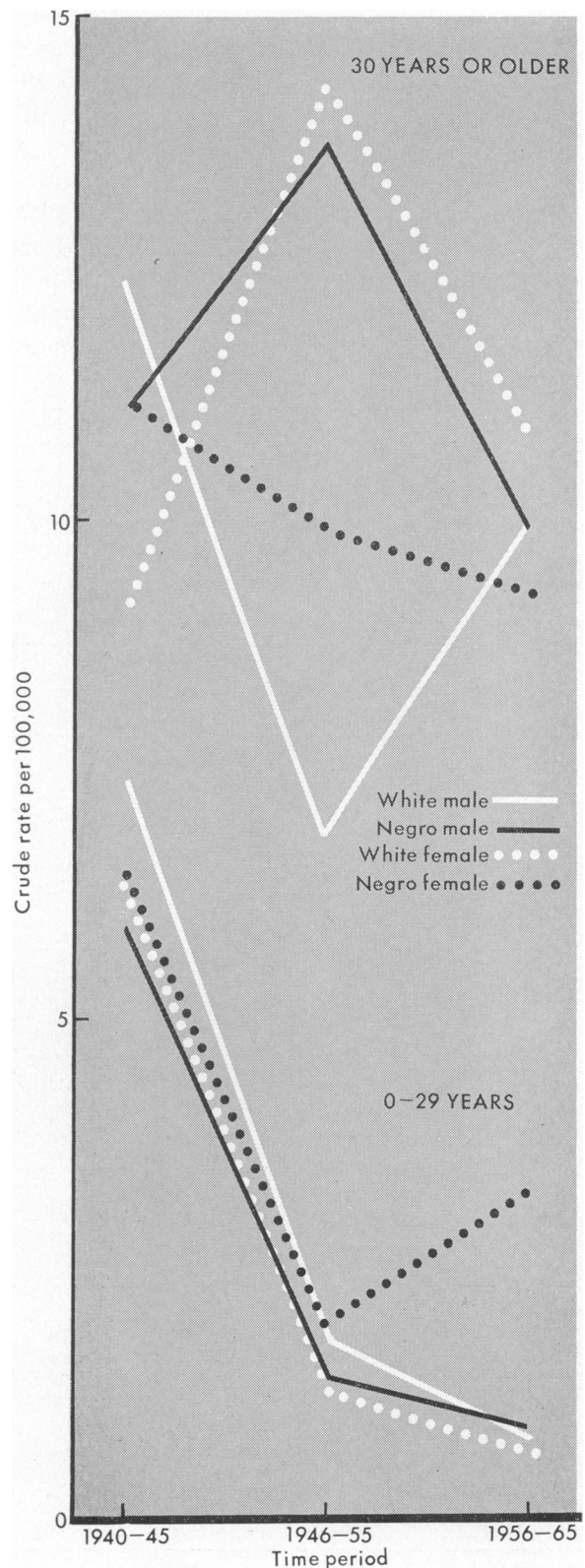
Age group (years) and period	White male		White female		Negro male		Negro female	
	Number	Rate	Number	Rate	Number	Rate	Number	Rate
All reported deaths.....	253		275		139		161	
1940-45								
0-29.....	14	7.98	12	6.25	7	10.67	5	6.48
30-49.....	11	11.34	14	12.40	12	30.40	10	19.35
50-69.....	21	40.05	11	17.41	30	154.71	16	72.42
70 or older.....	18	154.32	19	120.04	10	257.60	20	420.88
1946-55								
0-29.....	13	2.54	7	1.29	2	1.44	4	2.56
30-49.....	27	9.46	33	10.51	16	19.36	16	15.90
50-69.....	32	21.79	45	25.04	18	40.20	24	46.20
70 or older.....	22	57.16	28	49.08	9	79.86	21	164.06
1956-65								
0-29.....	6	.73	6	.72	3	1.00	7	3.26
30-49.....	27	6.36	30	6.65	9	10.29	12	11.71
50-69.....	50	20.65	47	16.41	17	28.75	12	17.04
70 or older.....	12	19.02	23	22.89	7	46.35	14	72.58
Verified deaths.....	177		214		51		64	
1940-45								
0-29.....	13	7.41	12	6.25	4	6.10	5	6.48
30-49.....	10	10.31	13	11.53	3	7.60	6	11.61
50-69.....	7	13.35	3	4.75	4	20.63	3	13.58
70 or older.....	3	25.72	2	12.64	0		0	
1946-55								
0-29.....	9	1.76	7	1.29	2	1.44	3	1.92
30-49.....	23	8.06	30	9.55	13	15.73	8	7.95
50-69.....	19	12.94	36	20.03	4	8.93	10	19.25
70 or older.....	9	23.38	13	22.79	2	17.75	4	31.25
1956-65								
0-29.....	6	.73	6	.72	3	1.00	7	3.26
30-49.....	26	6.12	30	6.65	7	8.00	8	7.81
50-69.....	44	18.17	42	14.66	8	13.53	6	8.52
70 or older.....	8	12.68	20	19.90	2	13.24	4	20.74

were in keeping with the generally accepted idea that death rates from RF and RHD are lowest in the upper socioeconomic group. Rates did not differ significantly between middle and lower socioeconomic classes for either Negroes or whites.

Of the 828 deaths attributed by the statistical services of the Tennessee Department of Public Health to rheumatic fever or chronic rheumatic heart disease from 1940 through 1965, only 506 (61.1 percent) were verified through supplementary information. The remaining certifications (38.9 percent) were classified "most likely wrong," "another diagnosis was as probable," or "another diagnosis was more probable." Very few causes of death were designated "doubtful" if it was not possible to tell whether the recorded cause was correct because of inadequate information. There were seven "doubtfuls" during 1940-45, five in 1946-55, and four in 1956-65.

Almost all of the deaths in category III.1.—another diagnosis more probable and rheumatic heart disease most likely wrong—were of persons whose deaths occurred in the seventh, eighth, or ninth decades. There were 25 such deaths in 1940-45, 31 in the 1946-55 interval, and 20 in 1956-65. Overall, there was a marked diminution in the III.1. category among whites but not among Negroes. The reason for this marked decrease was that after 1956 all death certificates on which "mitral insufficiency" or "mitral regurgitation" or "mitral incompetency" appeared were classified as rheumatic heart disease only if the defect was specified as "rheumatic." Before 1956 when "rheumatic" was not specified, supplementary records substantiated the "mitral insufficiency" diagnosis, but they did not substantiate its cause as being rheumatic valvular disease. After reviewing all available information, it appeared that these persons very well may have had mitral insufficiency but not due to rheumatic valvular disease. More likely the insufficiency was relative, caused by a dilated mitral annulus associated with arteriosclerotic or hypertensive heart disease and cardiac enlargement. Rheumatic heart disease or rheumatic fever listed under contributing or other conditions (IV.2.) was not a reason for reclassification in 1940-45. Sixteen contributing or other conditions were consid-

**Figure 4. Age-specific death rates per 100,000 per year for verified deaths caused by rheumatic fever and rheumatic heart disease**





ered to be wrong in 1946-55 and four in 1956-65 because an incorrect diagnosis was recorded on the death certificate.

The total number of deaths which could not be verified as rheumatic and were classified as II.2. (another diagnosis as probable), III. (another diagnosis more probable), or IV.2. (rheumatic heart disease or rheumatic fever listed under "contributing" or "other" conditions probably wrong and should not have been listed as rheumatic) decreased from 142 in 1940-45 to 125 in 1946-55 to 55 in 1956-65. During each period the number of causes of death of Negroes not verified as rheumatic and subsequently placed in categories II., III., or IV.2. was relatively much larger than the number of causes for white persons.

In order to be sure that some recent dramatic changes in death rates were not being missed after the study had been completed in 1965, the Bulletin of Vital Statistics of the Tennessee Department of Public Health was consulted. The total number of reported deaths attributed to rheumatic fever and chronic rheumatic heart disease was 29 in 1966 and 23 in 1967, the last year for which complete statistics were available. These numbers compare with a low of 15 and a high of 30 during the period 1960-65 and, although these certificates were not analyzed as described under "Methods," obviously no significant changes occurred in the reported deaths since 1960.

An interesting examination of one physician's reporting illustrates the frequency with which errors may be incorporated into mortality statistics. The physician recorded the cause of death as acute endocarditis, usually with chronic rheumatism a contributing cause, 30 times between 1940 and 1952. These were classified by the division of vital statistics and statistical services as 92(c) (disease of other and unspecified valves specified as rheumatic). The International List of Causes of Death (fifth revision) states that 92(c) includes conditions in 92(a), (d), or (e) when specified as "rheumatic" or associated with rheumatism. These rules of classification were followed by the division. All the death certificates listed essentially the same cause and all deaths were of persons 70 years of age or older. Chronic rheumatism undoubtedly referred to chronic arthritis and not rheumatic

fever. However, by following the rules of International List of Causes of Death, since the word "rheumatism" appeared as a contributing cause, classifications made in good faith now appear questionable through no fault of the statistical services.

From 1952 on, the same physician changed the recorded cause of death to acute rheumatic endocarditis and hypertension. He filed 32 certificates between 1952 and 1963 with these recorded causes of death, occasionally with general arteriosclerosis as a contributing cause. Twenty-seven were classified by the statistical services as 410, disease of the mitral valve (chronic rheumatic heart disease), plus 444, essential benign hypertension without mention of heart disease. Five filed after 1959 were classified as 401.1, active rheumatic endocarditis plus 444, essential benign hypertension. It would appear that an error had been made by the physician in listing the cause of death of persons in their seventies or older as acute rheumatic endocarditis. These errors then appeared in published vital statistics, again through no fault of the statistical services.

#### Discussion

This study attempted to assess the accuracy of diagnostic information on death certificates for RF and RHD over the period 1940-65 in Nashville and Davidson County, Tenn. Additional information collected and carefully evaluated from hospital charts, physicians' records, and autopsy reports confirmed 61.1 percent of the cause-of-death statements; the remaining were classified as questionable or incorrect. These findings were similar to those of Moriyama (5) who found that only 58 percent of the diagnoses for rheumatic fever and rheumatic heart disease were solidly established following an internist's evaluation of diagnostic information.

As opposed to the uncorrected rates, the verified RF and RHD rates (that is, those based on verified causes of death) showed only a slight decrease over the 26-year period. This significant finding refutes the general impression that rheumatic heart disease mortality has been diminishing markedly. Improvement in accuracy of diagnoses, augmented by clarifying changes after 1948 in the categories assigned to RF and RHD in the sixth revision of the International

List of Diseases and Causes of Death, probably were important factors in minimizing the changes in rates for verified deaths.

The decline in age-specific death rates for the 0-29 age group, as opposed to the relatively stable death rates for RHD for those 30 years or older, supports Paul's opinion (1) that there is a much greater percentage of old (inactive) cases of rheumatic heart disease in people over 30. The age-specific death rates reported in Nashville for ages 30 and over were in the same general range as those in New Haven, Conn., during the period 1920-48 for ages 25 and older, when they ranged from a low of nine to a high of 22 per 100,000 (7). The age-specific death rates per 100,000 for ages 2 through 24 in New Haven showed a marked downward trend in the 15 years before 1948; the age-specific death rates for those 0-29 in Nashville showed a decline during the period from 1940-55, but not in later years. The similarity of trends in these two cities may be attributed to the careful verification of causes of reported deaths in each of these studies.

A lower rheumatic heart disease death rate for the upper socioeconomic group is in keeping with well-documented evidence that rheumatic heart disease deaths occur in inverse ratio to socioeconomic status. This preponderance of RHD deaths in the lower socioeconomic groups was also a finding in the New Haven study (7).

Wolff (8) noted that RHD mortality has been consistently higher among Negro than white children and adolescents, but in the Nashville study, this differential was not found. However, mortality for Negroes aged 30 or older, which was much higher than for whites, diminished after verification, suggesting particularly inaccurate recording of deaths for Negro adults. It would be helpful if there were some review mechanism by which death certificates could be evaluated for accuracy of the physician's diagnosis before becoming part of the official mortality statistics. Health departments might in this way prevent many errors in diagnoses and certainly improve the quality and accuracy of vital statistics.

#### Summary

This study, designed to assess the accuracy of reported causes of death attributed to rheumatic fever (RF) and rheumatic heart disease

(RHD), revealed certain inaccuracies on death certificates which led to errors in calculating death rates for RF and RHD. A total of 828 certificates for deaths due to RF and RHD in Nashville and Davidson County from 1940-65 were examined.

Inaccuracies in diagnoses recorded on death certificates by physicians were largely responsible for the high crude death rates which over the study period declined threefold among female and fourfold among male Negroes but less than twofold among whites. However, after verification of cause-of-death and removal of deaths with causes most likely not rheumatic fever or rheumatic heart disease, all significant differences for the rates between the two races disappeared, and there were only slight overall downward rate trends from 1940 through 1965.

Age-adjusted rates were similar for the entire 26 years for males and females, Negroes and whites, but were lowest in the upper socioeconomic group among whites.

Verified death rates for Negro and white women aged 30 or older increased from 1940 to 1955 and declined thereafter, but the change was not statistically significant. Verified rates for Negro and white males declined slightly from 1940 through 1965; from 1940 through 1965 death rates were 11.59 per 100,000 for whites and 13.79 per 100,000 for Negroes.

Age-specific death rates per 100,000 for ages 0-29 years for verified deaths showed a decline from an average of 6.56 in 1940-45 to 1.60 in 1946-55, declining even further to 0.09 in 1956-65; among Negro females there was a slight increase from 1.92 to 3.26.

Age-specific death rates for verified causes in the three older age groups 30-49, 50-69, and 70 or older did not change significantly during any of the three time periods for either whites or Negroes.

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#### **Tearsheet Requests**

Robert W. Quinn, M.D., Department of Preventive Medicine and Public Health, Vanderbilt University School of Medicine, Nashville, Tenn. 37203

## **Disposable Artificial Kidney**

A disposable, presterilized, artificial kidney may soon replace those types that take many hours to sterilize prior to use in home dialysis. The new "envelope kidney," which already has successfully passed extensive clinical trials, will make it possible to reduce blood-cleansing time.

The envelope kidney was developed by Dr. Yukihiko Nosé and associates of the Cleveland Clinic Foundation with the aid of a contract from the Artificial Kidney Program, National Institute of Arthritis and Metabolic Diseases. It is essentially a sealed sandwich of Cuprophan PT-150 membranes (a special type of cellophane) supported externally by a fiber screen. Blood ports for attachment to the patient's circulation are included within each sealed package.

The new envelope kidney is designed for use with the conventional Kiil artificial kidney machine. In dialysis, blood flows over a cellophane membrane and impurities pass from the blood through small pores in the membrane into a dialysis solution being circulated against the membrane by the apparatus. Most patients require two or three treatments a week for periods of 6 to 14 hours; therefore, any preparation time saved becomes a great advantage.

Because the membranes of the envelope kidney are presterilized with ethylene oxide gas, the patient or his family no longer must begin assembling the artificial kidney 8 to 10 hours before dialysis to allow for sterilization with a

formaldehyde solution. With the new envelope kidney, assembly may begin only an hour before dialysis, and can be completed by one person. This is of significant value in using dialysis in the home, a treatment method which is considerably less costly than extremely expensive hospital dialysis.

The cost of a pair of envelopes, presterilized and ready for use in a double layer Kiil artificial kidney is approximately \$6, compared with \$17 for a prepackaged coil-type dialysis canister, the only other presterilized dialysis unit commercially available at the present time. Preliminary clinical results from trials of the envelope kidney (more than 200 dialyses with 14 patients) have been excellent, with no adverse reactions and with blood purification performance as good as or better than with standard cellophane membranes in the Kiil apparatus.

In the United States today an estimated 55,000 persons die each year as a result of irreversible kidney failure. To many of these the artificial kidney is a permanent life-saving treatment. Kidney transplantation, too, depends on the use of artificial kidneys for its success. Transplant candidates must be maintained by dialysis until a suitable donor kidney can be found for them. Dialysis also is used to support these patients postoperatively, and is essential for saving their lives if the transplanted kidney is eventually rejected by the body.

## Program Notes

### **Clinic for Teenagers**

The Health Services Administration of the District of Columbia has opened a new clinic in the Georgetown area of the District where teenagers who feel "up tight, turned off, hung up, bugged, or freaked out" can find a sympathetic ear.

Youngsters aged 13 to 18 may visit the clinic any Thursday from 3 to 5 p.m. or Fridays from 12 to 2 p.m. No appointment is necessary. Discussions are held in strict confidence, and there are no strings attached.—*D.C. Health News and Notes*, September 1970.

### **Chain Stores Push Immunization**

A mass immunization drive against German measles (rubella) was recently publicized over an intercom system in stores of the Schwegmann Brothers Giant Super Markets chain in the New Orleans, La., area. The owner of the chain, John G. Schwegmann, Jr., agreed to broadcast spot announcements about the immunization program as a public service.

During the last 2 weeks of August, therefore, three 30-second appeals to shoppers to get their children immunized were incorporated into a taped program of soft music and soft-sell advertising which the chain broadcasts throughout the day from indoor and outdoor speakers at its eight stores. An estimated 1 million shoppers heard the appeals.

### **Tips on Retirement**

The Louisiana Association for Mental Health has prepared two sets of retirement materials, one for men and one for women. The one for women is the only material known to have been specifically prepared for female retirees, according to Dr. Loyd W. Rowland, director of education and research for the association.

Both series consist of informal, il-

lustrated letters from Dr. and Mrs. Rowland to prospective retirees. Each series is supposed to be made available at regularly spaced intervals from the time a person's plan calls for formal preparation for retirement to the date he actually retires.

Titles of the letters in the series for women include "Anticipating Your Retirement," "Money, Money, Not Everywhere," "Housing—Single or Married," "Making and Keeping Friends," and "Some Ideals to Consider in Retirement."

The persons "who should have a special interest in this series" are the directors of employee services corporations, of municipal, State, and national civil service departments, of religious denominations (the clergy and teachers), of labor unions, of professional organizations, and of many other groups. Costs of the sets vary according to the quantity ordered.

### **Self-Tests for Cervical Cancer**

A total of 428 women voluntarily tested themselves in a mass cervical cancer screening program conducted in January 1970 by the San Fernando Valley District of the Los Angeles County Department of Health. The tests were performed with Davis-type Prevette Papanicolaou kits. National Cancer Detection Centers, Inc., of Hollywood, Calif., participated in the screening, which was part of a multiphasic county program. Mobile vans for the testing were parked in 10 different outlying locations of the San Fernando Valley on 10 consecutive days.

Forty-two of the 428 women tested had non-negative cytological reports. The physicians of record of these 42 were written several letters, phoned, and otherwise urged to follow up these patients. Responses were thereby elicited from 32 of the phy-

sicians, 21 of whom provided usable data. The repeat smears for 12 of the 17 women who were retested by their physicians were class I; those of the other five were class II. Biopsies on four other women revealed chronic cervicitis in three women and carcinoma, probably endometrial, in the fourth woman.

### **Leukemia Cure?**

Research scientists are enthusiastic over the results of a 5-year study of the treatment of leukemia. One has stated: "We are just beginning to use the word 'cure.' Nobody dared to use it until last year . . ."

About 10 years ago scientists discovered that potent antileukemia drugs always killed a certain portion of leukemia cells. When different drugs were used in combination, a high proportion of the cells were destroyed and lives could be prolonged.

But the search is on to find a way of killing 100 percent of the leukemia cells. Even now victims who "should have died" after a few months are well after 5 years, and in some cases, after 10.—*AMA news release*, based on article in *Today's Health*, October 1970.

### **Help for Harlem Addicts**

The municipal Harlem Hospital Center, New York City, has established a 100-bed drug detoxification unit and agreed to provide medical services for a community-operated rehabilitation center for addicts. The center acted in response to community demands dramatized late in July when some 300 addicts seeking medical treatment took over two unused hospital wards. Since then, the hospital has provided food, bedding, and medical examinations to the addicts. It has also admitted, to other sections of the hospital, those found to have medical problems besides drug addiction.—*Hospital Week*, Aug. 21, 1970.

*Items for this page: Health departments, health agencies, and others are invited to share their program successes with others by contributing items for brief mention on this page. Flag them for "Program Notes" and address as indicated in masthead.*