

Public Health

MORTALITY IN THE LONDON FOG INCIDENT, 1952

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THE Meuse Valley fog episode in 1930 caused 64 deaths, and the Donora (Pennsylvania) episode in 1948 caused 20 deaths. In December, 1952, a four-day fog in London caused about 4000 deaths. This paper gives a short account of when and where these deaths occurred, the age-distribution, and the reported medical causes. No attempt is made here to present detailed meteorological data or to discuss clinical aspects; these and other features of the incident, including additional details about mortality, will no doubt be discussed in a report which, it is understood, will be made to the Minister of Health when investigations have been completed. Two papers have already been published concerning the

TABLE I—DEATHS REGISTERED IN GREATER LONDON FROM WEEK ENDED NOV. 15, 1952, TO JAN. 10, 1953, COMPARED WITH THE ANNUAL AVERAGE FOR CORRESPONDING WEEKS OF THE FIVE PREVIOUS YEARS, 1947-52

Year	Deaths in week ended							
	Nov. 15	Nov. 22	Nov. 29	Dec. 6	Dec. 13	Dec. 20	Dec. 27	Jan. 3
1952	1565	1699	1902	2062	4703	3138	2234	2977
1947-52 (av.)	1747	1708	1809	1805	1852	1914	1923	2303

effects of the fog on hospital admissions ¹ and on general practice.²

The figures given here are from the Registrar-General's weekly returns, with additional data, and indicate that the incident was a catastrophe of the first magnitude in which, for a few days, death-rates attained a level that has been exceeded only rarely during the past hundred years—for example, at the height of the cholera epidemic of 1854 and of the influenza epidemic of 1918-19.

INCREASE IN DEATHS

Unusually dense fog developed over practically the whole of the Greater London area early in the morning of Friday, Dec. 5, 1952, and continued until early in the morning of Tuesday, Dec. 9. In relation to the

1. Abercrombie, G. F. *Lancet*, Jan. 31, 1953, p. 234.
2. Fry, J. *Ibid*, p. 235.

TABLE II—DEATHS REGISTERED IN LONDON ADMINISTRATIVE COUNTY AND THE OUTER RING (BY COUNTY AREAS) AND IN THE 160 GREAT TOWNS OF ENGLAND AND WALES : WEEKS ENDED NOV. 29, 1952, TO JAN. 10, 1953

Area	Deaths in week ended							Ratio of week ended Dec. 13 to Dec. 6
	Nov. 29	Dec. 6	Dec. 13	Dec. 20	Dec. 27	Jan. 3	Jan. 10	
London A.C. ..	853	945	2484	1523	1029	1372	1216	2.6
Outer ring :	1049	1117	2219	1615	1205	1605	1418	2.0
Middlesex ..		499	942	728				1.9
Surrey ..		293	564	390				1.9
Kent ..		103	174	104				1.7
Heris ..		21	45	33				2.1
Essex ..		201	494	360				2.5
160 great towns	6042	6647	9452	7701	6472	7842	7617	1.4
Great towns minus Greater London ..	4140	4585	4749	4563	4238	4865	4983	1.04

periods for which the numbers of deaths registered are published in the weekly returns, the fog began towards the close of the week ended Saturday, Dec. 6, and continued into the first half of the week ended Saturday, Dec. 13; and it was in the latter week that the majority of the deaths due to the fog were registered. Table I shows numbers of deaths registered in the Greater London area (population about 8½ million) from the week ended Nov. 15, 1952, to the week ended Jan. 10,

TABLE III—DEATHS REGISTERED IN LONDON ADMINISTRATIVE COUNTY, BY AGE : WEEKS ENDED DEC. 6 AND 13, 1952

—	Age							
	All ages	Under 4 weeks	4 weeks-1 year	1-14	15-44	45-64	65-74	75 and over
Dec. 6 ..	945	16	12	10	61	237	254	355
Dec. 13 ..	2484	28	26	13	99	652	717	949
Ratio of week ended Dec. 13 to week ended Dec. 6 ..	2.6	1.8	2.2	1.3	1.6	2.8	2.8	2.7

1953, compared with the annual averages in corresponding weeks of the five previous years. Deaths registered increased from 2062 in the week ended Dec. 6 to 4703 in the week ended Dec. 13 and 3138 in the week ended Dec. 20. In the next week (week ended Dec. 27) the number of registrations fell to 2234—less than 200 more than in the week before the fog incident. It is possible, therefore, that by that time the effect of the fog had more or less come to an end and was not responsible for the subsequent rise in mortality during the weeks ended Jan. 3 and 10. On the other hand, part of the decline in registrations in the week ended Dec. 27 may have been due to the intervention of the Christmas holidays, during which some registrations may have been postponed. It is not possible to be sure, therefore, that all the deaths brought about by the fog had been

TABLE IV—PERCENTAGE AGE-DISTRIBUTION OF DEATHS REGISTERED IN LONDON ADMINISTRATIVE COUNTY, WEEKS ENDED NOV. 29, 1952, TO JAN. 3, 1953

Age (years)	Week ended					
	Nov. 29	Dec. 6	Dec. 13	Dec. 20	Dec. 27	Jan. 3
Under 1 ..	3	3	2	2	2	3
1-44 ..	5	8	5	5	6	5
45-64 ..	25	25	26	23	24	25
65 and over ..	67	64	67	70	68	67
All ages ..	100	100	100	100	100	100
Total number ..	853	945	2484	1523	1029	1372

registered within the two weeks ended Dec. 13 and 20. Assuming that they were, the number of deaths so caused can be estimated to lie between 3717 (the excess in the weeks ended Dec. 13 and 20 over the week ended Dec. 6, 1952) and 4075 (the excess in the weeks ended Dec. 13 and 20, 1952, over the corresponding average for 1947-51). Having regard to the opposing considerations that all of the excess deaths in weeks ended Dec. 13 and 20 were not necessarily due to fog, and on the other hand that all of the fog deaths had not necessarily been registered within these two weeks, it is reasonable to estimate that in Greater London approximately 4000 deaths were brought about by the fog incident.

Table II gives numbers of deaths in the weeks ended Dec. 6, 13, and 20 in Greater London, divided into London administrative county and the outer ring, with the latter also subdivided by county areas, and in the 160 great towns of England and Wales minus Greater London. Although a certain amount of dense fog was reported in other areas it is evident that it was only

in Greater London that there was an appreciable increase in mortality in the week ended Dec. 13. In the remainder of the great towns (aggregate population 14 million) the increase amounted to only 164 deaths, compared with an increase of 2641 in Greater London. Incidentally the fact that the subsequent rise in numbers of registrations in the weeks ended Jan. 3 and 10, already noted for Greater London, was paralleled in the remainder of the great towns supports the suggestion that this later increase in mortality was independent of the fog.

Within the Greater London area the abrupt increase for the week ended Dec. 13 occurred both in the central area (administrative county) and in the outer ring; as the right-hand column of table II shows, the weekly mortality in the central area almost trebled (ratio 2.6) and in the outer ring it doubled (ratio 2.0). The breakdown of the outer ring into towns within the constituent county areas indicates that mortality increased most sharply in the Essex section (ratio 2.5) and least in Kent (ratio 1.7). But clearly no large section of the Greater London area escaped. As examples of what

TABLE V—NUMBERS OF DEATHS ASSIGNED TO VARIOUS CAUSES, LONDON ADMINISTRATIVE COUNTY: WEEKS ENDED NOV. 29, 1952, TO JAN. 3, 1953

Cause of death	Week ended					
	Nov. 29	Dec. 6	Dec. 13	Dec. 20	Dec. 27	Jan. 3
Respiratory tuberculosis ..	19	14	77	37	21	24
Cancer of lung ..	27	45	69	32	36	48
Vascular lesions of C.N.S. ..	98	102	128	119	91	131
Coronary disease ..	131	118	281	152	109	150
Myocardial degeneration ..	79	88	244	131	108	136
Influenza ..	7	2	24	9	6	4
Pneumonia * ..	28	45	168	125	91	104
Bronchitis ..	73	76	704	396	184	215
Other respiratory diseases ..	8	9	52	21	13	10
Motor-vehicle accidents ..	1	8	4	10	4	5
Suicide ..	5	10	10	7	5	12
Total (all causes) ..	853	945	2484	1523	1029	1372

* Excluding deaths at ages under 4 weeks.

happened in some districts, deaths registered in Stepney increased from 29 to 119 (ratio 4.1), and in East Ham from 16 to 62 (ratio 3.9).

ANALYSIS OF DEATHS

Age-distribution

Table III compares the age-distribution of deaths registered in the London administrative county in the weeks ended Dec. 6 and 13. Although the increase in mortality was greater at older than at younger ages it was slightly less at ages 75 and over (ratio 2.7) than at ages 45-74 (ratio 2.8). The mortality of newborn infants almost doubled, and that of infants aged 1-12 months more than doubled. Deaths of children rose by a third (from 10 to 13) and of young adults by close on two-thirds (from 61 to 99). It is clear, therefore, that all ages shared to some extent in the increased mortality, and that it was by no means confined to the very young or the very old. Altogether there was relatively little disturbance of the usual age-distribution of deaths, as

TABLE VIII—DEATHS IN GREATER LONDON AND CONSTITUENT AREAS BY DATE OF OCCURRENCE, DEC. 1-15, 1952 (EXCLUDING ANY DEATHS OCCURRING WITHIN THESE DATES BUT NOT REGISTERED BY DEC. 20). ATMOSPHERIC POLLUTION READINGS AT KEW OBSERVATORY, RICHMOND (SOUTH-WEST LONDON)

Area	Deaths on Dec.														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Greater London ..	259	301	321	288	406	581	894	910	792	543	528	484	501	449	425
London A.C. ..	112	140	143	120	196	294	513	518	430	274	255	236	256	222	213
Outer ring ..	147	161	178	168	210	287	381	392	362	269	273	248	245	227	212
Atmospheric pollution (mg. per c.m.), max. reading ..	0.30	0.95	0.30	0.95	2.55	2.55	1.70	1.95	1.45	0.30	0.30	0.45	0.45	0.95	0.30

TABLE VI—DEATHS FROM BRONCHITIS AND FROM PNEUMONIA BY AGE, LONDON ADMINISTRATIVE COUNTY: WEEKS ENDED DEC. 6, 13, AND 20, 1952

Age (years)	Bronchitis			Pneumonia (at ages over 4 weeks)		
	Dec. 6	Dec. 13	Dec. 20	Dec. 6	Dec. 13	Dec. 20
Under 1 ..	2	6	1	5	9	7
1-44 ..	—	11	4	2	4	6
45-64 ..	21	193	95	11	31	16
65 and over ..	53	494	296	27	124	96
All ages ..	76	704	396	45	168	125

is shown in table IV which gives the percentage of deaths at various ages during several successive weeks.

Causes of Deaths

Deaths registered in the London administrative county increased by about 1500 in the week ended Dec. 13, and the about half of the increase was attributed to bronchitis or pneumonia. Deaths from bronchitis increased by over eight times (from 76 to 704) and deaths from pneumonia by almost three times (from 45 to 168) (table V). In the next week—the week ended Dec. 20—deaths from bronchitis totalled 396, still a very high figure, and deaths from pneumonia numbered 125. Other causes of death that increased greatly in the week ended Dec. 13 were respiratory tuberculosis (from 14 to 77), cancer of lung (from 45 to 69), coronary disease (from 118 to 281), myocardial degeneration (from 88 to 244), and “other respiratory diseases” (from 9 to 52). 24 deaths were certified as due to influenza compared with 2 in the previous week. There was no increase in deaths from motor-vehicle accidents—possibly because fewer vehicles were on the roads—and there was no increase in deaths by suicide.

The age-distribution of deaths from bronchitis and from pneumonia are shown in table VI. As for deaths from all causes combined, the increases were greatest at advanced ages, but young persons by no means escaped. Deaths from bronchitis at ages under 45 rose from 2 in the week ended Dec. 6 to 17 in the next week,

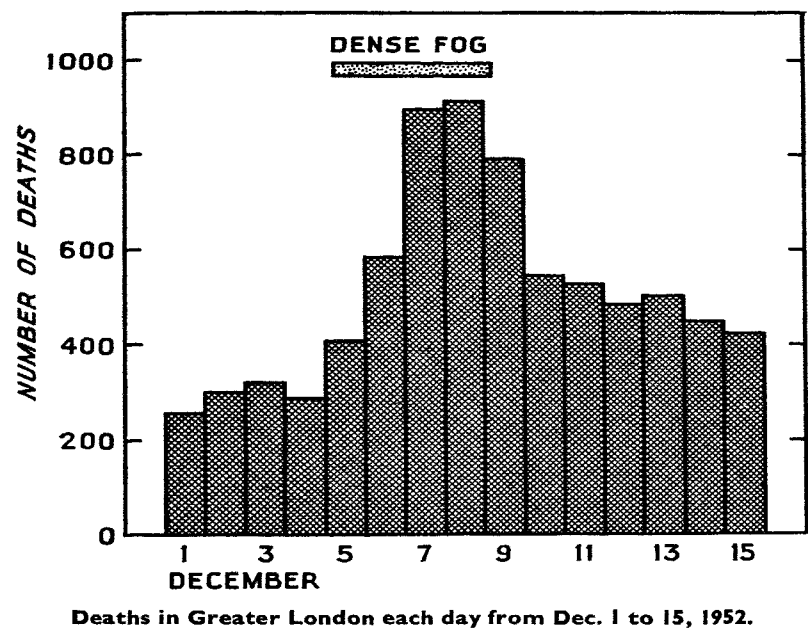
TABLE VII—NUMBERS OF DEATHS CERTIFIED BY CORONER OR CERTIFIED AFTER POST-MORTEM EXAMINATION, GREATER LONDON: WEEKS ENDED DEC. 6, 13, AND 20, 1952

Week ended	Total deaths	No. certified by coroner	No. certified after post-mortem examination		
			Coroners'	Others	Total
Dec. 6 ..	2062	458 (22%)	452	169	621 (30%)
Dec. 13 ..	4703	962 (20%)	960	267	1227 (26%)
Dec. 20 ..	3138	680 (22%)	680	203	883 (28%)

and deaths from pneumonia almost doubled (from 7 to 13).

Deaths Certified by Coroners

One of the results of the sudden increase in mortality was to double the work of coroners and coroners' pathologists. Their reports will provide valuable information about the pathological changes found and may throw



some light on the mechanism whereby the deaths occurred. As table VII shows, there was a very large increase in the week ended Dec. 13 in the number of cases certified by coroners and in the number of post-mortem examinations. In relation to the increased numbers of deaths, however, the proportions of coroners' cases and post-mortem examinations were slightly reduced. Cases certified by coroners include only those where referral to a coroner resulted in an inquest or post-mortem examination; the total number of referrals is not known.

Number of Deaths Each Day

One of the most striking features of the incident was the rapidity at which deaths started to increase. Table VIII shows the number of deaths occurring each day (not numbers of registrations as in other tables). Even on Dec. 5, the first day of the fog, there was an obvious increase in the number of deaths, and the daily totals mounted rapidly to their highest levels on Dec. 7 and 8, the third and fourth days of the fog. There was some decline on Dec. 9, and a still greater decline on Dec. 10; but even on Dec. 15 the daily total was almost twice as high as before the fog began (see figure).

PREVIOUS INCIDENTS

The 1952 incident is not the first in which dense fog in London has caused a sudden increase in deaths; as recently as 1948 a continuous but less dense five-day fog

TABLE IX—INSTANCES OF SUDDEN INCREASES IN MORTALITY IN THE LONDON COUNTY AREA ASSOCIATED WITH DENSE FOG

Year	Dates of dense fog	Deaths				Ratio of deaths in week of suddenly increased mortality to deaths in previous week
		Weekly totals				
1873	Dec. 9-11	<i>Dec. 13:</i> 1759	<i>Dec. 20:</i> 2415	<i>Dec. 27:</i> 1540	<i>Jan. 3:</i> 1842	1.4
1880	Jan. 26-29	<i>Jan. 31:</i> 2200	<i>Feb. 7:</i> 3376	<i>Feb. 14:</i> 2495	<i>Feb. 21:</i> 2016	1.5
1892	Dec. 28-30	<i>Dec. 31:</i> 1830	<i>Jan. 7:</i> 2509	<i>Jan. 14:</i> 2503	<i>Jan. 21:</i> 2101	1.4
1948	Nov. 26-Dec. 1	<i>Nor. 27:</i> 779	<i>Dec. 4:</i> 1019	<i>Dec. 11:</i> 944	<i>Dec. 18:</i> 891	1.3
1952	Dec. 5-9	<i>Dec. 6:</i> 945	<i>Dec. 13:</i> 2484	<i>Dec. 20:</i> 1523	<i>Dec. 27:</i> 1029	2.6

was responsible for some 300 deaths in the London administrative county.³ But so far as can be ascertained from a rapid search through the weekly returns, such events have been very rare, and only three others have been traced in which an association between dense fog and suddenly increased mortality has been clear-cut. In table IX mortality is related to these three incidents and to those in 1948 and 1952. It is evident that the increase in mortality in the 1952 incident was very much greater than on previous occasions.

There is reason to believe that the fog incident in December, 1952, caused deaths in London on a scale possibly never experienced before from this cause. It is to be hoped that such an event will never recur—or be allowed to recur.

SUMMARY

The dense four-day fog in Greater London in December, 1952, was responsible for some 4000 deaths during the two following weeks.

The increased mortality affected persons of all ages, but particularly those aged 45 and over.

Deaths assigned to bronchitis and pneumonia increased eight times and three times respectively in one week.

A considerable increase in numbers of deaths occurred even on the first day of the fog.

Four previous London fogs resulting in a sudden increase in deaths have been noted; but the 1952 incident caused by far the largest increase.

THE FLOODS AND THE HEALTH SERVICES

ON Saturday night, Jan. 31, a severe gale combined with an unusually high tide to produce one of the worst floods ever recorded in the flat lands bordering the North Sea. England, Holland, and Belgium have all suffered severe loss of life and damage to great tracts of land and property. Holland has suffered most; the low islands of Zeeland and the mouth of the Scheldt have been almost entirely devastated, with a tragic death-roll which at the time of writing is still lengthening. The east coast of England was struck from Yorkshire to Kent with a force unparalleled probably since the beginning of the 18th century. Over 250 people lost their lives, more required treatment for injury or exposure, and tens of thousands were rendered homeless; sewage works were flooded and put out of action, water-supplies were contaminated. The whole disaster put an immense strain on the health and welfare departments of the local authorities concerned, and it is heartening to be able to record that everywhere those responsible rose to the occasion. Regional and national schemes for coördinated help came to the rescue wherever necessary, mostly with emergency supplies and a watchful eye over all; but on the whole those on the spot have dealt smoothly and efficiently with the many problems of health, welfare, and sanitation, as well as with the care of the injured and homeless, and they deserve all praise for their enterprise, initiative, and self-reliance. The offers of help from other areas have been numerous and prompt.

The most serious public-health problems have been concerned with sewage. At Tilbury the main sewage works were put out of action and at Grays the main sewer burst. The result was that the flood waters became contaminated. Fortunately the water-supply to the area affected was all from mains under pressure and there has been no danger from this source. At Canvey Island, however, the worst-stricken area, the water-supply has been superchlorinated as a precaution and those using surface wells have been advised to boil their water. In the Isle of Sheppey there has been contamination of,

3. Logan, W. P. D. *Ibid*, 1949, i, 78.