Associations of Cardiovascular Mortality With Weather in Memphis, Tennessee

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PREVIOUS investigations in temperate climates have usually shown higher cardiovascular (CV) mortality in winter months than in summer months. This is true of recent studies by Rose (*1*) and Boyd (*2*) in England, Rosenwaike (*3*) in the United States, Baubinene (*4*) in Russia, and Doring and Loddenkemper (*5*) in West Germany. On the other hand, Heyer and associates (*6*) reported increased frequency of acute myocardial infarctions in summer in Dallas, Tex., and Avierinos (*7*) reported similarly for Cairo and for all of Egypt.

In our paper, we report mainly on variations in cardiovascular and other mortality with daily average temperature in Memphis, Tenn., for the 3-year period 1959–61. The aims of the study were to measure any excess in CV mortality related to daily temperatures and other weather indices and to determine, by using data on multiple causes of death, whether any excess in the CV mortality could be linked to respiratory disease.

Materials and Methods

We studied death certificates for all resident deaths occurring in Memphis in the 3-year period 1959–61. (Resident deaths occurring elsewhere were not included.) A single physician coded all causes of death appearing on the certificate according to the Seventh Revision of the International Lists. Using ICD 4-digit codes, up through six causes per certificate were recorded. Coding details are given elsewhere (*8*). The month, day, and year of death were taken from the death certificate.

Meteorologic information for Memphis was obtained from the weather bureau for each day from January 1, 1959, through December 31, 1961. This information included average (midrange), high, and low temperatures, precipitation, average wind speed, fastest wind speed, percent of possible sunshine, barometric pressure at 1200 hours, and relative humidity at 0600 and 1200 hours.

The specific disease categories selected for study were arteriosclerotic heart disease—ASHD (ICD 420), vascular lesions affecting the central nervous system—VL (ICD 330–334), all cardiovascular disease—CV (ICD 330–334, 400–468), malignant neoplasms—MN (ICD 140–205), and diseases of the respiratory system—R (ICD 470–527). Each category was studied in relation to each of the weather variables cited.

Since multiple-cause coding was used, we could tabulate deaths in a number of different ways. Pertinent to our investigation was the presence or absence of another disease, in particular a respiratory disease, along with a car-

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diovascular disease. We listed the possible combinations, maintaining a distinction between underlying and contributory causes.

The tabulating scheme was designed so that a cause of death would be counted only once for a decedent even though it may have been coded more than once. If a cause was coded both as underlying and contributory, the contributory cause was discounted.

The basic statistical index used throughout was the average daily number of deaths for the 3-year period. Justification for use of this index is the assumption of a stable population for the 3 years.

In all, a total of 12,188 deaths from all causes occurred in the 3-year period. The numbers of deaths for the specific disease categories selected were as follows:

Arteriosclerotic heart disease, any mention	2,694
Vascular lesions affecting central nervous system, any mention	2,164
Cardiovascular disease, any mention	6,481
Malignant neoplasms, any mention	2,043
Diseases of respiratory system, any mention	1,350

Results

Data for mortality from arteriosclerotic heart disease classified by average temperature on the day of death appear in table 1; similar data for vascular lesions affecting the central nervous system, cardiovascular disease, diseases of the respiratory system, and malignant neoplasms appear in tables 2–5.

The average daily number of deaths with any mention of arteriosclerotic heart disease was highest for days under 30° F.—3.56 deaths; next highest for 30–39° days—2.70 deaths; thereafter the average number declined slowly (with one exception) to a low of 2.12 deaths for 80–89° days. As illustrated in figure 1, the general pattern is somewhat L-shaped, with the sharp change occurring between the 10–29° days and the 30–39° days.

Strikingly similar patterns are observed for arteriosclerotic heart disease, whether (*a*) alone or in combination with other diseases, (*b*) as the underlying or as a contributory cause of death, or (*c*) in combination with diseases of the respiratory system or with causes other than R.

The average number of deaths per day with vascular lesions of the central nervous system as the sole cause (table 2) reveals no clearcut pattern in relation to temperature. For any mention of VL, however, the same pattern as for arteriosclerotic heart disease emerges. The causes combining with VL which appear to be contributing to the pattern are, contrary to expectation, nonrespiratory diseases. More detailed study indicates that general arteriosclerosis (ICD 450) and hypertensive diseases (ICD 440–447) are mainly responsible, as indi-

Table 1. Average number of deaths per day for arteriosclerotic heart disease (ASHD), alone and in combination with respiratory disease (R) and with non-R causes, by daily average temperature, Memphis, 1959–61

Daily average temperature (degrees F.)	Number of days	Average daily number of deaths					Total deaths [1]
		1	2	3	4	5	
10–29	31	1.81	0.13	1.13	0.10	0.39	3.56
30–39	126	1.28	.07	1.09	.03	.23	2.70
40–49	139	1.28	.08	1.02	.03	.27	2.68
50–59	180	1.29	.12	.68	.03	.28	2.40
60–69	174	1.24	.10	.83	.02	.34	2.53
70–79	262	1.14	.06	.88	.02	.22	2.32
80–89	184	1.07	.08	.76	.03	.18	2.12
Total	1,096	1.22	0.08	0.87	0.03	0.25	2.45

[1] ASHD (ICD 420) was underlying or contributory cause.

KEY:

1=ASHD was sole cause of death.

2=ASHD was underlying cause and R (ICD 470–527) was present.

3=ASHD was underlying cause and cause other than R was present.

4=ASHD was contributory cause and R was present.

5=ASHD was contributory cause and cause other than R was present.

Figure 1. Average daily deaths for arteriosclerotic heart disease, by daily average temperature, Memphis, 1959–61

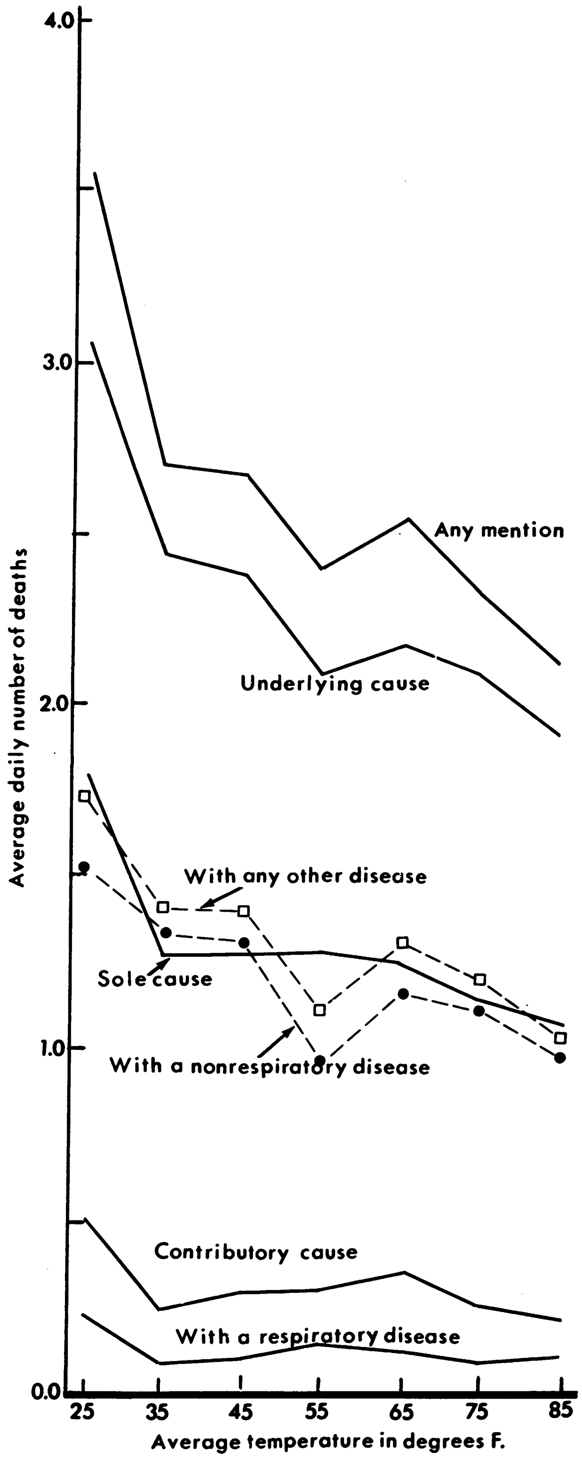
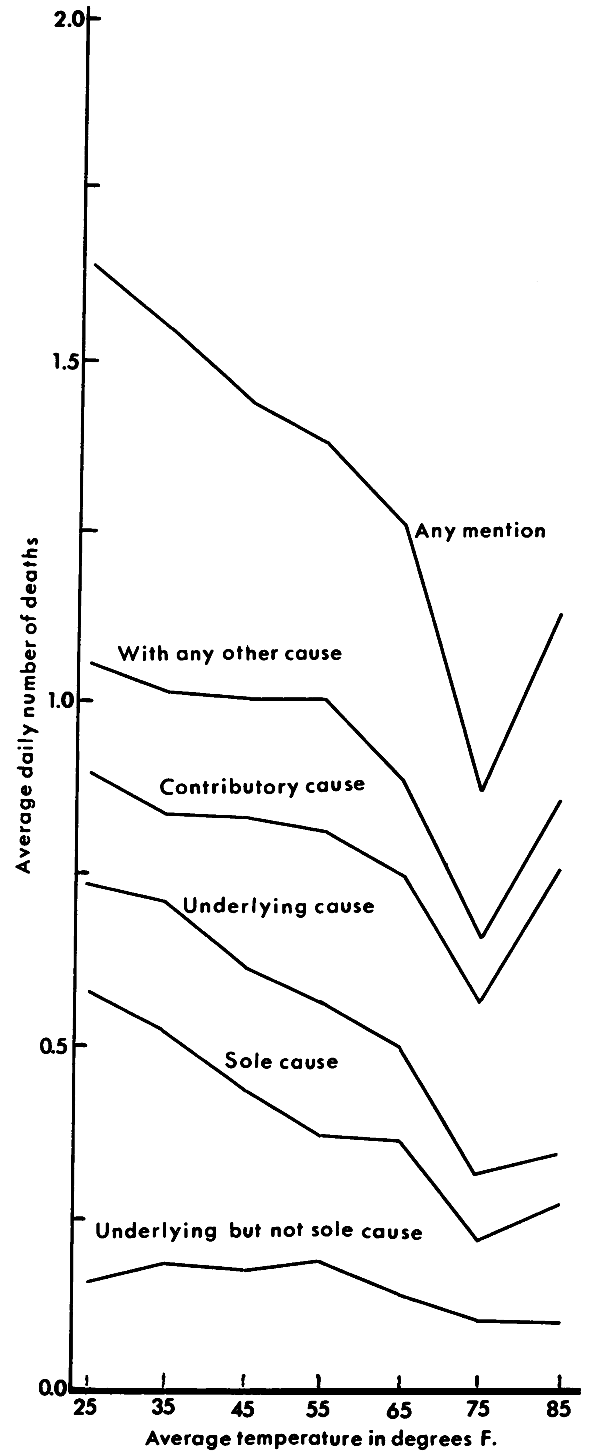


Figure 2. Average daily deaths for respiratory disease categories, by daily average temperature, Memphis, 1959–61



cated by the average number of deaths per day in relation to temperature for VL with arteriosclerosis or hypertensive diseases:

Temperature (degrees F.)	*Average deaths per day*
10–29	1. 23
30–39	1. 03
40–49	1. 00
50–59	1. 02
60–69	. 98
70–79	. 80
80–89	. 68

In table 3, the somewhat L-shaped pattern described earlier for ASHD appears again for cardiovascular disease as the sole cause. Inverse relationships with temperature are also suggested for CV in combination with other diseases, whether respiratory or not. Thus, the observed pattern for cardiovascular diseases considered as an entity is clearly not explicable simply in terms of an association between CV and respiratory diseases in which respiratory diseases are assumed to be the actual cause of the excess mortality occurring in cold weather. Another view of the CV-respiratory disease association with temperature is shown in table 6,

Table 2. Average number of deaths per day for vascular lesions (VL), alone and in combination with respiratory disease (R) and with non-R causes, by daily average temperature, Memphis, 1959–61

Daily average temperature (degrees F.)	Number of days	Average daily number of deaths					Total deaths [1]
		1	2	3	4	5	
10–29	31	0. 58	0. 19	1. 48	0. 00	0. 16	2. 41
30–39	126	. 58	. 15	1. 25	. 01	. 12	2. 11
40–49	139	. 74	. 21	1. 12	. 00	. 10	2. 17
50–59	180	. 69	. 22	1. 17	. 01	. 06	2. 15
60–69	174	. 58	. 15	1. 11	. 03	. 12	1. 99
70–79	262	. 60	. 13	1. 01	. 00	. 06	1. 80
80–89	184	. 61	. 16	. 87	. 00	. 07	1. 71
Total	1, 096	0. 63	0. 17	1. 08	0. 01	0. 09	1. 98

[1] VL (ICD 330–334) was underlying or contributory cause.

KEY:

1=VL was sole cause of death.

2=VL was underlying cause and R (ICD 470–527) was present.

3=VL was underlying cause and cause other than R was present.

4=VL was contributory cause and R was present.

5=VL was contributory cause and cause other than R was present.

Table 3. Average number of deaths per day for cardiovascular diseases (CV), alone and in combination with respiratory (R) and non-R causes, by daily average temperature, Memphis, 1959–61

Daily average temperature (degrees F.)	Number of days	Average daily number of deaths					Total deaths [1]
		1	2	3	4	5	
10–29	31	5. 90	0. 45	0. 84	0. 16	0. 55	7. 90
30–39	126	4. 49	. 36	. 93	. 14	. 69	6. 61
40–49	139	4. 40	. 45	. 83	. 13	. 54	6. 35
50–59	180	4. 33	. 46	. 58	. 15	. 54	6. 06
60–69	174	4. 10	. 36	. 75	. 13	. 52	5. 86
70–79	262	3. 98	. 26	. 76	. 10	. 51	5. 61
80–89	184	3. 66	. 33	. 66	. 11	. 35	5. 11
Total	1, 096	4. 17	0. 36	0. 74	0. 12	0. 52	5. 91

[1] CV (ICD 330–334, 400–468) was underlying or contributory cause.

KEY:

1=CV was sole cause of death.

2=CV was underlying cause and R (ICD 470–527) was present.

3=CV was underlying cause and cause other than R was present.

4=CV was contributory cause and R was present.

5=CV was contributory cause and cause other than R was present.

which indicates that some sort of inverse relationship with temperature is present for all deaths but is especially strong for cardiovascular disease without respiratory disease.

The average number of deaths per day with diseases of the respiratory system as the underlying cause, either alone or combined with another (non-R) cause, or with R as a contributory cause, are presented in table 4 and figure 2. For all groups, an inverse, approximately linear pattern is seen except for an increase in mortality from the 70–79° F. days to the 80–89° days.

For comparative purposes and as an aid in understanding the relationship between cardiovascular mortality and temperature, investigation of a major noncardiovascular disease in relation to temperature seemed appropriate. In table 5, daily mortality for malignant neoplasms in relation to temperature was studied. As anticipated, MN as a contributory cause of death was relatively infrequent; for the other MN categories, a generally flat pattern was observed.

The observed patterns for arteriosclerotic heart disease, vascular lesions of the central

Table 4. Average number of deaths per day for diseases of the respiratory system (R), alone and in combination with other causes, by daily average temperature, Memphis, 1959–61

Daily average temperature (degrees F.)	Number of days	Average daily number of deaths			
		1	2	3	Total deaths [1]
10–29	31	0. 58	0. 16	0. 90	1. 64
30–39	126	. 52	. 19	. 83	1. 54
40–49	139	. 43	. 18	. 83	1. 44
50–59	180	. 37	. 19	. 82	1. 38
60–69	174	. 36	. 14	. 75	1. 25
70–79	262	. 21	. 10	. 56	. 87
80–89	184	. 26	. 10	. 76	1. 12
Total	1, 096	0. 34	0. 15	0. 74	1. 23

[1] R (ICD 470–527) was underlying or contributory cause.

KEY:
1=R was sole cause of death.
2=R was underlying cause, but not sole cause.
3=R was contributory cause.

Table 5. Average number of deaths per day for malignant neoplasms (MN), alone and in combination with respiratory (R) and non-R causes, by daily average temperature, Memphis, 1959–61

Daily average temperature (degrees F.)	Number of days	Average daily number of deaths					Total deaths [1]
		1	2	3	4	5	
10–29	31	1. 26	0. 13	0. 48	0. 00	0. 00	1. 87
30–39	126	1. 33	. 20	. 47	. 01	. 06	2. 07
40–49	139	1. 14	. 13	. 42	. 01	. 04	1. 74
50–59	180	1. 36	. 17	. 31	. 01	. 03	1. 88
60–69	174	1. 29	. 13	. 37	. 01	. 03	1. 83
70–79	262	1. 29	. 12	. 42	. 01	. 03	1. 87
80–89	184	1. 26	. 17	. 35	. 00	. 06	1. 84
Total	1, 096	1. 27	0. 15	0. 39	0. 01	0. 04	1. 86

[1] MN (ICD 140–205) was underlying or contributory cause.

KEY:
1=MN was sole cause of death.
2=MN was underlying cause and R (ICD 470–527) was present.
3=MN was underlying cause and cause other than R was present.
4=MN was contributory cause and R was present.
5=MN was contributory cause and cause other than R was present.

nervous system, cardiovascular disease, diseases of the respiratory system, and malignant neoplasms as sole causes may be compared with one another in figure 3. Here the individual patterns are "pure" in the sense that no other disease was recorded on the death certificate. Obviously, the more complete and accurate the information on the death certificate, the more meaningful is this kind of classification. The Y-axis in figure 3 is logarithmic to allow for a more compact set of graphs and to permit a direct comparison of relative changes in mortality with temperature, as indicated by the slopes of the lines.

The relationships already described for each of these five disease categories are evident. The graph of ASHD mortality is seen to parallel that of CV. Over the entire temperature span, the graph of R mortality shows the most pronounced decline, although the sharpest decline at the outset is noted for ASHD and CV.

The basic statistical analysis was carried out for ASHD mortality in relation to daily high temperature and to daily low temperature; in each case, results were virtually the same as described for daily average temperature. This result was also observed for VL, CV, R, and MN. For daily precipitation, percent of possible sunshine, and barometric pressure, no substantial variation in mortality could be detected for any of the five disease categories other than apparently random fluctuations resulting in generally flat or irregular patterns.

Table 6. Average number of deaths per day, by presence or absence of cardiovascular disease (CV) and respiratory disease (R) and by daily average temperature, Memphis, 1959–61

Daily average temperature (degrees F.)	CV and R [1]	CV but no R [1]	R but no CV [1]	Neither CV nor R [1]
10–29	0. 61	7. 29	1. 03	4. 74
30–39	. 50	6. 11	1. 04	4. 54
40–49	. 58	5. 77	. 86	4. 31
50–59	. 61	5. 45	. 77	4. 62
60–69	. 49	5. 37	. 76	4. 61
70–79	. 36	5. 25	. 51	4. 41
80–89	. 44	4. 67	. 68	4. 27
Total deaths	0. 48	5. 43	0. 75	4. 45

[1] ICD codes: CV=330–334, 400–468; R=470–527.

Table 7. Average number of deaths per day with any mention of arteriosclerotic heart disease (ICD 420), by daily average temperature and wind speed, Memphis, 1959–61

Daily average temperature (degrees F.)	Daily average wind speed (mph)			
	1–4	5–9	10–14	15 and over
10–29	(1)	3. 23	4. 08	(1)
30–39	2. 63	2. 73	2. 54	3. 30
40–49	2. 17	2. 87	2. 31	3. 13
50–59	2. 46	2. 47	2. 35	2. 27
60–69	3. 15	2. 31	2. 67	2. 62
70–79	2. 77	2. 16	2. 57	3. 00
80–89	1. 57	2. 20	2. 24	(1)

[1] Less than 5 days in category.

For average wind speed and, to a lesser extent, for fastest wind speed, the data suggest direct associations with mortality from ASHD, CV, VL, and R. For relative humidity at 0600 hours (but not at 1200 hours), there is some suggestion of inverse relationships with mortality from ASHD, VL, and CV. These relationships probably are due to correlations of these weather variables with average temperature, correlations which for average wind speed and for relative humidity at 0600 hours are appreciable. The following product-moment correlations, based on 1,096 observations, were calculated for grouped data for the 3 years 1959–61:

Variable	*Correlation with average temperature*
Average wind speed	−0. 25
Fastest wind speed	− . 10
Relative humidity (0600 hours)	. 34
Relative humidity (1200 hours)	− . 02

The effect of two meteorologic variables on mortality may also be studied (table 7). In table 7, the average mortality from arteriosclerotic heart disease (any mention) is classified by average temperature and average wind speed for the 3 years. The number of days was rather small for some cells at the extremes of temperature and wind speed. Nevertheless, the table indicates that most of the variation in ASHD mortality with wind speed is lost when average temperature is held constant. On the other hand, the inverse pattern of average daily ASHD mortality with daily average temperature generally remains when wind speed is held con-

Figure 3. Average daily deaths for ASHD alone, VL alone, CV alone, R alone, and MN alone, by daily average temperature, Memphis, 1959–61

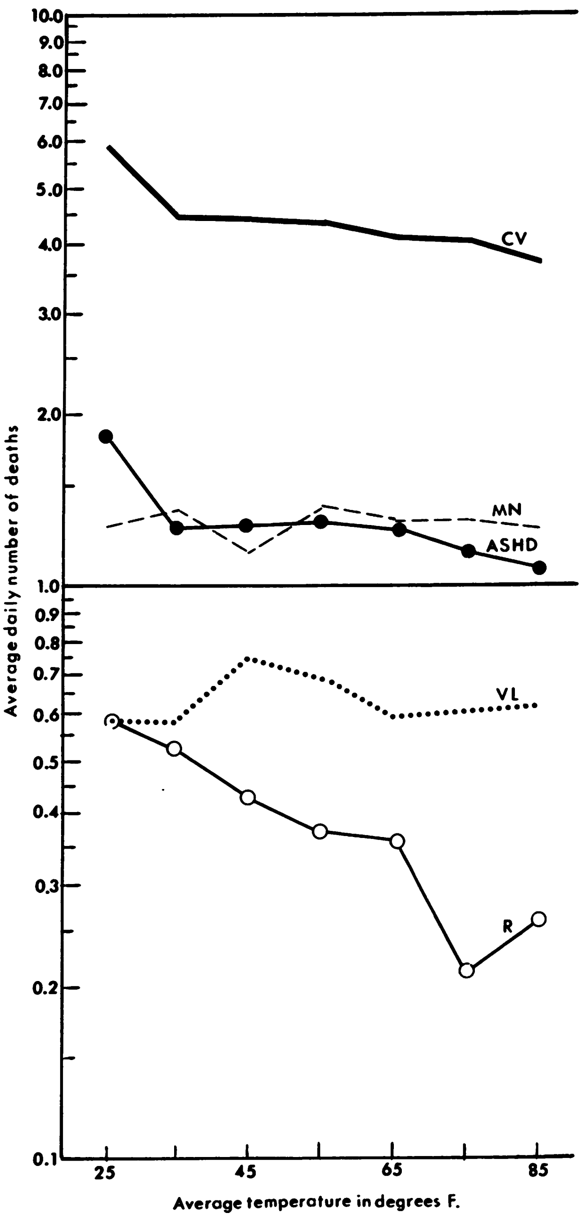
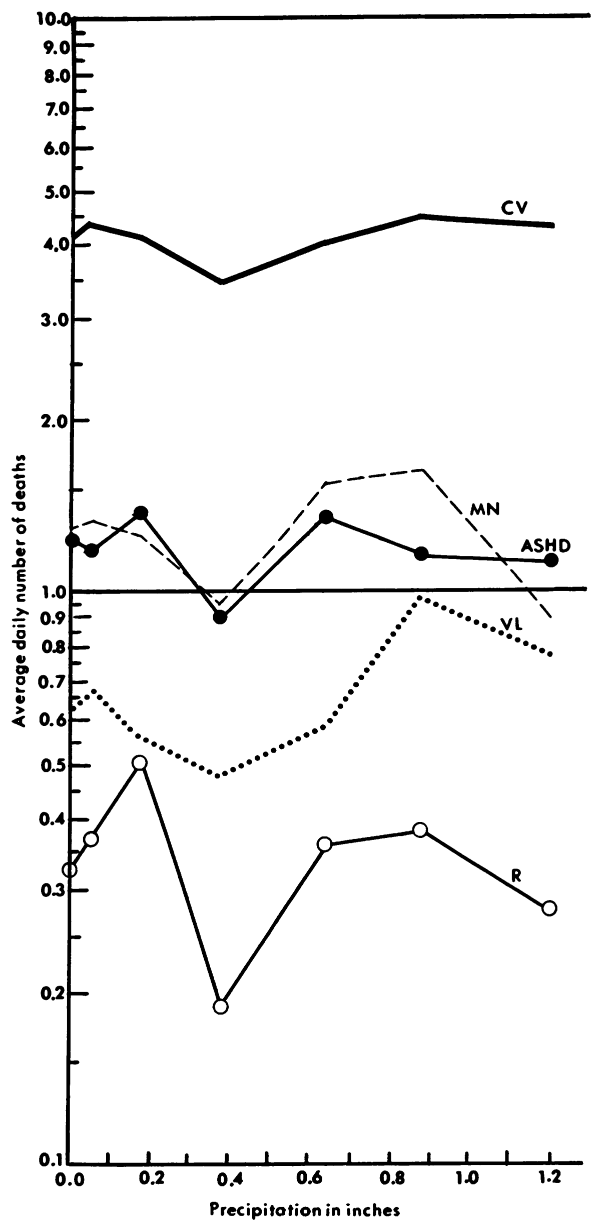


Figure 4. Average daily deaths for ASHD alone, VL alone, CV alone, R alone, and MN alone, by daily precipitation, Memphis, 1959–61



CV — Cardiovascular diseases
MN — Malignant neoplasms
ASHD — Arteriosclerotic heart disease
VL — Vascular lesions affecting the central nervous system
R — Diseases of the respiratory system

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Figure 5. Average daily deaths for ASHD alone, VL alone, CV alone, R alone, and MN alone, by average wind speed, Memphis, 1959–61

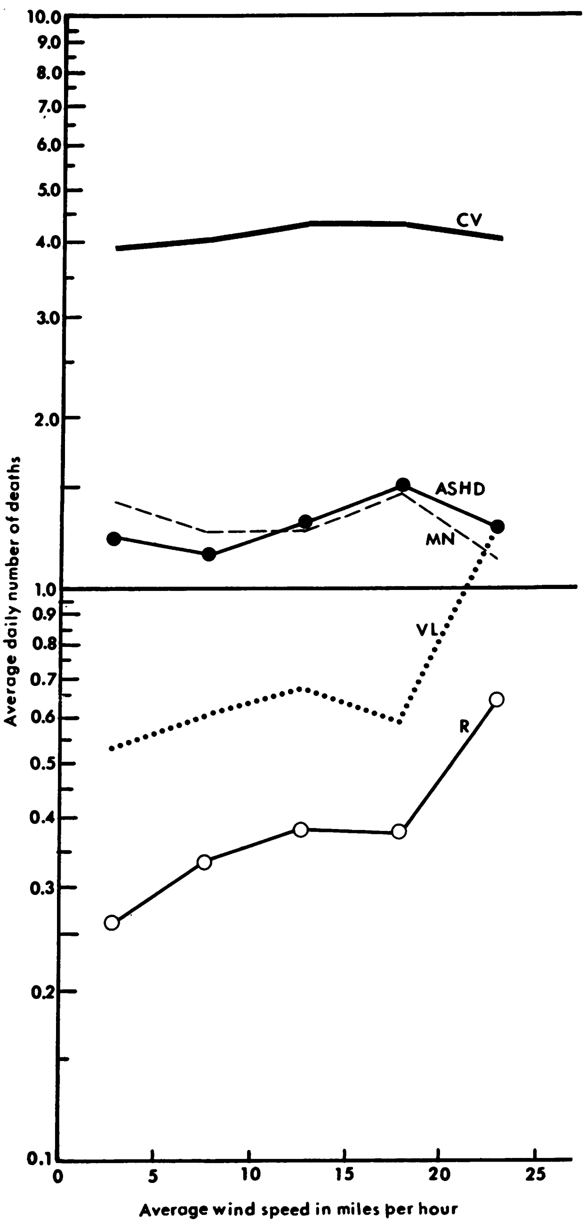
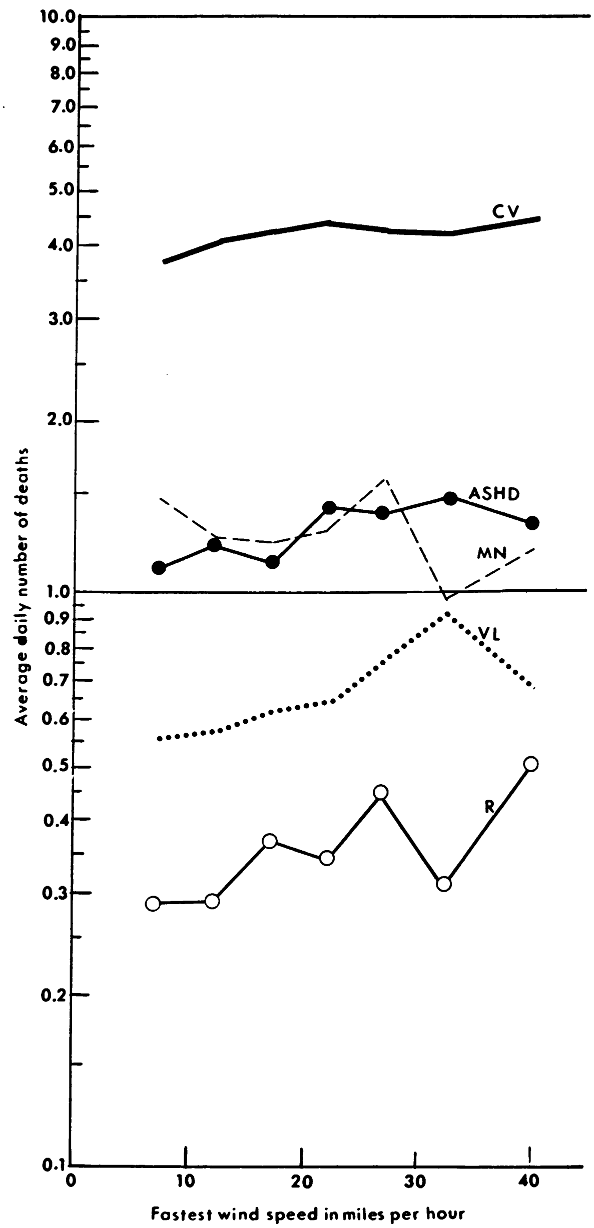


Figure 6. Average daily deaths for ASHD alone, VL alone, CV alone, R alone, and MN alone, by fastest wind speed, Memphis, 1959–61



CV — Cardiovascular diseases
MN — Malignant neoplasms
ASHD — Arteriosclerotic heart disease
VL — Vascular lesions affecting the central nervous system
R — Diseases of the respiratory system

Figure 7. Average daily deaths for ASHD alone, VL alone, CV alone, R alone, and MN alone, by percent of possible sunshine, Memphis, 1959–61

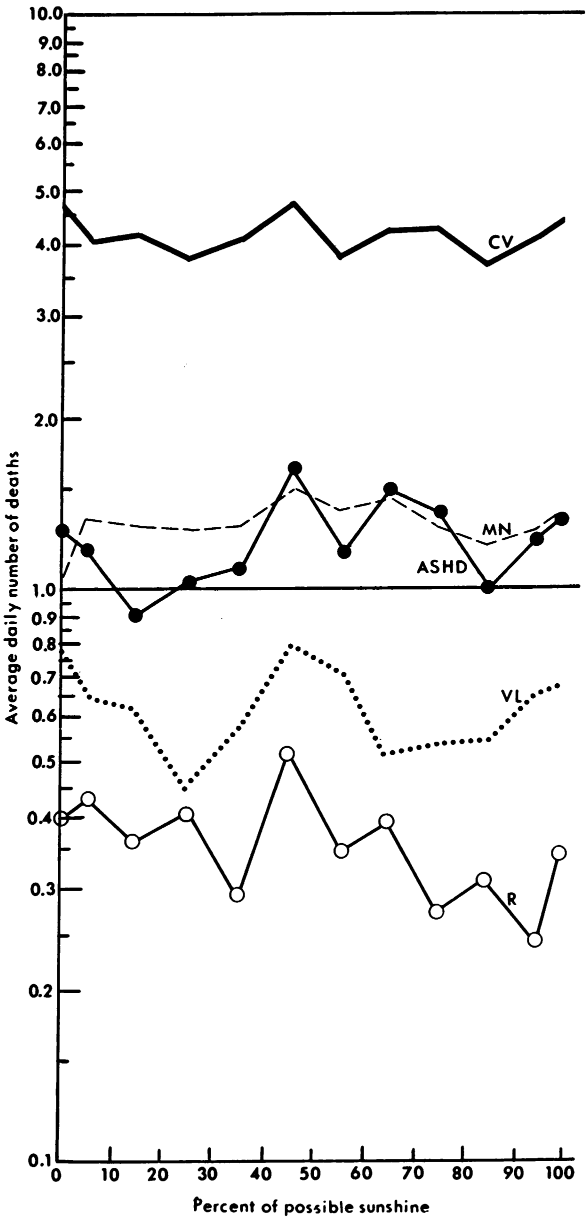
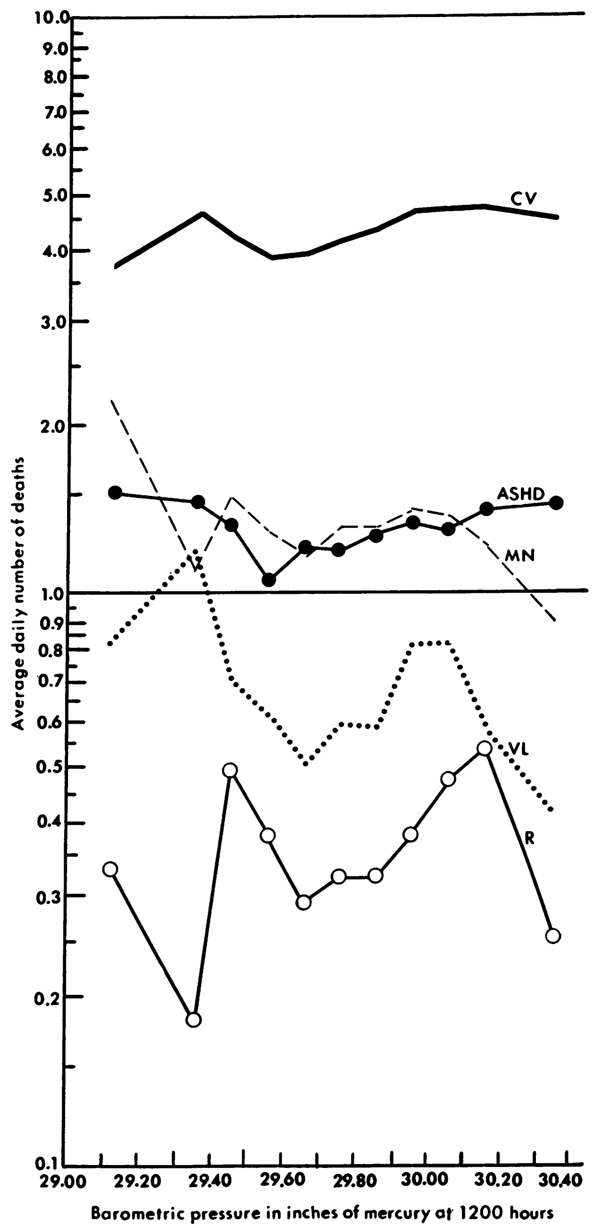


Figure 8. Average daily deaths for ASHD alone, VL alone, CV alone, R alone, and MN alone, by barometric pressure, Memphis, 1959–61



CV — Cardiovascular diseases
MN — Malignant neoplasms
ASHD — Arteriosclerotic heart disease
VL — Vascular lesions affecting the central nervous system
R — Diseases of the respiratory system

Figure 9. Average daily deaths for ASHD alone, VL alone, CV alone, R alone, and MN alone, by relative humidity at 0600 hours, Memphis, 1959–61

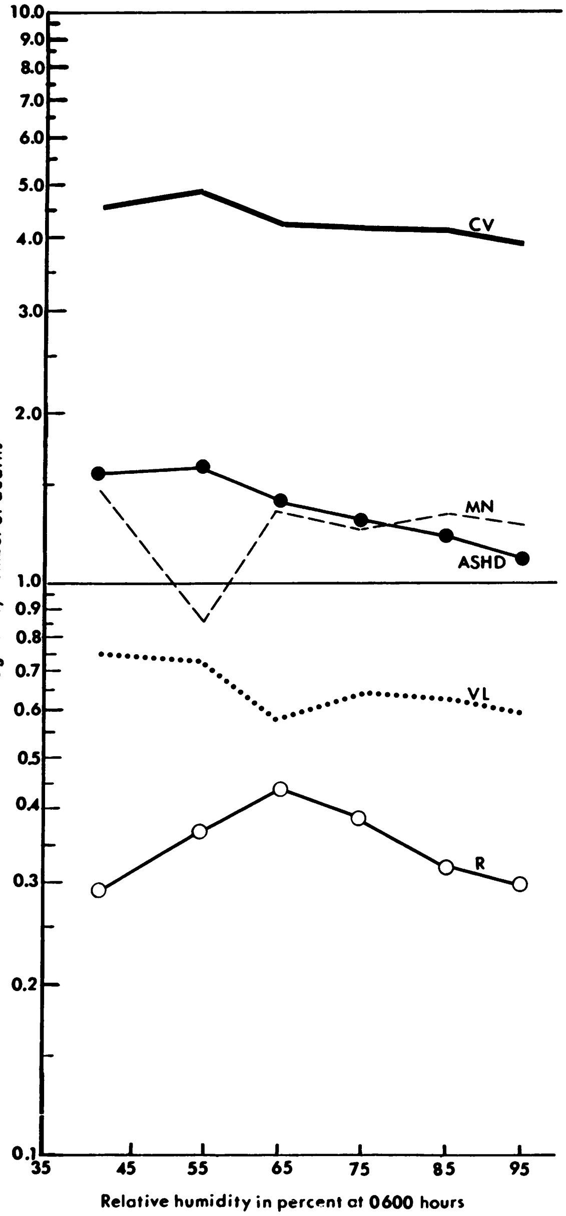
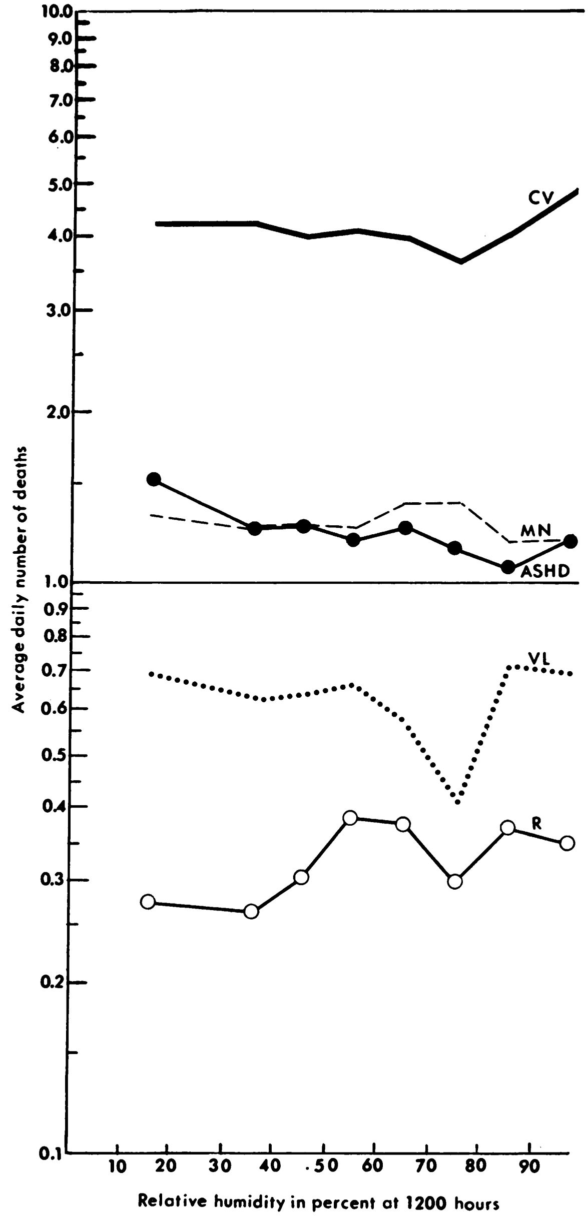


Figure 10. Average daily deaths for ASHD alone, VL alone, CV alone, R alone, and MN alone, by relative humidity at 1200 hours, Memphis, 1959–61



CV — Cardiovascular diseases
MN — Malignant neoplasms
ASHD — Arteriosclerotic heart disease
VL — Vascular lesions affecting the central nervous system
R — Diseases of the respiratory system

stant. Similar results were obtained for mortality from arteriosclerotic heart disease classified by (*a*) average temperature and fastest wind speed, (*b*) average temperature and relative humidity at 0600 hours, and (*c*) average temperature and relative humidity at 1200 hours. Respiratory mortality was also classified by average temperature and wind speed (average and fastest); again, most of the variation in mortality with wind speed disappeared.

The data relating sole-cause mortality to single weather variables are summarized in figures 3–10; mortality for each of the five causes was plotted on a logarithmic scale. Similar sets of graphs were prepared for each of the five causes as the underlying cause and for any mention of the condition (underlying plus contributory). In only a few instances did the patterns materially differ from those shown in figures 3–10. No differences were observed which indicated a meaningful association between weather and mortality besides those already noted.

Discussion

Before reviewing our results, it may be well to compare the overall mortality rates for Memphis with rates for other areas in the United States. Average annual (age-adjusted) death rates for 1959–61 have been published for 201 Standard Metropolitan Statistical Areas—SMSA's (*9*).

These rates per 100,000 for all causes were 1,006 for the Memphis SMSA compared with 998 for all 201 SMSA's; for arteriosclerotic heart disease, the Memphis rate was only 177 compared with 278 for all SMSA's; for vascular lesions of the central nervous system, 145 for Memphis and 95 for all SMSA's; for cardiovascular disease (exclusive of ICD 400–402 and 451–468), 376 for Memphis and 484 for all SMSA's. For deaths from respiratory causes (ICD 480–502, 523, 525–526, and 527.1), rates were 47 for Memphis and 44 for all SMSA's. Thus, Memphis had low mortality rates for ASHD and cardiovascular disease but high rates for vascular lesions of the central nervous system and noncardiovascular causes when compared with other areas. Reasons for these differences are not known. Reporting differences may be present. What this result means in terms of seasonal differences in mortality needs to be further explored by studies of other areas, especially those with higher absolute levels of cardiovascular mortality. If one could control for other influences, perhaps areas with cold climates would tend to have higher cardiovascular death rates than areas with warm climates. Nevertheless, geographic patterns recently reported by Sauer (*10*) and by Hechter and Borhani (*11*) indicate no simple pattern. Generally, however, higher CV mortality rates were noted for coastal than for interior areas in the United States. This subject deserves continued study.

The results we have so far described explore possible associations between weather and mortality on day X, although we are actually more interested in the relationship between weather and onset of disease on day X. If a pattern did exist for weather and the onset of disease, then clearly the observed "pattern" for mortality would tend to be weaker for at least two reasons. First, the duration of disease from onset to death is often more than a day and may, in fact, vary widely in time. Second, many persons do not die from the specific disease, making any relationship between incidence of disease and weather more difficult to detect. We should therefore not expect to find any strong relationship between a weather variable with a low autocorrelation for short intervals and mortality from a disease with a long duration from onset to death, even if there is a strong relationship linking incidence with the specific weather variable. (By autocorrelation we mean the correlation of a variable with itself, in which the paired values differ by a specified time interval.) On the other hand, if a weather variable has high autocorrelation for long intervals, we might still expect to find a relationship between the variable and mortality from the disease. Autocorrelations at various intervals for eight meteorologic variables studied in Memphis for the 3 years (grouped data, based on 1,096 observations) are shown in table 8. Temperature is the only variable we studied which showed consistently high autocorrelations, and it is also the only variable for which strong relationships with mortality were apparent.

For several causes of death, Boyd (*2*) has obtained increased associations between mortality and weather by correlating mortality with values of meteorologic variables at an earlier period, usually 1 to 2 weeks before death. As indicated, one might expect an intervening period, or lag, when studying mortality and, possibly, even when studying the onset of disease. Even with a considerable amount of variability in the actual interval, a stronger association might emerge for some nonzero lag than for a lag of zero (weather variables correlated with mortality on the same day).

We have examined the association between average daily mortality from arteriosclerotic heart disease and average temperature for various lags (fig. 11). The comparative index used is the ordinary product-moment correlation coefficient, in which temperature is grouped as in tables 1–5. The association previously noted (table 1 and fig. 1) is not strictly linear; also, the averages used in the correlation coefficients are of varying precision; for example, there were only 31 days in the under 30° F. category and 262 days in the 70–79° category. Nevertheless, we believed that the product-moment correlation coefficient would be an adequate, if imperfect, measure for comparison of associations for different lags. Mortality was correlated with temperature for negative as well as positive lags; a negative lag indicates that mortality on a given day was correlated with temperature on a later day.

Although a negative lag does not lead to a meaningful relationship, figure 11 shows that high correlations were found fairly consistently for both positive and negative lags. Hence, we apparently could correlate mortality from arteriosclerotic heart disease with average temperature on any day around the day of death

Table 9. Average number of deaths per day with any mention of arteriosclerotic heart disease (ASHD), by length of interval between onset and death and by daily average temperature, Memphis, 1960

Daily average temperature (degrees F.)	Number of days	Average daily ASHD (ICD 420) deaths		
		Sudden [1]	Nonsudden	Unknown interval
10–29	11	1. 455	1. 182	1. 636
30–39	68	. 868	. 500	1. 074
40–49	30	. 767	. 667	1. 600
50–59	50	. 800	. 520	1. 040
60–69	58	. 897	. 638	1. 086
70–79	82	. 695	. 598	1. 024
80–89	67	. 657	. 731	. 940
Total	366	0. 795	0. 624	1. 096

[1] A sudden death is defined as a death with interval between onset of illness and death of less than 24 hours.

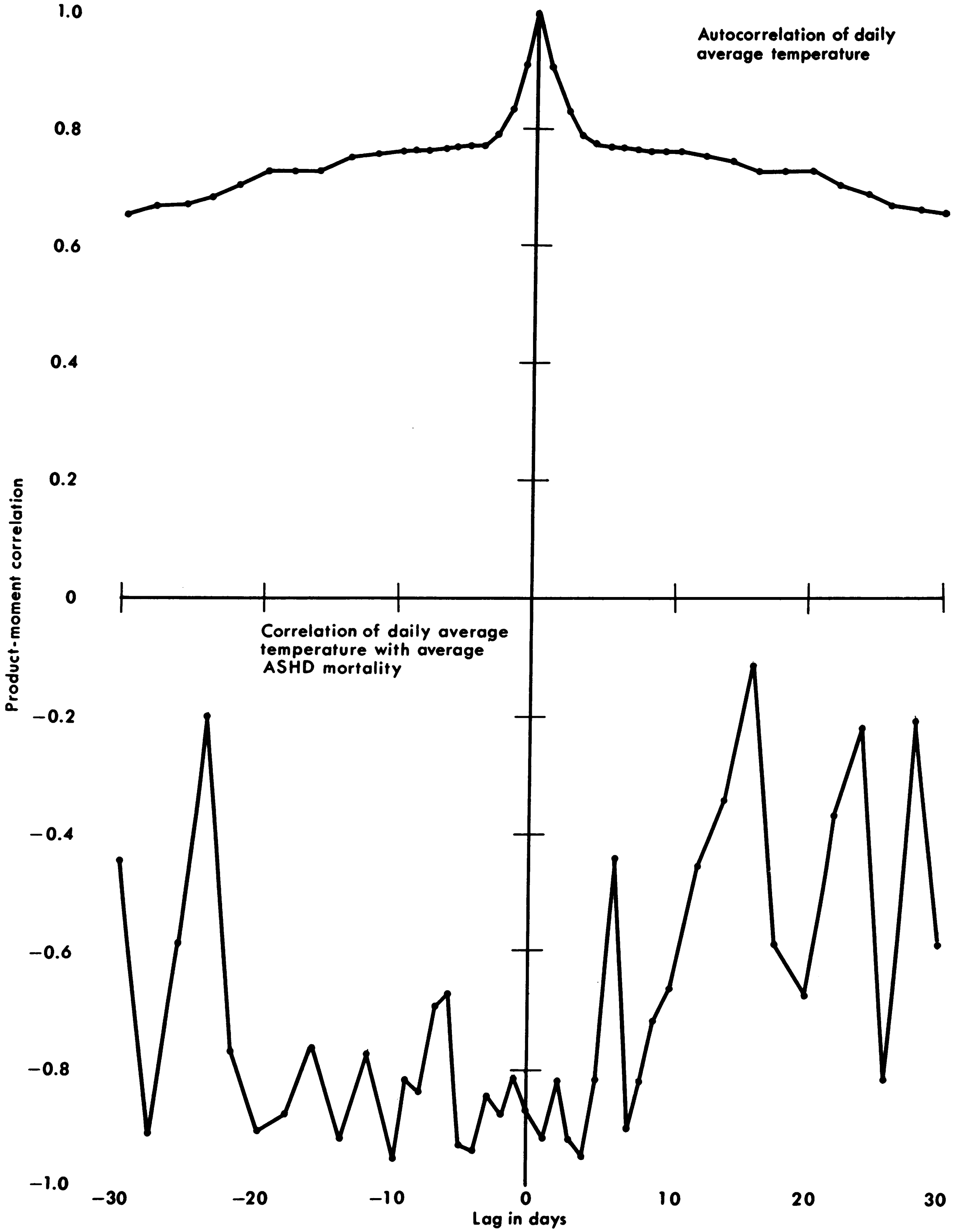
and obtain substantially the same results. This phenomenon can be attributed to the high autocorrelation of average temperature (for periods up to about 30 days), as shown in figure 11. Thus, in mortality studies such as ours, one apparently might just as well use a lag of zero with daily data for temperature, at least in studying ASHD mortality.

We had hoped that an examination of "sudden" deaths from arteriosclerotic heart disease would shed some light on the variation of ASHD mortality with temperature. For our purposes, a "sudden" death was one for which the interval between onset of illness and death was less than 24 hours. Table 9 shows average daily mortality from arteriosclerotic heart dis-

Table 8. Autocorrelations of meteorologic variables for selected intervals, Memphis, 1959–61

Variable	Interval (number of days)						
	1	2	3	4	5	10	20
Average temperature	0. 91	0. 83	0. 79	0. 78	0. 78	0. 76	0. 73
Total precipitation	. 12	. 02	−. 01	−. 03	. 01	. 00	. 05
Average wind speed	. 40	. 18	. 13	. 14	. 16	. 19	. 13
Fastest wind speed	. 29	. 08	. 04	. 05	. 06	. 10	. 08
Percent sunshine	. 38	. 08	. 09	. 09	. 05	. 08	. 05
Barometric pressure at 1200 hours	. 57	. 22	. 14	. 13	. 17	. 11	. 18
Relative humidity at 1200 hours	. 38	. 11	. 05	. 04	. 02	. 09	. 05
Relative humidity at 0600 hours	. 32	. 26	. 22	. 17	. 20	. 17	. 19

Figure 11. Autocorrelations of daily average temperature and correlations of average mortality for arteriosclerotic heart disease with daily average temperature for selected time lags, Memphis, 1959–61



ease for 1960 by the temperature on the day of death and by the interval between onset of the disease and death, whether sudden, nonsudden, or unknown. The sudden deaths show an inverse pattern with temperature, although a χ^2 test for independence did not give a significant result. The nonsudden deaths do not show such a pattern, although the average daily mortality was highest for the coldest days. The deaths with an unknown interval show a pattern similar to that for sudden deaths except for a sharp increase for 40–49° F. days. Several factors weaken the results of this aspect of the study. Data on the interval between onset and death were collected only for 1960; on only 11 days in 1960 was the average temperature less than 30°; for 401 deaths, or 44 percent of the total ASHD deaths in 1960, the interval between onset and death was unknown.

The data indicate that sudden deaths from arteriosclerotic heart disease may be the ones for which the effect of weather is greatest. Such a result is not entirely unexpected since, by definition, sudden deaths have a short interval between onset and death; nevertheless, there may be a real difference in the effects of weather conditions on sudden and nonsudden ASHD deaths. Further study is indicated.

A number of limitations in our study would make a similar study in a large northern city worthwhile. First, the number of cold days in Memphis was small (the average temperature was less than 30° F. on only 31 days in the 3 years). Also, we could not study the effects of snowfall, particularly its effects on sudden ASHD deaths, with the Memphis data. No investigation of the relationships of mortality and weather for different age, sex, and race groups was undertaken; a study with more data than the Memphis study would lend itself better to such an examination. As noted, Memphis has rather low mortality from cardiovascular disease compared with the average for the 201 SMSA's in the United States. A similar study in a large northern city, especially one with relatively high CV mortality, would be a great aid in determining whether the types of associations found for Memphis are present more generally. One point to watch for is increased mortality from respiratory diseases on the hottest days. In addition, it would be interesting to examine the relationships between mortality and other variables, such as air pollution.

Summary

Daily records on mortality and meteorologic variables for Memphis, Tenn., in the years 1959–61 were used to investigate the associations between mortality, especially mortality from cardiovascular disease, and weather. The variable most strongly associated with mortality was daily average temperature, which was inversely related to mortality from cardiovascular disease, whether or not respiratory disease was present. Deaths in which respiratory disease was present were inversely related to temperature except for an increase in mortality on the hottest days.

Memphis has low mortality rates for cardiovascular disease compared with all U.S. Standard Metropolitan Statistical Areas. Also, in the years 1959–61, there were few cold days and little snow in Memphis. For these reasons, a similar study in a large northern city with high mortality from cardiovascular disease is indicated.

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Tearsheet Requests

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Harvard's Educational Facilities Building

An application for a Federal grant for more than $7 million toward the construction and equipping of a new educational facility at the Harvard School of Public Health has been approved by the National Advisory Council on Public Health Training. The school must raise more than $2,500,000 as the private portion of the estimated total.

The site will provide an additional 74,159 net square feet of educational space on 12 levels, enabling the school to double its enrollment from 172 to 360 students. Construction began on July 21, 1969, and is tentatively scheduled for completion during the fall of 1971.

Architecturally the building is unusual in that the lower floors are being constructed on a stair-step basis while at the same time the outside wall of each floor is rotated slightly from the one below. The first three levels will contain teaching and student areas of sufficient size to accommodate large numbers of people. The major teaching area includes a 180-seat lecture hall and two 60-seat classrooms. The main entrance floor will have a lounge, a 200-seat dining area which can be converted to a general assembly area for 600 persons, and three small dining rooms which can be used for seminars.

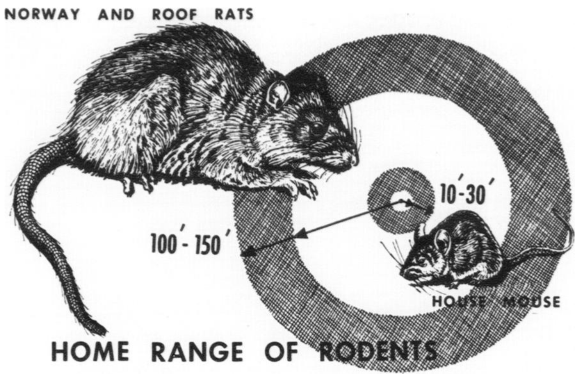
Eight seminar rooms of varying sizes and a TV seminar room with an observation camera room will be located on the second floor. The third and fourth floors will contain 64 multipurpose rooms—offices for advanced students and teaching personnel and group study rooms for students. Multipurpose teaching laboratories for courses in infectious diseases and environmental health sciences will be located on the fifth floor, connecting with infectious disease laboratories in the adjoining research building.

The department of biostatistics and the data processing facilities will occupy the sixth and seventh floors and the department of epidemiology the eighth and part of the ninth. The registrar and other student-related offices, as well as the administrative offices, will be on the ninth and the top floor.

Aside from the fact that the school, for the first time in its history, will have a building specifically designed for the needs of its students and faculty members in the educational program, a major feature of the new facility will be a comprehensive communications system permitting extensive use of audiovisual services, television, and computer-assisted instruction in teaching and learning. Production facilities will be located on the ground floor, near the major teaching area, and on the floor below. A general learning laboratory will be provided with carrels, most of which will have access to audio and video information. The laboratory resource collection will contain films, slide sets, filmstrips, microfilms, audiotapes, videotapes, and programed instruction materials with appropriate machines.

The entire building will be equipped to use audiovisual media. The three largest classrooms will permit both front and rear projection by remote control and a telelecture installation will be included. All of the seminar rooms, small dining rooms, and the multipurpose teaching laboratories will be equipped with modules to permit the instructor to use slides, motion pictures, telelectures, computer consoles, and television within the rooms.

Publications for Rat Control and Prevention Programs



With the $15 million authorized by Congress in 1968 for a Federal rat control program through the Partnership for Health grants, the Consumer Protection and Environmental Health Service, Environmental Control Administration, Public Health Service, increased its work with health departments and local agencies involved in rat control through training courses, field consultation, and new training films and literature.

A list of audiovisual training aids can be found in "Control of Domestic Rats and Mice," Public Health Service Publication No. 563,50 cents, which also covers a broad spectrum of rodent-borne diseases, habits of rats and mice, gives suggestions for rodent control and prevention, and includes numerous illustrations. Another useful publication for rat control programs is "Biological Factors in Domestic Rodent Control," Public Health Service Publication No. 773, revised 1969, 40 cents. It deals with the various species of rats and mice, their identification, distribution, life history, characteristics of rodent populations, and principles of rodent control.

Geared to assist administrators, rodent control operators, and others responsible for rodent control operations in training employees in this field, these publications are also helpful to college students wishing detailed knowledge of practical rodent biology.

Both publications can be ordered from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.