

POLIOMYELITIS IN 1953

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SYNOPSIS

The incidence of poliomyelitis throughout the world is outlined on the basis of official statistics—in many cases necessarily provisional or approximate—augmented by information from wider and unpublished sources. Available reports on the virus types responsible for poliomyelitis outbreaks in recent years are also summarized.

A rise in apparent incidence occurred in the following countries in 1953: Africa—Angola, Egypt (largely due to improved reporting), Middle Congo (French Equatorial Africa), Morocco (French Zone), Ruanda-Urundi, Tanganyika, Tunisia, Union of South Africa, and Upper Volta (French West Africa); America—Argentina, Brazil, Canada, Colombia, El Salvador, Greenland, Mexico, Nicaragua, and Uruguay; Europe—Austria, Finland, France, Greece, Italy, Norway, Republic of Ireland, Saarland, Sweden, Switzerland, Trieste (British/United States Zone), Turkey, United Kingdom, and Yugoslavia. The epidemics in Canada and Sweden were the most severe ever recorded in the two countries. The incidence decreased markedly in: Africa—Kenya, Mauritius, Southern Rhodesia, and Uganda; America—Chile (probably), Cuba, and the USA; Asia—Cambodia, Ceylon, India, Israel, Lebanon, Philippines, and Thailand; Europe—Belgium, Denmark, Federal Republic of Germany, Luxembourg, the Netherlands, Portugal, and Spain; Oceania—Gilbert and Ellice Islands, Hawaii Islands, and New Zealand.

While data on virus types are insufficient for any definitive conclusions to be reached as to responsibility for poliomyelitis outbreaks, it would appear that all three types are widely distributed, while in the selected areas where polioviruses have been typed, type 1 virus has been isolated the most frequently.

"The transformation of the relatively uncommon 'infantile paralysis' of the 19th century into 'epidemic poliomyelitis' of almost worldwide distribution presents today one of the most formidable public-health problems." ⁴⁹

This development, which, according to the reported figures of the incidence of the disease, has become more marked during the last 20 years, has formed the subject of a separate study.¹⁰ Readers wishing to obtain a general picture of the present world situation should refer to the paper in question and to certain of the studies which accompany it.^{11, 32, 36}

The present article is another contribution to the series of similar studies which have appeared since 1935 in the epidemiological publications of the League of Nations Health Organisation and of the World Health Organization.^{2, 8, 9, 20-23, 38, 46-48} However, some additional data have been introduced in an attempt to increase the value of the statistical material provided. This additional information—some of it not previously published—has been provided by members of the WHO Expert Advisory Panel on Virus Diseases and by a number of other leading workers on poliomyelitis, to whom grateful acknowledgment is made. It may be thought that the introduction of these data in a study of this kind is premature, because they are certainly very limited and so far available from only a few countries. However, we are living in an era of rapidly expanding poliomyelitis research, an era which might be said to have begun with the already classic discovery of Enders and his colleagues⁷ that the poliomyelitis virus can be grown in tissue culture. This discovery and subsequent developments have transformed poliomyelitis from a disease which could be studied only with difficulty and at great expense, and for which no prospect of control was apparent, into a disease which can now readily and relatively cheaply be studied in the laboratory and for which there are encouraging prospects of effective control measures. Indeed, so rapid have been these developments that there is a danger that their practical application in the field of public health may suffer from undue haste, resulting from the severe pressure of public opinion to which health authorities are subject. It is evident that the successful application of the control measures now under development will depend on a sound knowledge of the epidemiology of poliomyelitis in the area concerned, knowledge which is currently available for very few areas and which in other areas may take a number of years to obtain.

It is partly to stimulate further attempts to acquire this knowledge that the limited information at present available has been introduced into this paper. The main reason, however, is that a mass of new information will become available in the coming years which should be collected in convenient form and recorded alongside the related records of the reported incidence of clinical disease. This paper is the first step in that direction.

Space does not permit a detailed discussion of the epidemiological and virological data needed for the successful application of control

measures. However, a brief summary of the most obvious information required is given in the following paragraphs in explanation of the selection of the data collected.

(1) *The age incidence of clinical disease.* This information is essential for the application of control measures, and to be of use should be reported as the specific incidence in the age-groups selected. Reports of the percentage age-incidence of cases without reference to population size are of much less value. To ensure comparability between reports, the age-groups selected should preferably be the same in different countries: under 1, 1-2, 3-4, 5-9, 10-14, 15-19, 20-29, 30-39, 40 and over are suggested. Alternatively, if this is too complicated, under 1, 1-4, 5-9, 10-14, 15-19, 20-29, 30 and over would be reasonably satisfactory. The changing age-incidence of poliomyelitis has been the subject of a previous study¹⁰ and relatively little new information is available for inclusion in the present article.

(2) *The age incidence of infection and the state of immunity of the population.* This information can be obtained through serological studies. Its importance is evident since it may provide a more reliable guide than the age incidence of clinical disease as to when and where to apply control measures involving immunization. The subject has been studied in a few areas and the results have been reviewed by Sabin³⁶ but many more such investigations are needed and nothing of value can be added at the present time to previous publications.

(3) *The characteristics and behaviour of the prevalent viruses, both poliovirus and others which may cause similar clinical syndromes.* This is essential information since immunization procedures can have satisfactory results only if the immunity produced is specifically effective against the prevalent infecting organisms responsible for clinical disease. Recent observations show that the prevalence of different types of poliovirus varies from year to year and from place to place; that there are strain differences within the three recognized types of poliovirus; that a significant proportion of viruses isolated from cases of clinical poliomyelitis cannot be assigned to any of the three types; and that clinical illness resembling paralytic poliomyelitis has been described with evidence that it was not caused by poliovirus.^{26, 33, 37}

The main addition to the statistical information in this article, therefore, refers to this third point.

With regard to the statistical information itself, this has been recorded in a manner similar to that adopted in previous reports in this series. As has been pointed out in those reports, the significance of the reported figures is difficult to assess owing to the very varied standards of reporting in different countries. Furthermore, the figures at present available for the year 1953 are mainly provisional figures and will be subjected to more or less extensive revision. As a result, comparison of morbidity-rates between

different countries is hardly justifiable. Nevertheless, the notification figures may indicate trends and give a picture of the seasonal variations and of the changes of incidence from year to year within a given country. However, even in the same country it is not always justifiable to compare reported figures of incidence over a number of years because of the changes in reporting regulations or practice that may occur. For example, in 1951-2 an attempt was made by the Ministry of Public Health of Egypt to improve reporting (R. M. Taylor—personal communication). Following this, a big increase in incidence was recorded—from an average of 9.5 cases per annum for the years 1944-51 to 260 cases in 1952 and 551 cases in 1953—the greater part of this increase being attributed to improved reporting.

The first part of this article contains the statistical information regarding the reported incidence of the disease in 1953, and, for some countries, the age incidence and seasonal incidence. The second part contains such data as could be obtained on the viruses responsible for outbreaks in recent years.

REPORTED INCIDENCE

Africa (table I)

In 1952 and 1953 there was a serious rise in the number of notifications in *Egypt*, where 260 and 551 cases of poliomyelitis, respectively, were registered. The total number of cases registered in the period 1944-51 inclusive was 76. The increase is believed to have been due largely to better reporting. The number of cases in different age-groups and the number by four-week period in 1953 are given in tables II and III.

For the rest of the African continent and islands, covering about 40 countries or territories, the 1953 notifications (about 2,170) differed very little from those of the previous year (2,210). Three-quarters of these 2,170 cases occurred in the following countries: *Belgian Congo* (34%), *Angola* (17%), *Union of South Africa* (16%), *Tanganyika* (6%), and Middle Congo, *French Equatorial Africa* (5%). The countries which appeared to be the most affected in 1952 were: *Belgian Congo* (32% of the notified cases), *Mauritius* (15%), *Union of South Africa* (12%), *Uganda* (11%), and *Kenya* (6%).

1953 was marked by a considerable increase in apparent morbidity in: *Angola* (ten times as many notifications as in 1952); Middle Congo, *French Equatorial Africa*, where there were 116 cases, which almost equalled the 1951 record figure; Upper Volta, *French West Africa*, where there were 35 cases as compared with 3 in 1952; *Morocco* (French Zone) and *Tunisia* where the 1952 figures were more than doubled (75 cases in Morocco,

**TABLE I. NOTIFIED CASES OF, AND DEATHS FROM, POLIOMYELITIS :
VARIOUS COUNTRIES, 1949-53**

Countries or territories	1949		1950		1951		1952		1953	
	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths
AFRICA										
Algeria	17	.	86	.	28	.	35	.	20	.
Angola	15	—	9	—	764	60	37	2	378	19
Belgian Congo	242	11	493 *	28 *	1,009 *	41 *	603	24	736	59
Egypt	13	9	8	1	18	12	260	23	551	43
French Equatorial Africa : Middle Congo	3	—	5	1	135	5	46 *	—	116	—
French West Africa: Upper Volta	1	—	6	—	—	—	3	—	35	1
Kenya	73 ^a	3 ^b	156 ^a	7 ^b	126 ^a	15 ^{bc}	240 ^a	19 ^{bc}	58 ^d	3 ^d
Mauritius ^{a, e}	426	15	10	—	22	—	328	4	28	.
Morocco : French Zone	14	.	64	.	64	.	33	.	75	.
Mozambique	21	4	21	—	22	—	38	5	6	—
Northern Rhodesia	12	1	7	1	22	2	23	2	7	1
Réunion	103	2	6	—	24	—	4	.	3	.
Ruanda Urundi	23 *	1 *	38	3	38	2	21	—	32	2
Southern Rhodesia	16	2	57	13	168	14	98	13	28	5
Tanganyika	63	6	14	—	24	5	90	10	136	22
Tunisia	4	.	24	.	44	.	10	.	21 ^f	.
Uganda	13	1	18	1	45	3	253	15	45	3
Union of South Africa	308	.	161	.	463	.	270	.	339	.
AMERICA										
Alaska	1	1	60	4	33	.	80	2	67	.
Argentina	1,022	.	468 *	.	776 *	.	695	.	2,537 *	.
Brazil : Federal District and State capitals	149	17	66 *	17	123 *	26	125 *	25	940 *	79
Canada (excluding Yukon and North West Territories): all forms paralytic cases	2,438	175	911	41 ^c	2,568	162 ^c	4,755	311 ^c	8,734	.
	.	.	284	.	1,148	.	2,181	.	3,627	.
Chile	292	56	596	135	204	43	575	108	171 ^g	86
Colombia ^h	.	182 ^e	133	.	67	.	29	.	153	.
Costa Rica	6 *	2 *	30	3	53	5	.	7	9	4
Cuba *	30	.	32	.	15	.	345	.	37	.
El Salvador	10 ^h	— ^e	2 * ^h	2 ^e	37 * ^h	.	10 ^h	5 ^e	152 ^h	4 ^e
Greenland	.	.	.	.	.	.	25	.	283	.
Guatemala	45	5	13	3	39	1	66	7	37	5
Mexico	683	168	804	134	1,834	371	771	236	1,787	.
Nicaragua	8 *	.	10	1	42	1	24	.	181	8

**TABLE I. NOTIFIED CASES OF, AND DEATHS FROM, POLIOMYELITIS :
VARIOUS COUNTRIES, 1949-53** (continued)

Countries or territories	1949		1950		1951		1952		1953	
	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths
AMERICA (contd)										
Panama Canal Zone (including cities of Panamá and Colón)	9	—	74	.	38	.	33	.	13	.
Peru	35	24	.	31	53	.	127	34	75	.
Puerto Rico	52	10	38	4	89	.	57	6	31	.
United States of America:										
all forms	42,033	2,720 ^c	33,300	1,904 ^c	28,386	1,551 ^c	57,879	3,145 ^c	35,592	.
paralytic cases	.	.	.	.	10,037	.	21,269	.	15,648	.
Uruguay	22 [*]	5	99	9	95	7	27	.	56	.
Venezuela ^k	122	7	112	9	125	14	260	17	255	26
ASIA										
Cambodia	—	—	1	—	7	—	105	13	19	—
Ceylon	109	.	190	66 ^c	212	67 ^c	241	81 ^c	151	.
Cyprus	2	.	5	—	4	1	2	—	7	.
Hong Kong	5	—	16	3 ^c	28	3 ^c	19	4 ^c	22	3 ^c
Israel	130	.	1,604	202 ^{c,i}	918	177 ^{c,i}	874	163 ^{c,i}	637	124 [*]
Japan	3,127	1,074	3,212	775	4,233	570	2,308	508	2,352	467
Jordan ^j	3	—	23	—	39	6	15	3	54	9
Lebanon	5	.	3	.	5	.	58	.	24	.
Malaya, Federation of:										
all forms	58	6	44	3	199	21	126	14	133	.
paralytic cases	.	.	.	.	182	.	123	.	125	.
Philippines	21	14	435	59	89	25	192	39	67	16
Portuguese India	15	8	16	3	3	2	4	3	4	—
Sarawak	67	6	28	—	7	—	7	1	1	—
Singapore Colony ^{a,e}	76	4	82	14	81 ^c	9	55 ^c	7 ^c	45 ^c	5 ^c
Thailand: Bangkok	.	.	.	.	.	.	283 ^k	9 ^k	80	10
Viet Nam	9	1	458	27	77	4	77	3	64	—
EUROPE										
Austria	784	105	160	29	414	66	200	39	529	49 [*]
Belgium	183	41	86	24	118	24	897	34 ^c	184	.
Denmark:										
all forms	323	9	1,571	36	383	1 ^c	5,676	263 ^c	1,591	86 ^c
paralytic cases	153	.	308	.	20	.	2,450	.	695	.
Finland	241	40	322	36	150	22 ^c	82	19 ^c	316	.
France	1,957	290	1,979	292 ^c	1,493	201 ^c	1,665	223 ^c	1,834	237 ^c
Germany:										
Federal Republic	1,733	187	2,830	284	1,269	159	9,517	729 ^c	2,243	.
Berlin (Western Sectors)	419	20	49	6	115	14	211	16 ^c	86	8 ^c

**TABLE I. NOTIFIED CASES OF, AND DEATHS FROM, POLIOMYELITIS :
VARIOUS COUNTRIES, 1949-53** (continued)

Countries or territories	1949		1950		1951		1952		1953	
	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths
EUROPE (contd)										
Greece	278	11	374	13	291	16	55	3	140 *	4 *
Iceland:										
all forms	622	—	17	1	85	—	30	—	10	.
paralytic cases	.	.	.	.	26	.	11	.	7	.
Ireland, Republic of (paralytic cases)	76	21	201	30 ^c	63	15 ^c	96	16 ^c	245	33 ^c
Italy	2,770	265	2,035	203	2,867	233 ^c	2,708	246 ^c	4,995	.
Luxembourg	6	—	6	1	2	—	61	4	7	—
Malta	1	—	154	8	43	—	37	2 ^c	26	1 ^c
Netherlands:										
all forms	160	2	77	8 ^c	568	32 ^c	1,712	72 ^c	171	8 ^c
paralytic cases	.	.	.	.	541	.	1,333	.	163	.
Norway:										
all forms	121	11	905	99	2,233	207 ^c	724	69 ^c	1,095	.
paralytic cases	111	.	706	.	1,563	.	528	.	923	.
Portugal ("continent")	98	16	179	29	107	25	132	20 ^c	89	28 ^c
Saarland	9	1	35	1	217	12	22	1	89	4
Spain (paralytic cases)	483	.	1,705	.	543	.	1,584	.	932	.
Sweden:										
all forms	2,560	165	1,704	157	551	48 ^c	492	56 ^c	5,090	.
paralytic cases	1,843	.	1,164	.	339	.	363	.	3,029 *	.
Switzerland	658	75	380	37	889	87	579	51	764	.
Trieste:										
British/United States Zone	6	—	2	—	25	4 ^c	3	— ^c	16	— ^c
Turkey	13	3	12	1	27	1	71	9	32	2
United Kingdom: England and Wales ^l										
all forms	5,982	657	7,760	734 ^c	2,614	191 ^c	3,910	275 ^c	4,547	320 ^c
paralytic cases	.	.	5,565	.	1,529	.	2,747	.	2,976	.
Northern Ireland	40	4	273	25 ^c	80	10 ^c	142	7 ^c	290	.
Scotland ^l	185	14	1,112	64 ^c	316	24 ^c	217	12 ^c	436 ^m	13 ^c
Yugoslavia	169	20	104	16	299	18	128	10	603	25
OCEANIA										
Australia	1,648	86	2,206	113 ^c	4,736	346 ^c	1,743	109 ^c	1,719	.
French Oceania	—	—	—	—	140	9	1	1	—	—
Gilbert and Ellice Islands	—	.	—	.	—	.	147	14	2	.
Guam	.	.	13	—	9	2	—	—	14	1

**TABLE I. NOTIFIED CASES OF, AND DEATHS FROM, POLIOMYELITIS :
VARIOUS COUNTRIES, 1949-53 (concluded)**

Countries or territories	1949		1950		1951		1952		1953	
	cases	deaths	cases	deaths	cases	deaths	cases	deaths	cases	deaths
OCEANIA (contd)										
Hawaii Islands (paralytic cases)	21	1	30	—	16	—	156	14	38	.
Netherlands New Guinea	—	.	2	.	31	.	—	.	7	.
New Zealand: White population	346	13	70	2	26	1	861	54	401 ^a	.
Maoris	9	3	2	—	1	1	29	3	.	.
Papua and New Gui- nea (Australian administration)	2	.	107	.	36	.	2	.	3	.
Solomon Islands: British Protectorate	—	.	1	.	1,280	156	2	—	.	.

* Provisional or approximate figures

. No information available

^a Cases treated in hospitals and dispensaries^b Deaths in hospitals^c 1948 nomenclature (excluding sequelae)^d Notified cases and deaths (corresponding figures for 1952 : 122 cases, 10 deaths)^e Deaths for the whole territory^f 10 months^g 24 weeks^h Reporting areaⁱ Jewish population

From 1950, including Western Jordan (old territory, 1950 : 10 cases, 0 deaths)

^k 6 months^l Confirmed cases^m Notified cases (corresponding figure for 1952 : 285 cases)ⁿ Preliminary figure for the whole population : 501 (in 1952 : 1,043)**TABLE II. NOTIFIED CASES OF POLIOMYELITIS, BY SEX
AND AGE-GROUP : EGYPT, 1953 ***

Age-groups (years)	Males		Females		Total	
	no. of cases	%	no. of cases	%	no. of cases	%
under 1	69	23.3	68	28.5	137	25.6
1-2	177	59.8	125	52.3	302	56.5
3-4	36	12.2	31	13.0	67	12.5
5-9	11	3.7	10	4.2	21	3.9
10-14	1	0.3	2	0.8	3	0.6
15-34	0	0.0	1	0.4	1	0.2
35 and over	2	0.7	2	0.8	4	0.7
Total	296	100.0	239	100.0	535	100.0

* Cases for which information by sex and age-group was available.

TABLE III. NOTIFIED CASES OF, AND DEATHS FROM, POLIOMYELITIS, BY FOUR-WEEK PERIOD : EGYPT AND CAIRO, 1953

Final date of four-week period	Egypt (including Cairo)		Cairo	
	cases	deaths	cases	deaths
31 January 1953	30	0	17	0
28 February	33	2	20	1
28 March	31	5	23	3
25 April	45	4	26	2
23 May	39	2	20	1
20 June	37	3	30	2
18 July	73	6	59	1
15 August	52	2	39	1
12 September	39	2	27	0
10 October	51	2	45	2
7 November	41	0	34	0
5 December	42	9	34	3
2 January 1954	38	6	33	4
Total	551	43	407	20

21 in Tunisia in ten months); *Ruanda-Urundi* and *Tanganyika* (50% increase); and *Union of South Africa* (25% increase).

On the other hand, there was a drop in the apparent incidence in : *Mauritius*, where there was a 90% decrease in the number of cases treated in hospitals and dispensaries; *Uganda* (80% drop); *Kenya* (about 50% less). The same was true of *Algeria*, *Mozambique*, and *Northern Rhodesia* where, however, the 1952 figures were already low, and of *Southern Rhodesia*.

In 1953 there was an epidemic in *Angola* which, although less serious than that of 1951, was nevertheless relatively serious (378 cases and 19 deaths as compared with 764 cases and 60 deaths). The first 7 cases were notified in December 1952 in the "circulo sanitario" (sanitary circle) of Congo. The epidemic reached its peak in the following month (77 cases, 4 deaths). One hundred and eighty-one cases and 11 deaths were noted in the Congo sanitary circle; 110 cases (4 deaths) in the Luanda region where the first cases of the 1951 epidemic were observed; and 49 cases (4 deaths) in the Benguela sanitary circle.

In the *Belgian Congo* in 1953 the apparent morbidity figures rose, as compared with 1952, in the provinces of Leopoldville (320 cases, 28 deaths),

Kivu (128 cases, 11 deaths), Katanga (158 cases, 11 deaths), and Kasai, whereas there was a considerable drop in Equator Province (25 cases and 1 death only as compared with 318 cases and 9 deaths in 1952) and a slight decrease in Eastern Province. Altogether, 736 cases (59 deaths) were notified in 1953.

America (table I)

The year 1953 was characterized by an appreciable drop in the number of notifications in several countries on the American continent—namely, *Chile, Cuba, and the United States of America*—that is, for Chile, according to the data available for the first five and a half months of the year (171 cases notified as compared with 368 for the corresponding period in 1952). There was a less marked decrease in six other countries or territories: *Alaska, Guatemala, the Panama Canal Zone, Peru, Puerto Rico, and Venezuela*. It should be noted that in *Alaska, Chile, Cuba, Guatemala, Peru, the United States of America, and Venezuela* there were serious epidemics in 1952.

On the other hand, there was a substantial rise in apparent morbidity in *Argentina, Brazil, Canada, Colombia, El Salvador, Greenland, Mexico, Nicaragua, and Uruguay*.

In *Greenland*, an epidemic broke out on 22 January at Umanak (1,600 inhabitants), one of the most northerly districts. Up to 22 June there were 80 cases (21 paralytic, 1 death). In the Egedesminde district (2,700 inhabitants), where the first case appeared on 13 May, the epidemic was more serious (of the 75 patients treated, 52 were paralysed and 11 died). The epidemic continued until 3 August. In the Julianehaab and Natortalik districts (4,500 inhabitants), 12 cases were notified (4 deaths); the first diagnosis was made on 12 July and no case was observed after 2 August.

Canada experienced in 1953 the most serious outbreaks of poliomyelitis ever recorded in its history. The figure for notified cases was 8,734, representing an increase of 84% over the 1952 figure, which constituted the previous record. Moreover, these figures do not include the Yukon and the North West Territories, where a number of cases were notified. This exceptionally high incidence affected six Provinces only. In Prince Edward Island the situation was quite different, the 1953 figures showing an improvement on those for 1952; this applied also to Nova Scotia, where there had already been a drop from 1951 to 1952, and to New Brunswick and Saskatchewan. The largest outbreaks were noted in: Newfoundland (233 notifications as compared with 4 in 1952); Quebec Province (488 as compared with 125); Ontario (2,239 as compared with 705); Alberta (1,425 as compared with 740); British Columbia (797 as compared with 596); and, in particular, in Manitoba, where the 2,320 cases notified in 1953, compared with 839 in 1952, represent 27% of the total notifications and

exceeded the annual figures for Canada in most of the 29 preceding years. The highest notification-rates (per 100,000 inhabitants) were observed in : Manitoba (287 cases); Alberta (142); Saskatchewan (128); British Columbia (65); Newfoundland (61); and Ontario (46). Next came : New Brunswick⁽¹⁶⁾; Quebec Province (11); Prince Edward Island (10); and Nova Scotia (5). It is interesting to note that the three Provinces with the highest morbidity-rates were among those with the lowest average population density (somewhat less than 1.5 inhabitants per km², or 4 inhabitants per square mile). The notification-rate for the country as a whole was 59 per 100,000 inhabitants (as compared with 33 in 1952 and 18 in 1951). This rate considerably exceeded the record rate registered in the United States of America in 1952 (37 cases per 100,000 inhabitants).

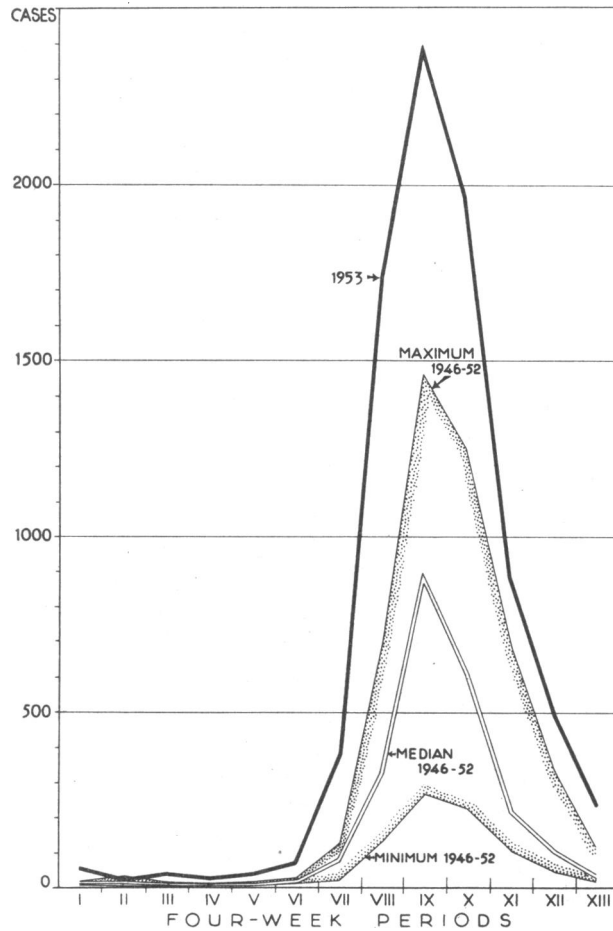
According to the available provisional data, there were 398 deaths in the country as a whole, including 106 in Alberta, 77 in Ontario, 73 in Manitoba, and 70 in Saskatchewan. The case-fatality-rate was thus higher in Alberta and in Saskatchewan than in the other two Provinces. The provisional mortality-rate for Canada was therefore about 2.7 per 100,000 inhabitants. (The final rate for 1952 was 2.2.)

It is important to note that of the 8,734 cases of poliomyelitis notified in 1953, 42% were paralytic forms of the disease, 35% non-paralytic forms, and 23% non-specified forms. The 1951 and 1952 figures were distributed somewhat differently : 45%, 50%, and 5%, respectively, for 1951; and 46%, 40%, and 14%, respectively, for 1952. In Manitoba, paralytic symptoms were noted in 30% of patients over 20 years of age.

Provisional information covering the Yukon and the North West Territories provides the following data : In the Yukon (about 9,000 inhabitants), an epidemic began in the second week of May among the military personnel billeted at Whitehorse. One hundred and forty-one cases were notified (36 paralytic, 9 deaths). These included 124 cases (4 deaths) from 1 May to 20 June as compared with 113 cases throughout the rest of Canada from 26 April to 20 June. In the North West Territories (about 16,000 inhabitants), 17 cases were notified (12 paralytic, 3 deaths).

Fig. 1 shows the four-weekly distribution of poliomyelitis in Canada in 1953, as compared with the maximum, median, and minimum figures for the seven preceding years.

Unlike Canada, the *United States of America* experienced a certain regression in poliomyelitis incidence in 1953. There were 35,592 final notifications (22 per 100,000 inhabitants)—that is 39% less than in 1952, the record year. Of these notifications, 60% were from 10 States which contain 52% of the country's population : California, 4,078 (4,047 in 1952); New York, 2,984 (2,506); Ohio, 2,635 (3,333); Michigan, 2,346 (3,912); Minnesota, 2,254 (4,130); Illinois, 2,041 (4,002); Texas, 1,751 (3,984); Pennsylvania, 1,471 (1,965); North Carolina, 926 (538); and Missouri, 877 (1,193).

FIG. 1. NOTIFIED CASES OF POLIOMYELITIS, BY FOUR-WEEK PERIOD : CANADA, 1946-53

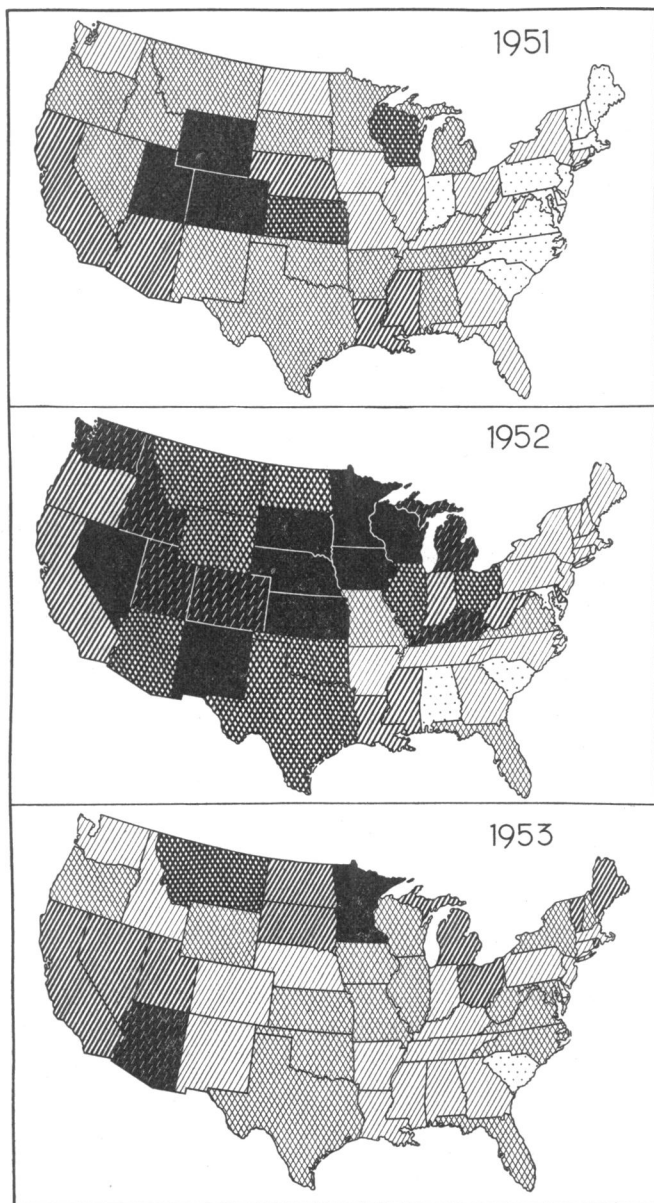
Excluding Yukon and the North-West Territories; since 1950, including Newfoundland.

The curve for 1953 is based on preliminary figures.

Fig. 2 shows the 1953 notification-rates per State compared with those for the two preceding years. From the number of notifications it may be seen that the incidence was lower than in 1952 in 34 States (plus the District of Columbia) and higher in 13 States; the situation remained almost identical in one State only (New Jersey).

The most marked improvements (70%-90%) were observed in the following 9 States : Nebraska (231 notifications in 1953 as compared with 2,247 in 1952); Iowa (613 as compared with 3,564); Kentucky (368 as

**FIG. 2. DISTRIBUTION OF POLIOMYELITIS :
UNITED STATES OF AMERICA, 1951-3**



Cases per 100,000 inhabitants

0.1-9.9 10-19.9 20-29.9 30-39.9 40-49.9 50-59.9 60+

Preliminary rates based on annual figures published by the National Foundation for Infantile Paralysis.

compared with 1,762); New Mexico (108 as compared with 502); South Dakota (225 as compared with 1,017); Idaho (97 as compared with 353); Delaware (32 as compared with 117); Colorado (194 as compared with 688); and Kansas (515 as compared with 1,718). With the exception of 4 (Alabama, Arizona, California, and New York), the 13 States in which the notification-rate rose are concentrated in two regions—namely, New England (Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont) and the South Atlantic (Florida, Maryland, North Carolina, and Virginia). In most of them, incidence had already increased from 1951 to 1952. In 1953, the morbidity-rate exceeded 40 per 100,000 inhabitants in 3 States only (Minnesota, where there were 74 cases per 100,000 inhabitants, Arizona, and Montana) whereas in 1952 this rate was exceeded in 22 States. According to the notification-rates, the least affected States were mainly those in the eastern half of the USA, and they were also among the most densely populated States, as during the period 1948-51.

The final mortality figures are not yet available. For the 16-week period ending 10 October 1953, the provisional figures showed total deaths as 346, which represents an extremely low case-fatality-rate of about 1.3%. These provisional figures are probably somewhat lower than the real rate, since the case-fatality-rate was never lower than 5.4% during the ten preceding years.

Forty-four per cent. of the cases were registered as "paralytic" (37% in 1952, 35% in 1951); 34% were "non-paralytic"; and 22% non-specified forms.

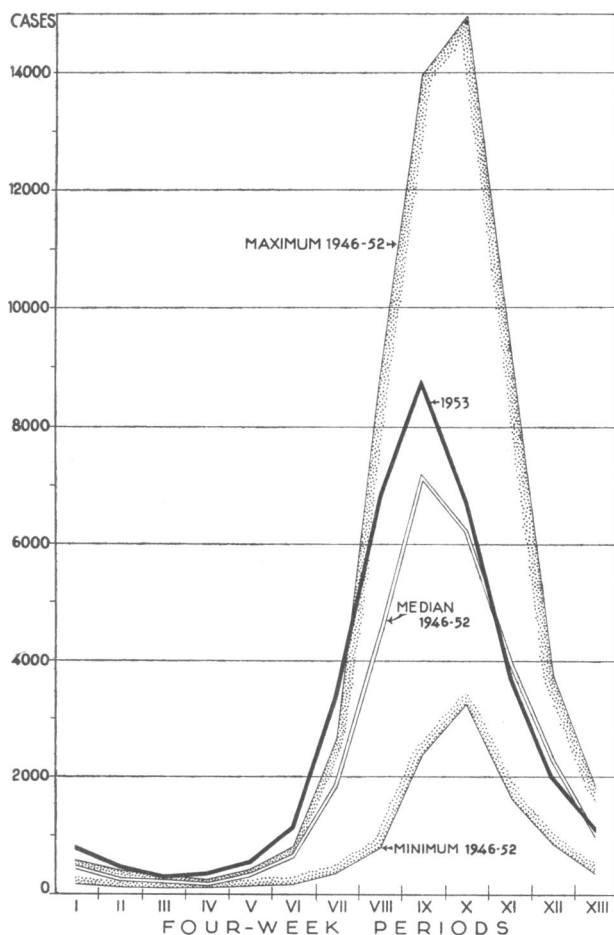
Fig. 3 shows the four-weekly distribution of poliomyelitis in the USA for 1953, as compared with the maximum, median, and minimum figures for the seven preceding years. The evolution of poliomyelitis in Canada and in the USA in the past 33 years is shown in fig. 4.

The number of notifications for 1953 in *Mexico* (1,787) has been exceeded only once since 1937 (in 1951).

A study of the known data for *Nicaragua* since 1938 (not available for the years 1939, 1942, and 1945) indicates that in 1953 this country suffered the most serious epidemic so far observed. The number of notifications (181 cases with 8 deaths) exceeds the record annual figure (93 cases in 1946) and almost equals the total number of cases registered throughout the seven preceding years (202 cases).

For *Colombia*, recent data are incomplete. From 1945 to 1949 the only figures available were those of the deaths due to poliomyelitis, and these varied between 160 and 205; only 133 cases were notified in 1950 for a part of the territory which contained 70% of the total population; this figure fell to 29 in 1952 and rose again to 153 in 1953. It is likely that these morbidity figures give only a very vague reflection of the real situation.

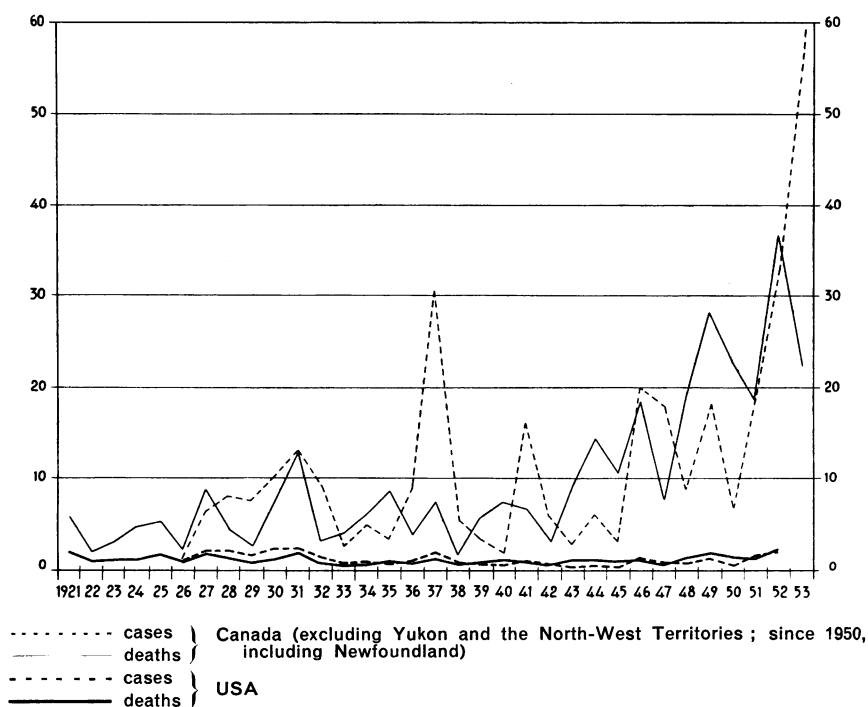
FIG. 3. NOTIFIED CASES OF POLIOMYELITIS, BY FOUR-WEEK PERIOD : UNITED STATES OF AMERICA, 1946-53



In the State capitals and Federal District of *Brazil*, the provisional notifications for 1953 (940 cases, 79 deaths) almost exceeded the total for the eight preceding years. In May and June the notification figures were higher than the total for any of the nine preceding years, with the exception of 1946. Paralytic cases for the whole year numbered 680 (36 deaths) for the Federal District alone, as against 330 (54 deaths) for the nine preceding years.

In *Argentina*, provisional reports for 1953 gave the number of notifications as 2,537, including 1,999 for the first six months. During the first quarter, notifications (1,015) exceeded the total for five of the six preceding

**FIG. 4. ANNUAL INCIDENCE OF POLIOMYELITIS :
CANADA AND UNITED STATES OF AMERICA, 1921-53
(RATES PER 100,000 INHABITANTS)**



years, the period for which figures are available. Distribution of the 1,999 cases by political division and age-group is given in tables IV and V. There is every reason to suppose that the final figures will be higher. In fact, from 1947 to 1949 the final figures covering notified cases were from two to three times as high as the provisional figures (in 1949, the final figure for the year was 1,022 as compared with a provisional figure of 368 for eleven months).

Asia (table I)

Throughout 24 Asiatic countries or territories only about 3,950 cases of poliomyelitis were notified in 1953, which is over 1,000 less than in 1952 (*Japan*, 2,352 ; *Israel*, 637 ; *Ceylon*, 151 ; *Federation of Malaya*, 133 ; *Bangkok*, *Thailand*, 80 ; etc.). This total does not include *India*, for which only hospital statistics are known, or *Pakistan*, where 22 cases were noted (2 only in 1952, during the week ending 26 January). Although the available information is inadequate, it would seem that poliomyelitis morbidity decreased in a certain number of countries in 1953. This was the case in :

Cambodia (where 1952 was an epidemic year), *Ceylon, India, Israel, Lebanon, Philippines, and Thailand* (80 cases notified in Bangkok as compared with 283 from July to December 1952).

Although violent epidemics were noted a few years ago in *Israel*, the number of notifications has been decreasing greatly during the past three

**TABLE IV. NOTIFIED CASES OF POLIOMYELITIS, BY MONTH
AND BY POLITICAL DIVISION : ARGENTINA, JANUARY-AUGUST 1953**

Divisions	January	February	March	April	May	June	Total January- June	July	August
Federal Capital	64	39	79	74	33	26	315	9	18
Buenos Aires	102	64	170	191	70	42	639	22	20
Catamarca	—	1	3	9	6	3	22	—	—
Córdoba	8	5	20	32	14	4	83	3	2
Corrientes	2	—	—	12	—	—	14	—	10
Entre Ríos	3	1	8	23	40	9	84	7	4
Eva Perón	—	—	1	14	7	1	23	1	1
Jujuy	—	—	1	2	2	—	5	1	—
La Rioja	—	—	3	19	4	5	31	—	3
Mendoza	11	4	11	—	—	—	26	—	—
Presidente Perón	—	1	1	2	3	3	10	4	3
Salta	—	—	—	9	1	1	11	—	—
San Juan	—	1	1	—	—	1	3	1	—
San Luis	—	2	2	—	—	—	4	—	—
Santa Fe	4	35	192	181	64	6	482	2	—
Santiago del Estero	3	2	2	5	—	—	12	—	1
Tucumán	31	54	75	37	11	3	211	5	—
Comodoro Rivadavia	—	—	—	—	—	—	—	—	—
Chubut	—	—	—	—	—	1	1	—	—
Formosa	—	—	—	—	—	—	—	—	—
Misiones	1	1	2	1	2	3	10	3	3
Neuquén	—	—	1	4	1	—	6	—	—
Río Negro	2	—	2	1	1	—	6	—	—
Santa Cruz	—	—	—	—	—	1	1	—	—
Tierra del Fuego	—	—	—	—	—	—	—	—	—
Total	231	210	574	616	259	109	1,999	58	65

TABLE V. NOTIFIED CASES OF, AND DEATHS FROM, POLIO-MYELITIS, BY AGE-GROUP : ARGENTINA, JANUARY-JUNE 1953

Age-groups (years)	Cases		Deaths	
	no.	%	no.	%
under 2	1,119	56.0	54	40.0
3-7	552	27.6	40	29.6
8-15	208	10.4	19	14.1
16-25	81	4.0	16	11.9
26 and over	39	2.0	6	4.4
Total	1,999	100.0	135	100.0

years (1,604 in 1950, 637 in 1953). This fact is all the more noteworthy in that the notifications refer practically exclusively to the Jewish population, which has increased by 34% during the period. The case-fatality-rate, on the other hand, appears to be increasing (12.8 in 1950; 19.4 in 1951; 19.5 in 1952—Jewish population, final figures; the 1953 figure (19.5), which is only provisional, is very probably lower than the actual figure, as was the case in preceding years). Table VI gives the attack-rates per 10,000 population by age-group in Israel in 1950 and 1951.

TABLE VI. NOTIFIED CASES OF POLIOMYELITIS, BY AGE-GROUP : ISRAEL, 1950 AND 1951 (RATES PER 10,000 POPULATION)

Age-groups (years)	1950	1951
under 1	126	58.8
1	159	80.1
2	84	39.9
3	53	17.2
4	35	15.5
5	16	11.3
6	14.9	6.0
7-9	7.1	4.1
10-14	4.1	1.5
15-19	2.2	0.9
20 and over	1.1	0.3
Total	14.5	6.9

In *India*, the Punjab hospitals treated 380 cases in eleven and a half months; the hospitals of the States of Madras and Delhi, 338 and 97 cases, respectively; and those of the rest of the country, 230 cases during the greater part of the year; in 1952, 1,257 patients were hospitalized, mainly in the Punjab (313) and in the States of Madras (290), Bombay (216), and Delhi (173). Table VII gives, by age-group, the number of cases of paralytic poliomyelitis notified in Bombay from 1949 to 1954.

TABLE VII. NOTIFIED CASES OF POLIOMYELITIS (PARALYTIC ONLY), BY AGE-GROUP : BOMBAY, INDIA, 1 SEPTEMBER 1949 — 10 AUGUST 1954

Age-groups	1949 ^a		1950		1951		1952		1953		1954 ^b	
	no. of cases	%	no. of cases	%	no. of cases	%	no. of cases	%	no. of cases	%	no. of cases	%
under 6 months	4	7.8	5	3.7	8	10.7	14	8.3	6	6.5	9	5.9
6-12 ..	20	39.2	34	25.6	28	37.3	45	26.6	23	25.0	46	30.3
1- 2 years	12	23.5	40	30.1	27	36.0	55	32.5	38	41.3	61	40.1
2- 3 ..	3	5.9	27	20.3	5	6.7	29	17.2	14	15.2	21	13.8
3- 4 ..	3	5.9	9	6.8	0	0.0	18	10.6	4	4.4	3	2.0
4- 5 ..	0	0.0	5	3.7	1	1.3	2	1.2	1	1.1	1	0.7
5 years and over	6	11.8	12	9.0	6	8.0	5	3.0	6	6.5	11	7.2
?	3	5.9	1	0.8	0	0.0	1	0.6	0	0.0	0	0.0
Total	51	100.0	133	100.0	75	100.0	169	100.0	92	100.0	152	100.0

^a Notifications since 1 September only

^b Notifications until 10 August only

In only a few cases are the 1953 figures for Asiatic countries higher than in 1952: in *Japan*, where, however the number of notifications did not exceed 2,352 (467 deaths), as compared with 2,308 (508 deaths) in 1952, and eight other countries or territories for which the total number of cases reported is too low to make it possible to draw any conclusions (248 notifications in 1953 as compared with 165 in 1952).

Europe (table I)

Statistical data are available for 26 European countries or territories. About 27,000 cases of poliomyelitis were notified in 1953 as compared with 32,000 in 1952. More than half this number (56%) occurred in three countries—namely, *England and Wales*, *Italy*, and *Sweden*. Incidence of the

disease rose in 15 countries, as may be seen from table VIII: in *Sweden*, there were ten times as many cases as in 1952; in *Yugoslavia*, four or five times as many; in *Saarland* and in *Finland*, four times as many; in *Austria*, *Greece*, and the *Republic of Ireland* the incidence also increased considerably. Comparatively less important outbreaks were noted in seven other countries and, in particular, in *Italy*, where—as in *England and Wales*—notifications numbered approximately 5,000. The most marked decreases in incidence

TABLE VIII. NOTIFIED CASES OF POLIOMYELITIS : EUROPE, 1952 AND 1953

Countries or territories	1952	1953	Quotient 1953 1952
Sweden	492	5,090	10.3
Trieste : British/United States Zone	3	16	5.3
Yugoslavia	128	603	4.7
Saarland	22	89	4.0
Finland	82	316	3.9
Austria	200	529	2.6
Ireland, Republic of ^a	96	245	2.6
Greece	55	140	2.5
Northern Ireland	142	290	2.0
Italy	2,708	4,995	1.8
Scotland ^b	285	436	1.5
Norway	724	1,095	1.5
Switzerland	579	764	1.3
England and Wales ^b	4,475	5,250	1.2
France	1,665	1,834	1.1
Malta	37	26	0.7
Portugal ("continent")	132	89	0.7
Spain ^a	1,584	932	0.6
Turkey	71	32	0.5
Berlin (Western Sectors)	211	86	0.4
Iceland	30	10	0.3
Denmark	5,676	1,591	0.3
Germany : Federal Republic	9,517	2,243	0.2
Belgium	897	184	0.2
Luxembourg	61	7	0.1
Netherlands	1,712	171	0.1

^a Paralytic cases ^b Total notifications

occurred in the countries which were most affected by poliomyelitis in 1952 (*Belgium, Denmark, Federal Republic of Germany, Luxembourg, and the Netherlands*). In these countries, only 4,196 cases were noted in 1953—16% of the total cases for Europe—as compared with 17,863 (57%) in 1952.

TABLE IX. NOTIFIED CASES OF POLIOMYELITIS : EUROPE, 1946-1952 AND 1953

Countries or territories	Number of cases		Rate per 100,000 inhabitants				Quo- tient 1953
	1946-1952		1953	1946-1952		1953	
	maxi- mum	me- dian		maxi- mum	me- dian		me- dian
Sweden	2,560	818	5,090	36.8	11.9	71.0	6.0
Saarland	217	22	89	22.7	2.3	9.1	4.0
Yugoslavia	299	135	603	1.8	0.9	3.5	3.9
Northern Ireland	273	80	290	19.9	5.8	21.0	3.6
Denmark	5,676	505	1,591	131.0	12.2	36.5	3.0
Trieste : British/United States Zone	25 ^a	6 ^a	16	8.5 ^a	2.0 ^a	5.4	2.7
Ireland, Republic of ^b	291	96	245	9.8	3.3	8.3	2.5
Turkey	71	12	32	0.32	0.06	0.14	2.3
Spain ^b	1,705	483	932	6.1	1.7	3.3	1.9
Italy	2,869	2,708	4,995	6.4	5.7	10.5	1.8
Scotland ^c	1,693	285	436	32.9	5.6	8.5	1.5
Norway	2,233	724	1,095	67.7	21.8	32.6	1.5
Finland	322	228	316	8.0	5.9	7.6	1.3
Austria	3,508	427	529	50.7	6.1	7.6	1.2
Belgium	897	144	184	10.3	1.7	2.1	1.2
England and Wales ^c	9,199	4,475	5,250	21.4	10.1	11.9	1.2
Luxembourg	61	6	7	20.3	2.0	2.3	1.2
France	1,979	1,545	1,834	4.9	3.8	4.3	1.1
Switzerland	932	658	764	20.9	14.2	15.7	1.1
Greece	374	146	140	4.9	2.0	1.8	0.9
Germany (Federal Republic)	9,517	2,830	2,243	19.6	5.9	4.6	0.8
Portugal (" continent ")	200	132	89	2.6	1.7	1.1	0.6
Malta	154	43	26	49.4	13.7	8.2	0.6
Netherlands	1,712	357	171	16.5	3.8	1.6	0.4
Berlin (Western Sectors)	1,218	211	86	59.4	9.7	3.9	0.4
Iceland	622	227	10	444.3	169.4	6.7	0.04

^a 1948-52 ^b Paralytic cases ^c Total notifications

**FIG. 5. ANNUAL INCIDENCE OF POLIOMYELITIS :
SCANDINAVIA, 1921-53 (RATES PER 100,000 INHABITANTS)**

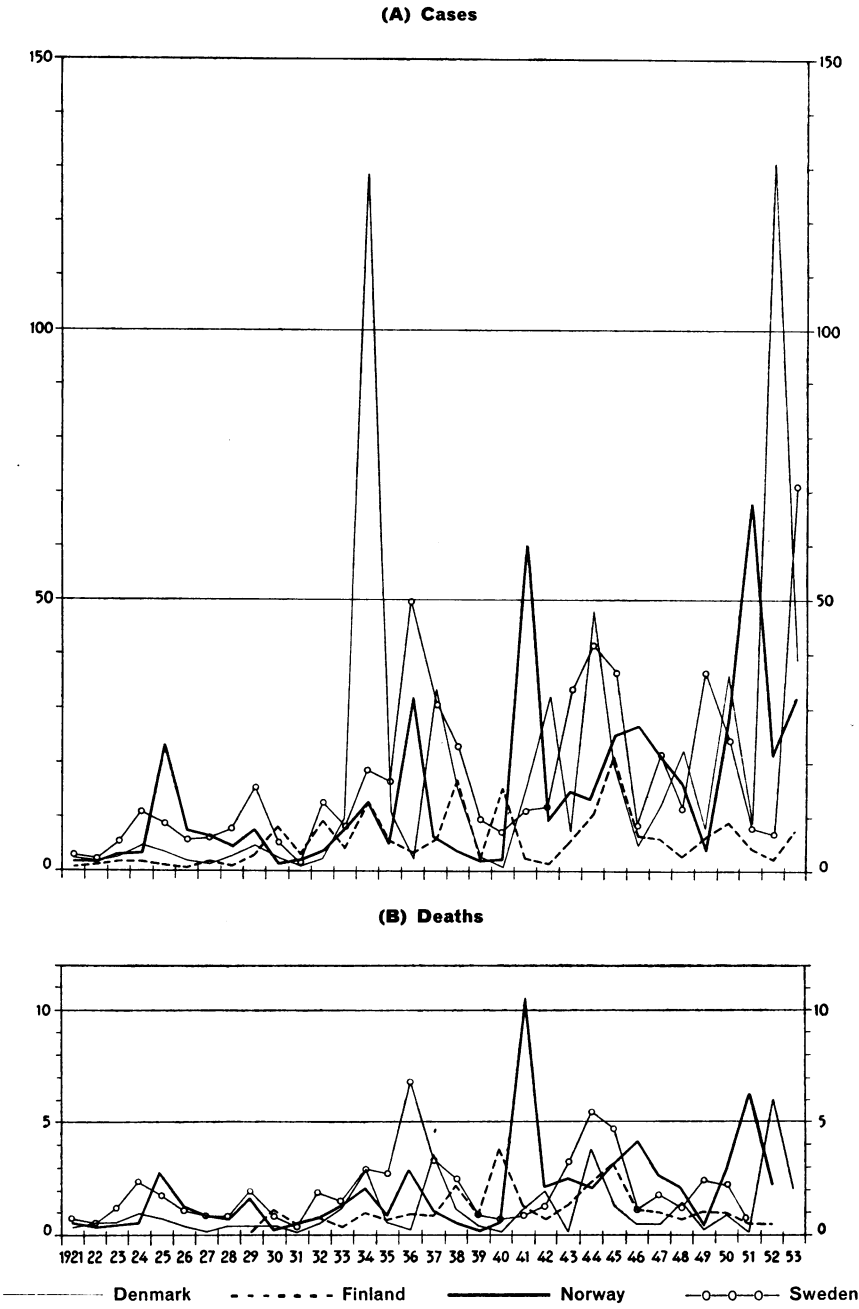
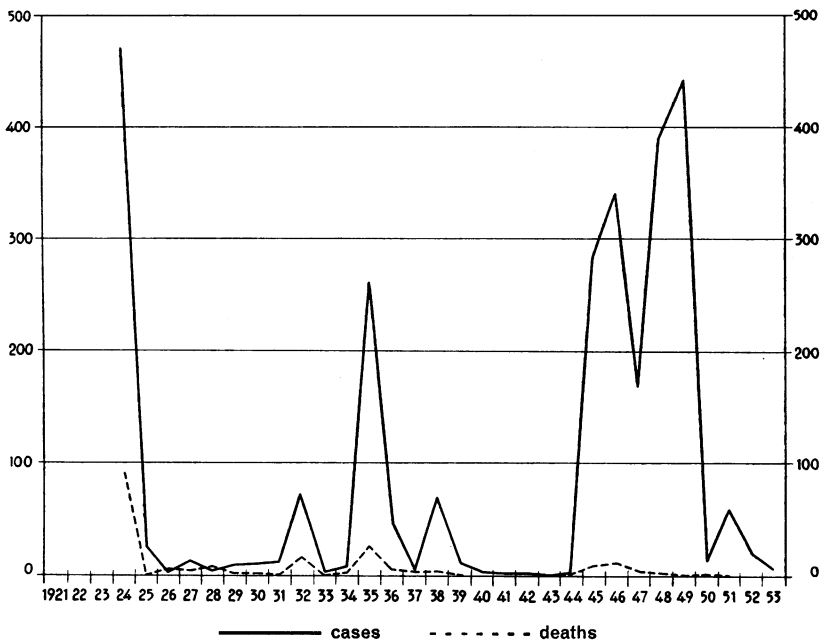


Table IX shows that for 19 countries or territories the 1953 notifications were higher than the median for the seven preceding years; the maximum observed during that period was, in fact, exceeded in Italy, Northern Ireland, Sweden, and Yugoslavia.

Northern Europe

Fig. 5 and 6, which have been commented upon in another study,¹⁰ show the poliomyelitis morbidity and mortality developments in Scandinavia in the past 30-33 years in so far as they are indicated by official statistics. In the present article we shall confine ourselves to pointing out that, apart from Iceland, where exceptional rates have been registered in the past, the highest morbidity-rates during recent years have been observed in : Denmark in 1952 (131 cases per 100,000 inhabitants); Sweden in 1953 (71 cases per 100,000 inhabitants); Norway in 1951 (68 cases per 100,000 inhabitants). During recent epidemics, the mortality-rate was about 6 deaths per 100,000 inhabitants—a relatively low figure—in Norway (1951) and Denmark (1952). There is as yet no definitive information concerning the mortality during the 1953 Swedish epidemic but, according to the available provisional figures, it appears—as mentioned later in this study—that the epidemic was not particularly deadly.

**FIG. 6. ANNUAL INCIDENCE OF POLIOMYELITIS :
ICELAND, 1924-53 (RATES PER 100,000 INHABITANTS)**

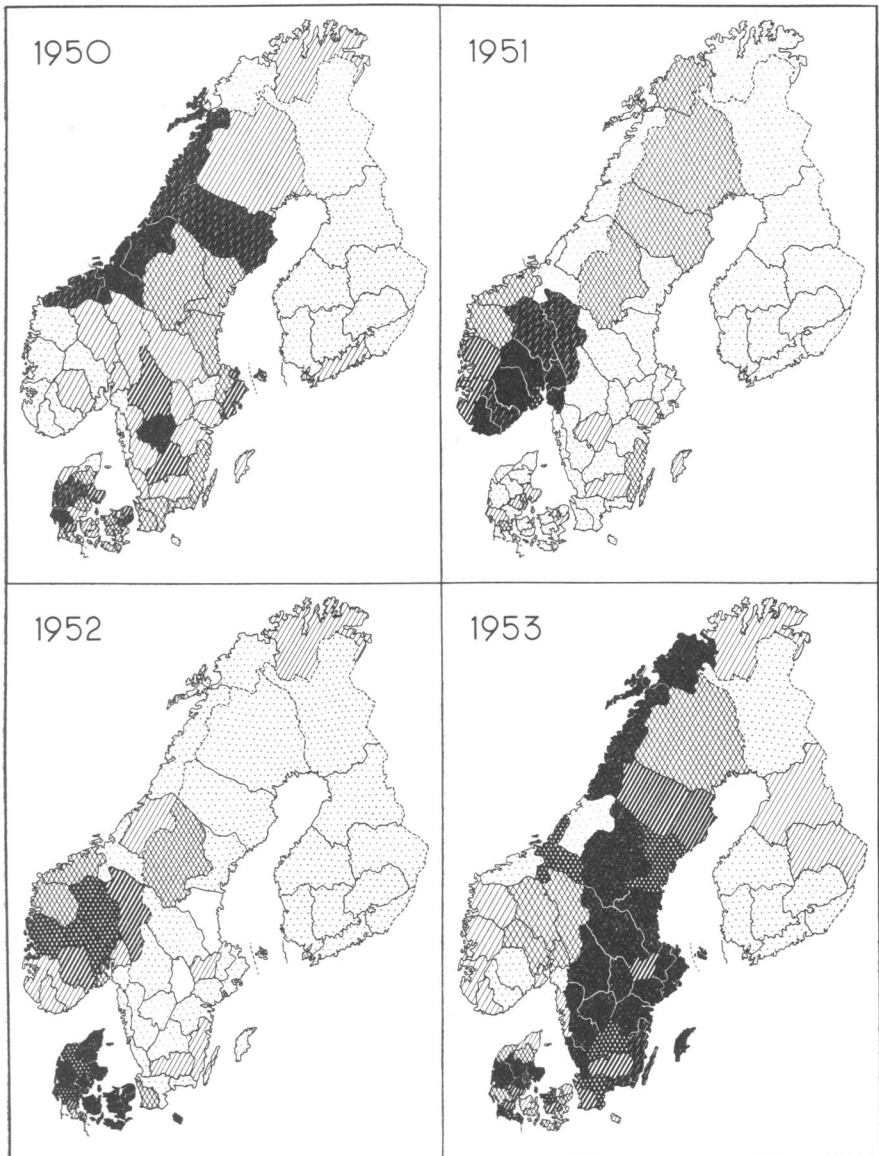


In fig. 7 the distribution of poliomyelitis in the Scandinavian countries has been shown for 1950-3 in order to enable the reader to compare the data with the figure published in a previous study⁴⁸ on the subject of regional distribution of the disease in Sweden for the period 1947-9. According to fig. 7, Finland has been relatively little affected during the past four years: with the exception of the Åland Islands in 1951 and 1953, the morbidity-rate has not exceeded 13 cases per 100,000 inhabitants for most counties, whereas the figures for many of the administrative subdivisions of other countries in the region seem to have been much higher. Nevertheless, it may be asked whether this is a true picture of the situation since, from September to December 1953 (period for which information of this type is available), the number of non-paralytic cases registered in Finland amounted to only 15% of the total notifications whereas, with the exception of the city of Oslo (where only the paralytic forms are recorded), the proportion has varied during the past four years between 20% and 35% in Norway, 26% and 40% in Sweden, and 56% and 95% in Denmark. It must be admitted that the existence of wide discrepancies of this order means that any comparison of morbidity statistics—even between those of neighbouring countries with similar health and social conditions—can be made only with very definite reservations.

Fig. 8 and 9 show the monthly distribution of poliomyelitis in Finland and Sweden, respectively, for 1953, as compared with the maximum, median, and minimum figures for the seven preceding years.

In Sweden, the 1953 epidemic was the most serious ever observed in that country: 5,090 cases of poliomyelitis were notified, which is nearly 2,000 more than in 1936, the previous record year. In the county of Stockholm alone (including the capital) there were more notifications than for the whole of Sweden during most of the preceding 34 years. The county of Stockholm and the adjacent counties of Uppsala and Södermanland, in which 21% of the country's inhabitants live, were responsible for 40% of the notified cases (1,552, 195, and 281, respectively). The average morbidity-rate for Sweden was 71 cases per 100,000 inhabitants (about 50 cases in 1936). Rates of over 100 were registered in Stockholm itself (134 cases), in the rest of the county (145), in Södermanland (130), in Gotland (128), in the county of Uppsala (125), and in Jämtland (114).

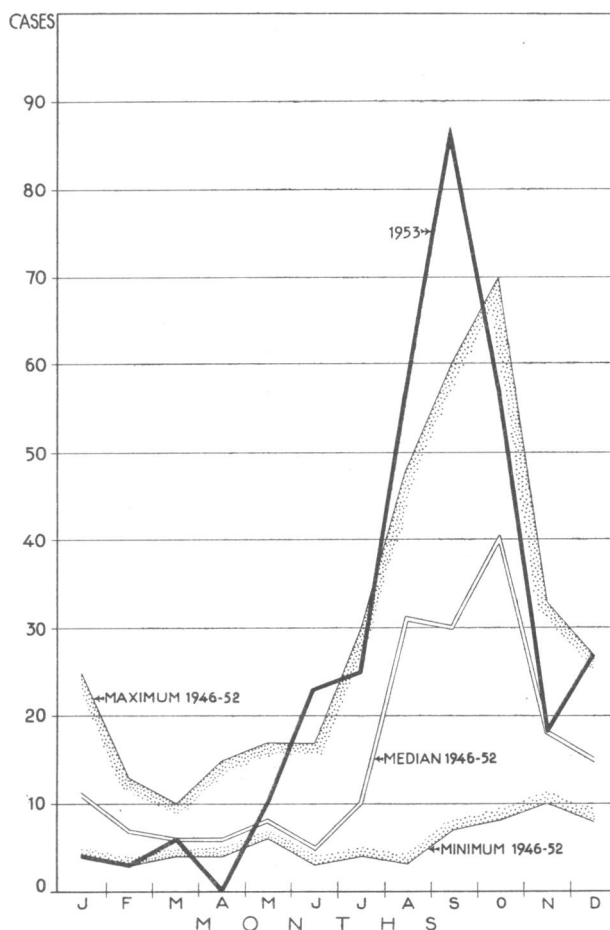
Final mortality statistics are not yet available. The provisional number of deaths recorded each week from 30 August to 15 December amounted to a total of 107, whereas the provisional figures for weekly notifications and the revised figures for bi-monthly notifications for the same period totalled 2,024 and 3,712 (2,138 paralytic cases), respectively. The 107 deaths would represent, therefore, 5.3% of the provisional number of weekly notifications, and only 2.9% of the bi-monthly notifications for the period in question. These rates are provisional but they would seem to

FIG. 7. DISTRIBUTION OF POLIOMYELITIS : SCANDINAVIA, 1950-3

Cases per 100,000 inhabitants



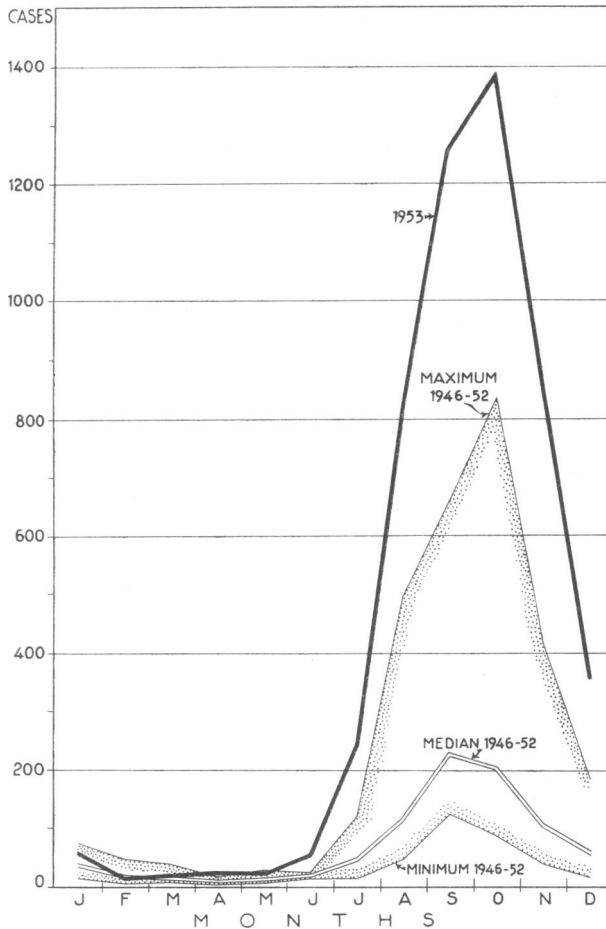
FIG. 8. NOTIFIED CASES OF POLIOMYELITIS, BY MONTH : FINLAND, 1946-53



indicate a relatively low case-fatality-rate compared with the final rates for the years 1945-52 (6.4%-13.3%). However, the percentage of paralytic cases was approximately the same as in recent years : 1950, 68%; 1951, 62%; 1952, 74%; and 1953, 60%. Fig. 10 shows the age incidence of paralytic cases for the whole country in 1953.

Of the 27 deaths noted in Stockholm during 1953, 18 were male and 9 female patients. The age-distribution of these deaths is noteworthy : 0-15 years, 1 death only (between 10 and 15); 15-20 years, 1 death; 20-40 years, 19 deaths; 40-60 years, 6 deaths. As very often happens, it was in the counties where the apparent morbidity was highest that the highest proportion of non-paralytic cases was observed, but in Göteborg and

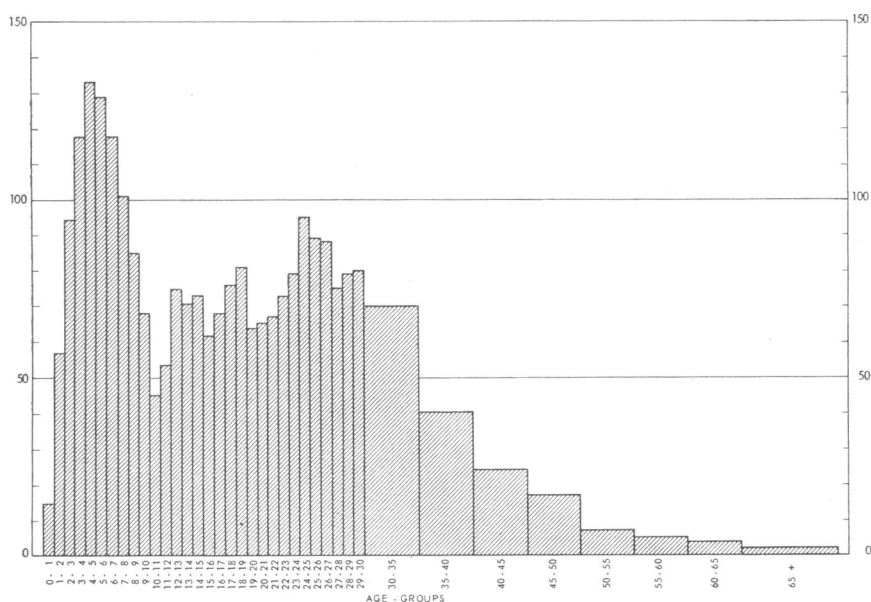
**FIG. 9. NOTIFIED CASES OF POLIOMYELITIS, BY MONTH :
SWEDEN, 1946-53**



Bohus County—where the notification-rate was lowest (17 cases per 100,000 inhabitants)—the proportion of non-paralytic cases was only 10%.

In *Finland*, the 316 cases notified in 1953 (of which 80% were in rural areas) represent the second highest morbidity-rate since 1946 (the highest occurred in 1950). The epidemic was severe and early in the Åland Islands, where 56 cases were notified (35 from May to July), giving a local morbidity-rate of 246 cases per 100,000 inhabitants. In the rest of Finland the morbidity-rate by county has not exceeded 13 cases per 100,000 inhabitants during the past four years, but in this connexion it must be remembered that only a very small proportion of non-paralytic cases are notified to the

FIG. 10. NOTIFIED CASES OF POLIOMYELITIS (PARALYTIC ONLY), BY AGE-GROUP : SWEDEN, 1953 (RATES PER 100,000 INHABITANTS)



Based on data received from G. Olin (personal communication)

health authorities (only 15% of the total number of cases reported in the last four months of the year—the only period for which the percentage is known—were non-paralytic).

In August, notification was received that the cases registered in continental Finland were concentrated around the railways—a phenomenon also observed in connexion with the influenza epidemic of the previous winter. The peak of the epidemic was reached in September, with 87 notifications.

After the Aland Islands, one of the most affected areas was that of Joensuu (county of Kuopio) near the USSR frontier. As far as can be judged from the morbidity statistics, the Finnish 1953 epidemic was not one of the most serious; there have been at least seven others since 1919 with higher absolute notification figures.

In Norway, on the other hand, the 1953 epidemic seems to have been one of the most severe : there were 1,095 final notifications, which is the highest number except for 1951 (2,233) and 1941. Most of the 1,074 cases preliminarily notified occurred in the northern two-thirds of the country, in the prefectures of More and Romsdal (181), Nordland (164), Sor-Trondelag (87), Nord-Trondelag (84), and Troms (73). In Oslo, only the paralytic cases were notified (94); in the adjacent prefecture of Akershus there were

47 cases (of which 39 were paralytic). The highest morbidity-rates were noted in Nordland (72 cases per 100,000 inhabitants) and in the prefectures of Troms (60) and Sor-Trondelag (43). It should be mentioned that in 1951 the majority of the cases were notified in the south of the country (Oslo and the surrounding prefectures, the Ostfold prefecture in particular, and the regions around Skagerrak). On an average, 20% of the 1953 notified cases were non-paralytic (excluding Oslo), which was a slightly higher proportion than in the three preceding years.

In *Denmark*, where a large number of non-paralytic cases appear in the morbidity tables (80% in 1950, 95% in 1951, 57% in 1952, 56% in 1953), there were 1,591 final notifications during 1953; this figure is very much lower than that for the preceding year (5,676). In Jutland, however, six counties were more seriously affected (664 preliminary notifications as compared with 356 in 1952), in particular those of Ringkøbing (376 cases in 1953 as compared with 179 in 1952) and Tønder (51 as compared with 0).

Distribution of notified cases by age, over the past four years, is given in table X.

The figures shown against the years at the two extremes of this table indicate that the number of cases in the youngest age-groups (under 1 and 1-14 years) tended to decrease, while the higher age-groups were more and more affected; on the other hand, the situation of the 5-14 year-olds remained more or less stationary. This tendency, which is present in a number of countries, has been mentioned elsewhere.¹⁰

**TABLE X. NOTIFIED CASES OF POLIOMYELITIS, BY AGE-GROUP :
DENMARK, 1950-3**

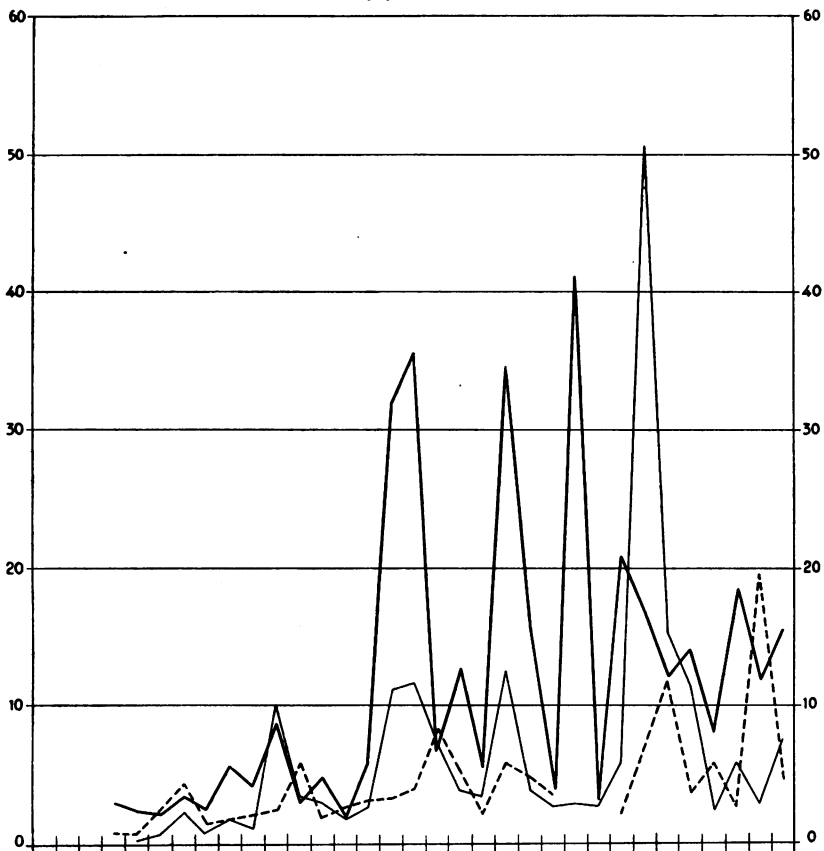
Age-groups (years)	1950 ^a		1951 ^a		1952 ^b		1953 ^b	
	no. of cases	%	no. of cases	%	no. of cases	%	no. of cases	%
under 1	52	3.3	10	2.6	165	2.9	42	2.5
1- 4	451	28.7	58	15.1	1,675	29.3	410	24.2
5-14	688	43.8	195	50.9	2,264	39.6	717	42.3
15-64	379	24.1	119	31.1	1,591	27.9	523	30.8
65 and over	1	0.1	1	0.3	16	0.3	4	0.2
Total	1,571	100.0	383	100.0	5,711	100.0	1,696	100.0

^a Final figures ^b Preliminary figures

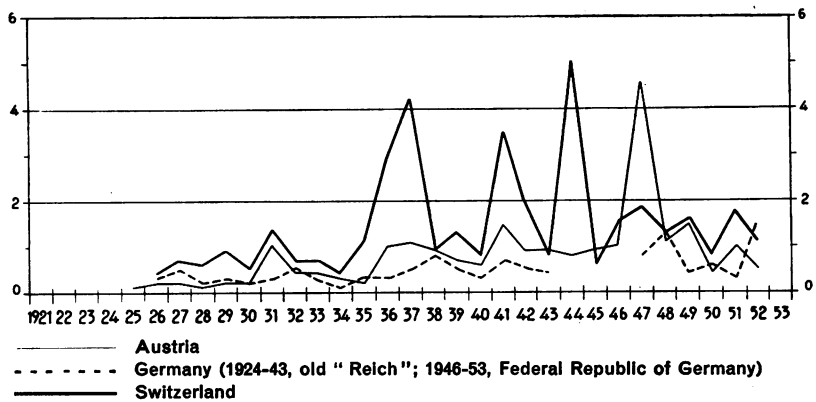
Central Europe

Fig. 11 shows the incidence of poliomyelitis in Austria, Germany, and Switzerland from 1924-6 to 1953.

**FIG. 11. ANNUAL INCIDENCE OF POLIOMYELITIS :
CENTRAL EUROPE, 1924-53 (RATES PER 100,000 INHABITANTS)**
(A) Cases

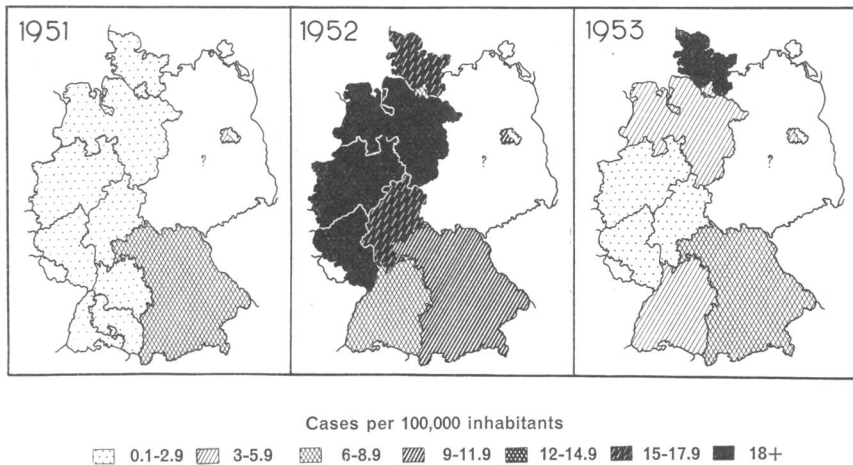


(B) Deaths



Federal Republic of Germany. There were 2,243 notifications in 1953, which was a considerable improvement upon 1952 when the record figure of 9,517 cases was reached. This improvement was quite marked in most of the "Länder", with the exception of Schleswig-Holstein, where, in 1953, there was an 18% increase in notifications (fig. 12). In Munich also, 82 cases (1 death) were observed as compared with 42 (8 deaths) in 1952. In the Federal Republic as a whole the provisional mortality figures, calculated weekly from 16 August 1953 to 2 January 1954, were 99 per 1,355 notifications; that is, a case-fatality-rate of 7.3%, which nearly equals the provisional rate of 7% for the period 13 July to 29 November of the 1952 epidemic. Of the 1,355 cases, 28% (383) were non-paralytic.

FIG 12. DISTRIBUTION OF POLIOMYELITIS : GERMANY, 1951-3



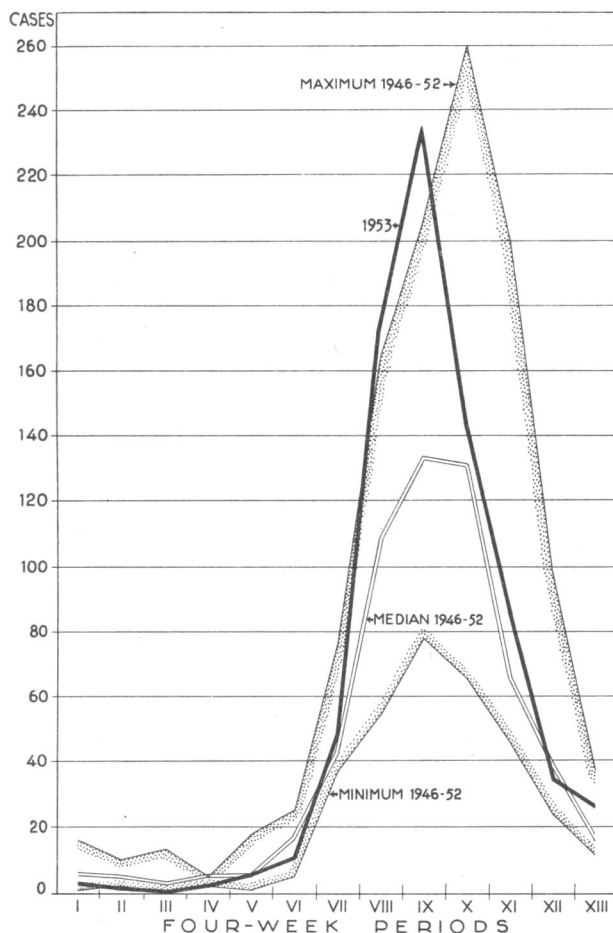
In *Saarland*, although the figures were much lower than in 1951, there were 89 cases in all—four times as many as in 1952.

The 1953 notifications for *Austria* showed 529 cases (49 deaths—provisional figure), which was an increase over the three preceding years, but a much lower figure than the annual totals for the period 1947-9. Of the provisional notifications (slightly higher than the above figure) almost three-quarters were for Upper Austria (148 cases, 6 deaths), Lower Austria (107 cases, 8 deaths), Styria (74 cases, 15 deaths), and Vienna (72 cases, 8 deaths).

In *Switzerland*, 1953 may be considered as having been an epidemic year. The 764 notifications represented the highest incidence during the past ten years, with the exception of 1944 (record year, with 1,793 notifica-

tions), 1946, and 1951. The 1953 figures showed an increase over 1952, mainly in the following Cantons : Berne (130 cases); St-Gall (111 cases); Aargau (61 cases); Glarus (54 cases); Thurgau (45 cases); Vaud (44 cases); and Basel-Stadt (24 cases). In the Canton of Zurich, 143 cases were notified,

FIG. 13. NOTIFIED CASES OF POLIOMYELITIS, BY FOUR-WEEK PERIOD : SWITZERLAND, 1946-53



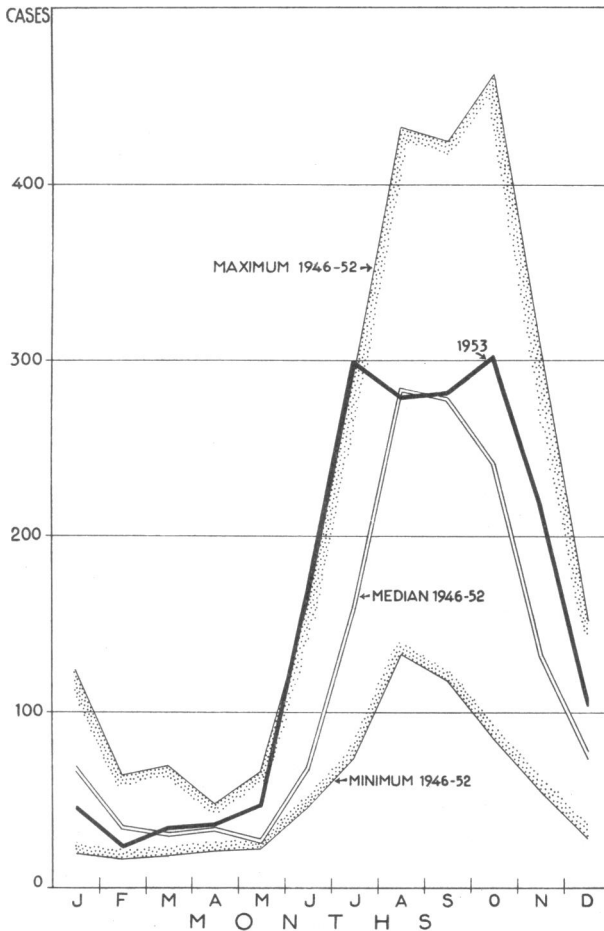
but this was an improvement on 1952. Fig. 13 shows the four-weekly distribution of poliomyelitis in Switzerland in 1953, as compared with the maximum, median, and minimum figures for the seven preceding years : the maximum figures for the years 1946-52 were exceeded in two periods in 1953 and the seasonal peak was noted a month earlier than previously.

Western Europe

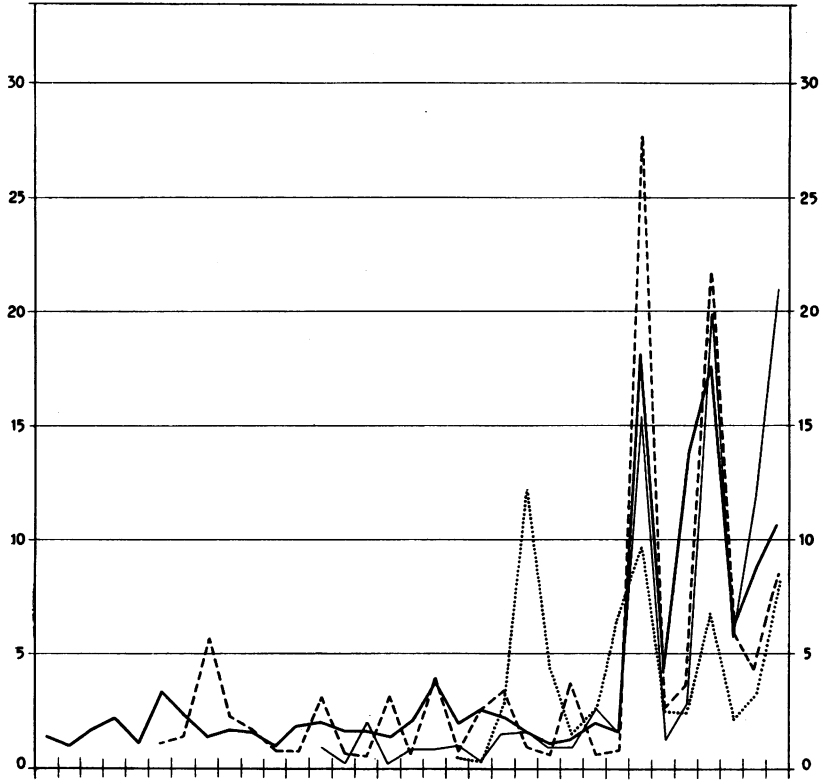
Whereas in *Belgium*, *Luxembourg*, and the *Netherlands*, the morbidity-rates showed a definite drop as compared with 1952 (epidemic year for these three countries), 1953 marked a rise in the number of notifications in the other Western European countries. These increases were as follows : *France*, 10%; *England and Wales*, 17%; *Scotland*, 53%; *Northern Ireland*, 104%; *Republic of Ireland*, 155%.

In the *Netherlands*, morbidity dropped by 90% from 1952 (1,712 notifications) to 1953 (171); in *Luxembourg* by 89% (7 notifications in 1953 as compared with 61 in 1952); in *Belgium* by 79% (184 notifications as compared with 897).

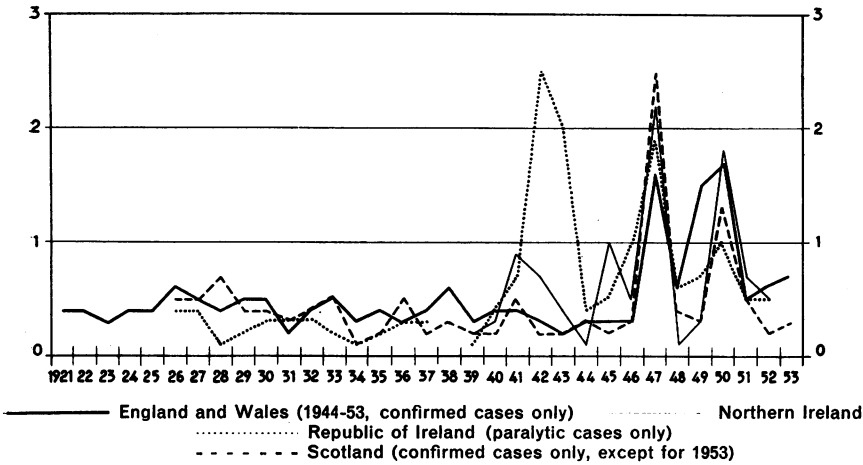
**FIG. 14. NOTIFIED CASES OF POLIOMYELITIS, BY MONTH :
FRANCE, 1946-53**



**FIG. 15. ANNUAL INCIDENCE OF POLIOMYELITIS : UNITED KINGDOM AND
REPUBLIC OF IRELAND, 1921-53 (RATES PER 100,000 INHABITANTS)**
(A) Cases

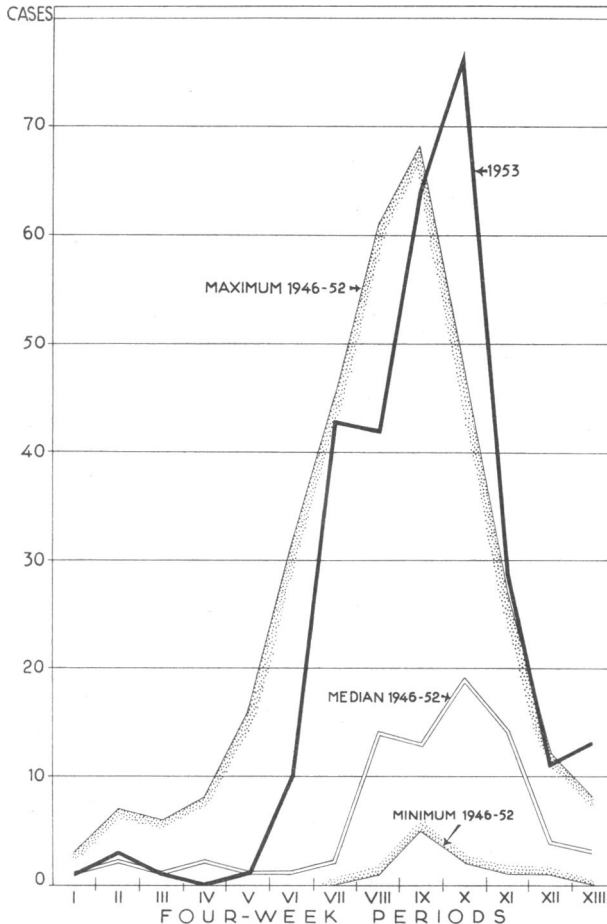


(B) Deaths



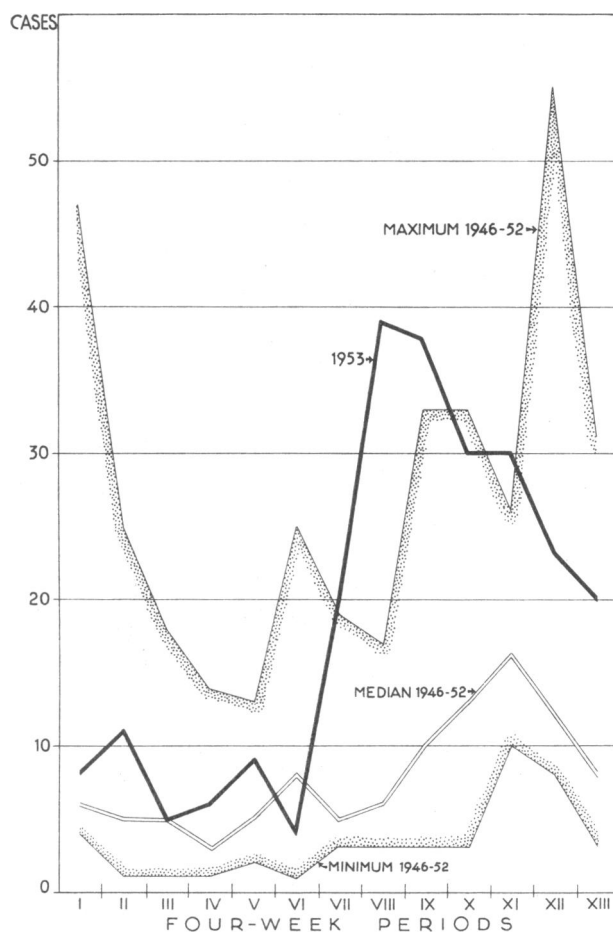
In *France*, notifications began to exceed those of 1952 only in October (fig. 14) and the total remained relatively low (1,834 notifications in 1953). Epidemics proper can be said to have occurred in only three “départements”, all in the south-west (Landes, 22.5 cases par 100,000 inhabitants; Basses-Pyrénées, 18.5 cases; Hautes-Pyrénées, 11.1 cases). In the Basses-

FIG. 16. NOTIFIED CASES OF POLIOMYELITIS, BY FOUR-WEEK PERIOD : NORTHERN IRELAND, 1946-53



Pyrénées, 80 cases were notified (as compared with 11 in 1952 and 1 in 1951); these cases occurred particularly in the Pau region and in the “cantons” to the north and west of that town. In the Landes department there was a fairly short outbreak, which was in direct relation to the Basses-Pyrénées epidemic, and this was followed in September by a recrudescence in the Dax region. It should also be noted that in the autumn poliomyelitis was

**FIG. 17. NOTIFIED CASES OF POLIOMYELITIS,
BY FOUR-WEEK PERIOD : REPUBLIC OF IRELAND, 1946-53**



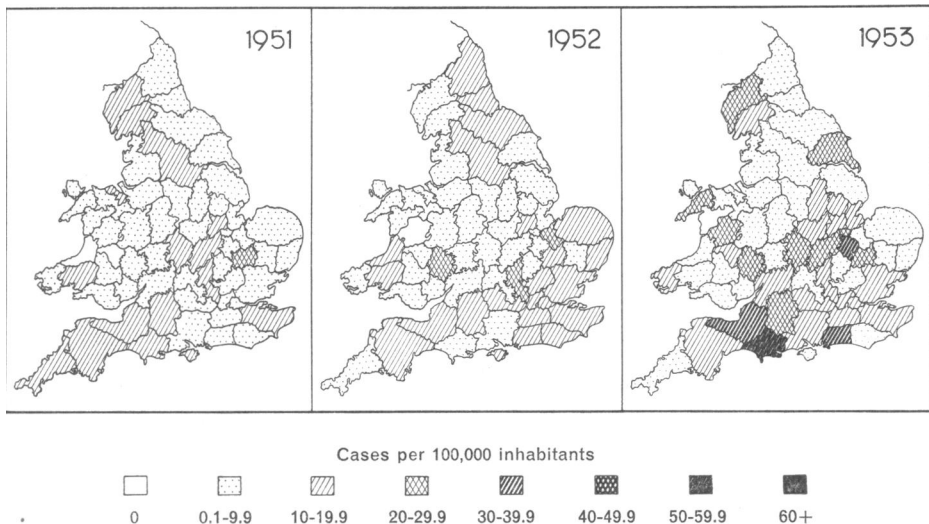
increasing in the Paris region. In the rest of the country incidence was in the form of isolated cases in all the departments, except Lot-et-Garonne, Lozère, and Pyrénées-Orientales, which remained free from the infection.

Fig. 15 gives a picture of poliomyelitis morbidity and mortality developments during the past 33 years in the *United Kingdom* and in the *Republic of Ireland*; for the latter, only the number of paralytic cases notified to the health authorities is known. In 1953, the outbreaks in *Scotland* and in *England and Wales* were less serious than those of 1947 (record year) and 1950. In *Northern Ireland*, on the other hand, 1953 was a record year, with 21 cases per 100,000 inhabitants. Fig. 16 and 17 show that the number

of notifications in the Republic of Ireland and in Northern Ireland in 1953 exceeded, for some months, the maximum figures for the seven preceding years, and that the peak of the seasonal outbreak was two months earlier in the Republic of Ireland than in Northern Ireland.

In *England and Wales* the seasonal recrudescence of poliomyelitis was more marked than in France, and the provisional figures give the notifications as 5,250. This figure has seldom been exceeded in the past and is higher than for the two preceding years. Of the provisional notifications, 37% covered non-paralytic cases (as compared with 31% in 1950, 42% in 1951, and 32% in 1952). One county only—Merionethshire (Wales)—was unaffected. Notification figures were highest in the following 11 counties: London (445); Lancashire (420); Warwickshire (415); Essex (298); Yorkshire—West Riding (293); Middlesex (268); Kent (246); Surrey (235); administrative county of Southampton (198); Somersetshire (180); and Dorsetshire (159). The number of counties in which the morbidity-rate was 10 or more cases per 100,000 inhabitants increased from 17 in 1951 to 26 in 1952 and 32 in 1953 (fig. 18). The highest notification-rates have been noted in the southern half of the country: 22 cases per 100,000 inhabitants in Cambridgeshire in 1951; 28 cases per 100,000 inhabitants in Buckinghamshire in 1952; 53 cases per 100,000 inhabitants in Dorsetshire in 1953. The figures reported here are only provisional, the 1953 revised figures (by county) not being available. On the other hand, it is known that the revised figures concerning notified cases over the whole of England and Wales for 1953 gave 4,547 cases only, which is 87% of the

FIG. 18. DISTRIBUTION OF POLIOMYELITIS: ENGLAND AND WALES, 1951-3



provisional number (nearly the same percentage as that recorded for confirmed cases in the seven preceding years).

Distribution by region during the past three years is shown in table XI. It will be noted that the highest apparent morbidity in 1953 was in the south and south-west of the country, whereas in 1952 it was in the north and east.

**TABLE XI. NOTIFIED CASES OF POLIOMYELITIS :
ENGLAND AND WALES, 1951-3 ^a**

Regions	Notified cases ^b			Rate per 100,000 inhabitants		
	1951	1952	1953	1951	1952	1953
England :						
Northern	161	455	196	5.1	14.6	6.2
East and West Ridings	355	373	339	8.7	9.1	8.3
North-western	283	246	388	4.4	3.8	6.0
North Midlands	241	144	333	7.1	4.2	9.7
Midlands	305	282	464	6.9	6.3	10.4
Eastern	152	419	396	4.9	13.3	12.4
London and south-eastern	545	1,190	1,267	5.0	10.9	11.6
Southern	165	317	462	6.2	11.7	16.8
South-western	268	302	472	8.9	9.9	15.5
Total	2,475	3,728	4,317	6.0	9.0	10.4
Wales	134	174	221	5.2	6.7	8.5
England and Wales	2,609	3,902	4,538	6.0	8.9	10.3

^a Excluding port health districts ^b Corrected figures

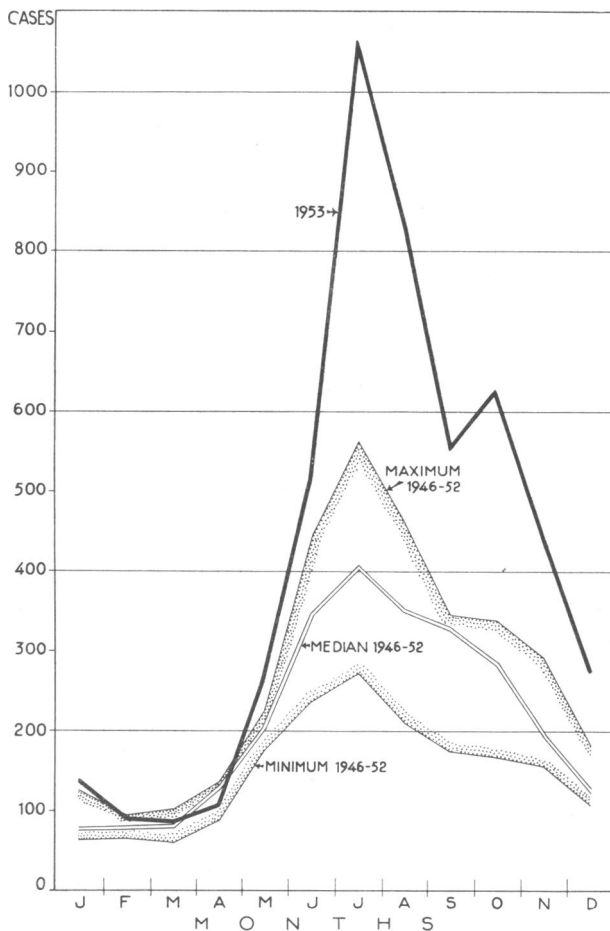
With regard to mortality the information available so far is to the effect that the final number of deaths from poliomyelitis recorded in 1953 amounted to 320, which is about 7.0 deaths per 100 cases (corrected notification) and 0.7 death per 100,000 inhabitants. The corresponding figures for the three preceding years were : 9.5% and 1.7 per 100,000 inhabitants in 1950; 7.3% and 0.4 per 100,000 inhabitants in 1951; 7.7% and 0.8 per 100,000 inhabitants in 1952. The mortality-rates therefore show a slight increase during 1951-3 although they are definitely lower than in 1950.

In *Scotland* there was a sharp rise in preliminary notifications, from 285 in 1952 to 436 in 1953. This figure had been exceeded only twice during the preceding 27 years, but on both these occasions (1947 and 1950) the figures were very much higher.

Notifications in *Northern Ireland* in 1953 reached the record figure of 290, which is a 31 % increase over the total notifications for the two preceding years.

The *Republic of Ireland* experienced a serious outbreak of poliomyelitis in 1953; the number of notifications (245) had been exceeded on only two previous occasions (in 1942 and 1947) since 1939, when data first became available. It must be noted that so far only paralytic cases are notified to the health authorities. Twenty-seven cases occurred in Dublin and 24 in County Dublin; in Cork there were 6, and in County Cork, 16; in the counties of Donegal, Kildare, and Roscommon there were 38, 13, and 13 cases, respectively.

**FIG. 19. NOTIFIED CASES OF POLIOMYELITIS, BY MONTH :
ITALY, 1946-53**



Southern Europe

Malta, Portugal, Turkey, and especially Spain, seem to have been less affected by poliomyelitis in 1953 than in 1952. On the other hand, the number of notifications rose in Greece, Italy, Trieste (British/United States Zone), and, in particular, Yugoslavia.

**FIG. 20. NOTIFIED CASES OF POLIOMYELITIS, BY MONTH :
YUGOSLAVIA, 1948-53**

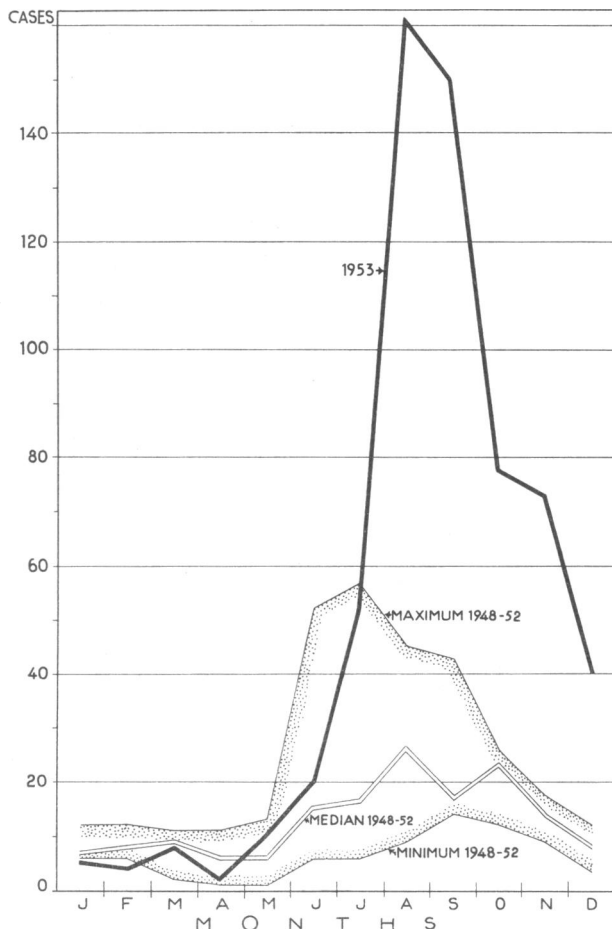


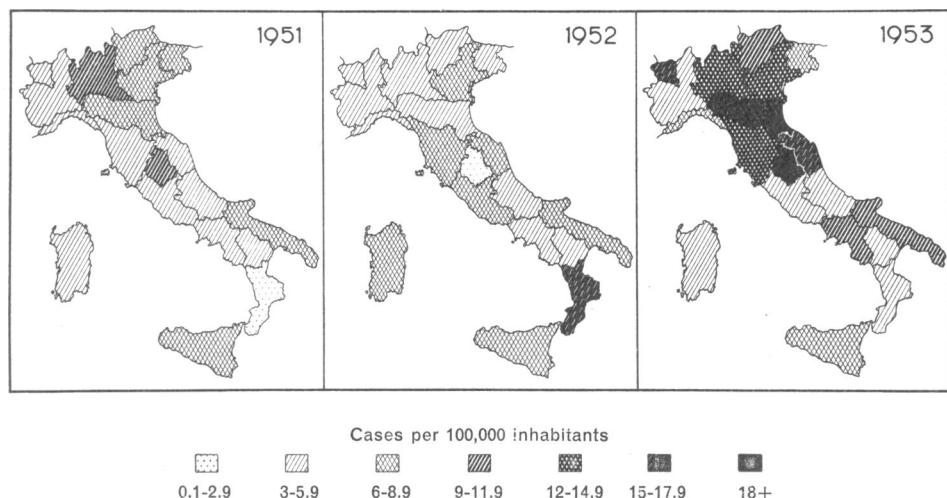
Fig. 19 and 20 show the monthly distribution of notified cases in Italy and Yugoslavia for 1953. It will be seen that in both countries the number of cases registered was higher during several months than the maxima observed over the seven (in the case of Italy) or five (in the case of Yugoslavia) preceding years. It is also interesting to note that the peak of the

seasonal outbreak was registered one month earlier in Italy than in Yugoslavia.

The recrudescence noted in *Greece* appeared particularly late : of the 140 cases notified in the greater part of the country throughout the whole year, 49 occurred in November (the majority in Athens and Piraeus) and 68 in December. Such a development had been noted on only one previous occasion—in 1949.

In *Italy*, notifications numbered 4,995 in 1953 as compared with 2,708 in 1952. About 70% of these cases occurred in six regions containing 52% of the total inhabitants of the country : Lombardy (849); Emilia-Romagna (778); Veneto (544); Campania (472); Tuscany (427); and Apulia (372). Emilia-Romagna, and, in particular, Umbria, had the highest notification figures (22 cases per 100,000 inhabitants and 26 cases per 100,000 inhabitants, respectively). With the exception of Apulia and Campania, the ten regions with the highest morbidity-rates (9 cases or more per 100,000 inhabitants) were situated in the northern half of the country (fig. 21).

FIG. 21. DISTRIBUTION OF POLIOMYELITIS : ITALY, 1951-3

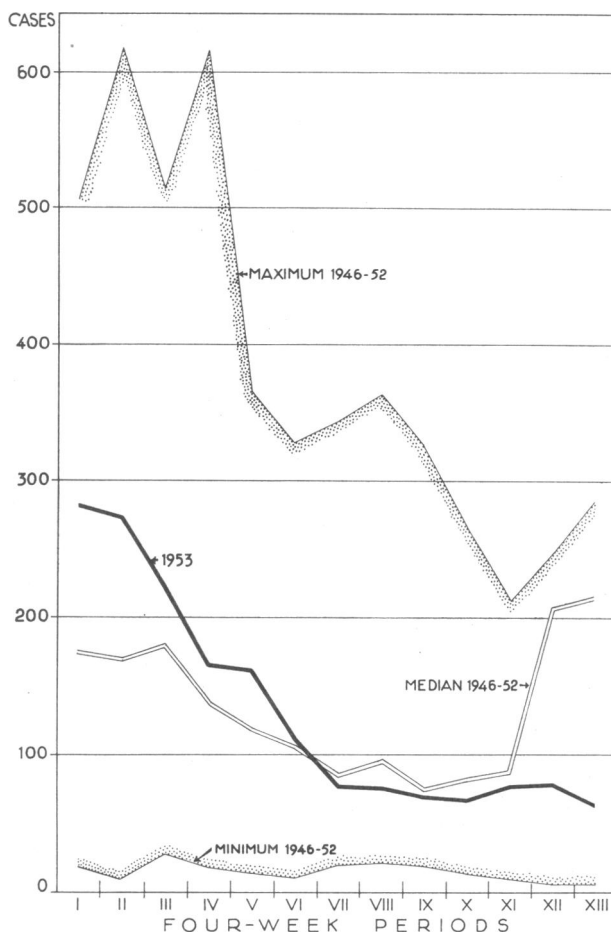


Among the four countries of southern Europe in which poliomyelitis incidence showed an upward trend in 1953, the most marked increase was observed in *Yugoslavia*, where 603 cases were notified during the year (25 deaths) as compared with 128 (10 deaths) in 1952. Nevertheless, notification-rates remained relatively low: 13 cases per 100,000 inhabitants in Slovenia (194 notifications, 12 deaths); and 7 per 100,000 in Croatia (271 notifications, 9 deaths). In Bosnia and Herzegovina, Macedonia, and Serbia the rates were below 1.5 cases per 100,000 inhabitants.

Oceania (table I)

In the 19 countries or territories of Oceania for which statistics covering the past two years are available, 2,201 ^a cases of poliomyelitis were notified

FIG. 22. NOTIFIED CASES OF POLIOMYELITIS, BY FOUR-WEEK PERIOD : AUSTRALIA, 1946-53

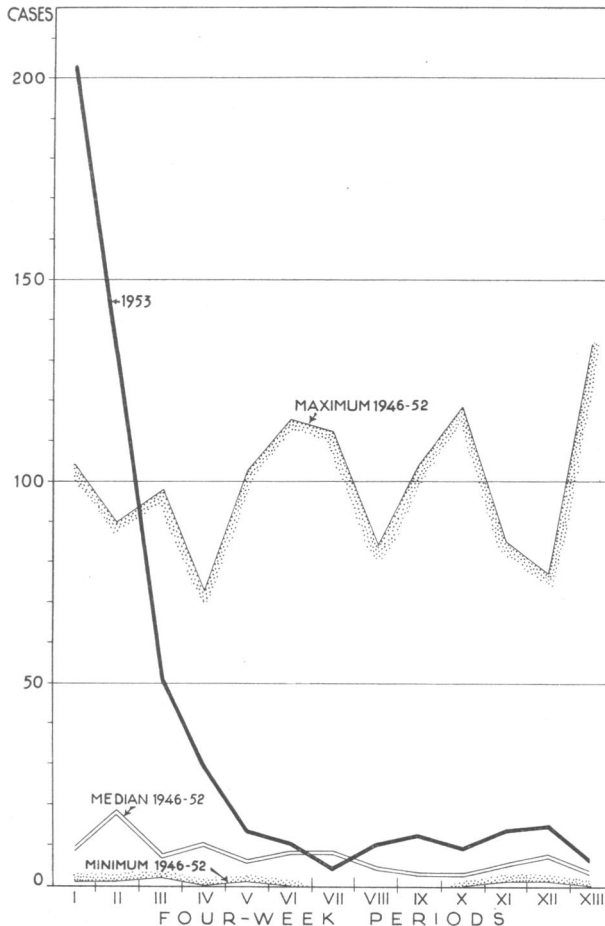


in 1953, which represents a marked decrease as compared with the figure for 1952 (2,961 notifications). *Australia* and *New Zealand* head the list (1,719 and 401 ^a cases, respectively, in 1953 as compared with 1,743 and 890 in 1952). Incidence was lower not only in *New Zealand* but also in:

^a Maoris excluded

Gilbert and Ellice Islands (2 cases as compared with 147); *Hawaii Islands* (38 paralytic cases as compared with 156); and *Fiji Islands, French Oceania*, and *Nauru Island* (2 cases in all in 1953 as compared with 19 in 1952). On the other hand, in the *Cook Islands, Guam, Netherlands New Guinea*,

**FIG. 23. NOTIFIED CASES OF POLIOMYELITIS, BY FOUR-WEEK PERIOD :
NEW ZEALAND, 1946-53**



and *New Caledonia* 27 cases were notified in 1953 whereas there were none in the previous year.

Fig. 22 and 23 indicate the four-weekly distribution of poliomyelitis in Australia and New Zealand, respectively, for 1953, as compared with the maximum, median, and minimum figures for the seven preceding years.

The situation appears to have been fairly favourable in general in both countries except during the first months of the year, which marked the end of the seasonal outbreak of the 1952-3 austral summer.

In *Australia*, where the total number of notified cases was about the same as in 1952, there was an increase in notifications in New South Wales (649 as compared with 407 in 1952) and in Queensland (225 as compared with 166 in 1952). There was, on the contrary, a marked regression of poliomyelitis in South Australia (413 notifications as compared with 721). In the other States, there was very little difference between the 1953 and 1952 figures. More than half the cases noted during the second half of the year occurred in New South Wales and nearly one quarter in South Australia.

In *New Zealand*, the first quarter of 1953 was marked by a recrudescence in South Island—previously very little affected—of the epidemic which began in mid-July 1952, whereas the incidence fell in all districts of North Island. Of the 501 preliminary notifications for the entire year, 206 (22 deaths) were recorded for the six southern districts as compared with 87 (4 deaths) in 1952; the greatest increase was noted in the Invercargill district (50 cases and 9 deaths as compared with 4 cases and 2 deaths in 1952).

RESPONSIBLE VIRUSES

Africa^{11, 12} (J. H. S. Gear—personal communication)

Systematic studies have been carried out on the types of poliovirus prevalent in some areas in Africa. In Johannesburg, Transvaal (Union of South Africa), in the summer of 1953-4, a year of average incidence, three waves of infection were detected, the first early in the season due to type 3, the second in mid-summer due to type 2, and the third in the autumn due to type 1. In Salisbury, Southern Rhodesia, type 1 was prevalent in the summer of 1951-2, type 2 in 1952-3, and type 3 in the autumn of 1954. In Port Elizabeth, Cape Province (Union of South Africa), nearly all the cases in the outbreak were due to type 2 virus. The recent (1954) outbreak in Kenya was due to type 1 virus. About 30% of the cases from whom poliovirus was isolated have also been infected with viruses belonging to the Cocksackie A group. Four "orphan"^b viruses have been isolated. From 200 cases of meningo-encephalitis diagnosed as abortive poliomyelitis, the following viruses were isolated: Cocksackie B, 20; Cocksackie A, 8; mumps, 17; herpes, 3; poliovirus, 2. The cause of the remainder was not determined.

^b The term "orphan" virus is used, with acknowledgement to Melnick,²⁷ to describe the several different agents isolated from stools which cannot at present be further identified and of which the significance as causes of human morbidity is uncertain. These agents have been isolated in tissue culture, in which they cause a cytopathogenic effect. They have often been referred to by the rather unwieldy phrase "unidentified cytopathogenic agents".

The results of the studies are summarized in the following tabulation:

Area	Year	Poliovirus types			
		1	2	3	unknown
Kenya	1949	2	—	—	—
	1954	11	—	—	—
Nyasaland	1950	2	—	—	—
Southern Rhodesia	1951	3	—	—	—
	1952	3	2	—	—
	1953	—	2	—	—
	1954	—	—	4	—
Transvaal	1948	1	—	—	—
(Union of South Africa)	1949	—	3	—	—
	1951	1	—	—	—
	1952	2	—	—	—
	1953	4	1	7	—
	1954	34	9	17	3
Cape Province	1952	—	1	—	—
(Union of South Africa)	1953	—	—	1	—
	1954	5	15	1	—
Johannesburg (Union of South Africa)	1953	October	—	1	—
		November	—	1	—
		December	—	1	—
	1954	January	1	3	—
		February	2	2	1
		March	1	6	2
		April	4	—	1
		May	1	—	—
		June	1	—	—
Port Elizabeth (Union of South Africa)	1954	January	—	4	1
		February	—	1	—
		March	1	5	—
		April	1	3	—
		May	—	1	—
		June	2	—	—

America

Canada^{5, 6, 34} (F. P. Nagler & E. H. Lossing, and A. J. Rhodes—personal communications)

In Toronto in 1952, 7 type 1 and 2 type 3 viruses were identified. Eight "orphan" viruses were recovered from 43 cases diagnosed as poliomyelitis: 7 from non-paralytic patients and 1 from a case of paralytic poliomyelitis from which poliovirus was also isolated. Coxsackie viruses were isolated from 18 out of 33 non-paralytic and from 1 out of 10 paralytic cases; 5 strains belonged to group A and 14 to group B.

In Saskatoon and Vancouver in 1952, 4 type 1 viruses and 2 "orphan" viruses were recovered from cases of paralytic poliomyelitis. In Kimberley, 3 type 3 strains were identified.

In 1953, 56 type 1 poliomyelitis viruses were isolated from the Provinces and Territory of Manitoba (13), Newfoundland (4), Nova Scotia (1), Ontario (33), and Yukon (5). No other types and no "orphan" viruses were recovered.

Jamaica (L. S. Grant—personal communication)

The 1954 epidemic, the first to occur in the island, was due to type 1 virus.

United States of America

More information is available for the USA than for any other country, yet even here it is fragmentary and incomplete. The studies of the Committee on Typing of the National Foundation for Infantile Paralysis³⁰ investigated 196 selected strains isolated between 1909 and 1951, the great majority from North America, but a few strains were included from widely scattered parts of the globe. The responsible virus in particular outbreaks was not being studied. The results of typing these strains were: type 1, 161; type 2, 20; and type 3, 15. Some attempts at typing^{31, 45} revealed irregularities and possible antigenic differences.

Other reports are summarized in the following paragraphs. In a few instances strains isolated before 1951 have been included in the figures reported by the Committee on Typing. However, they are listed here with reference to the outbreak in which they were isolated.

Minneapolis and the north central States^{40, 41} (J. T. Syverton—personal communication)

Year	Poliovirus types		
	1	2	3
1946	7	0	0
1948	59	0	0
1949	9	11	0
1950	21	1	32
1951	12	2	1
1952	77	0	8
1953	385	1	8
1954	6	2	2
Total	576	17	51

Two "orphan" viruses remain unidentified; other viruses not neutralized by poliovirus type-specific sera have been identified as Coxsackie B viruses or as the virus of lymphocytic choriomeningitis. Approximately 20% of the cases clinically diagnosed as poliomyelitis in 1950 yielded both poliovirus and a Coxsackie virus. Four Coxsackie viruses were recovered from 103 patients in 1953.

*New Haven, Conn.*²⁷ During 1952 the incidence in New Haven was low. The following viruses were isolated: type 1, 5; type 2, 8; type 3, 5.

*Lock Haven, Pa.*²⁷ In 1952 there was a severe outbreak in Lock Haven, Pa. Forty-six type 1 and 15 type 2 viruses were isolated; type 3 was not recovered.

*Easton, Pa.*³⁵ Sixteen strains were isolated from hospitalized patients in 1950; these consisted of 12 type 1, 1 type 2, and 3 type 3.

Philadelphia, Pa. (W. Henle—personal communication). In 1953, 27 strains of poliovirus were isolated from cases of clinical poliomyelitis: 19 type 1, 3 type 2, and 5 type 3. Three “orphan” viruses were isolated, including 1 from a paralytic case.

Utah, Texas, and Iowa-Nebraska^{15, 16} (W. McD. Hammon & J. Stokes—personal communication). This information was collected systematically during the field trials of gamma globulin.

Area	Poliovirus types			“Orphan” viruses
	1	2	3	
Utah (1951)	26	3	0	2
Texas (1952)	66	13	12	11
Iowa-Nebraska (1952)	125	0	0	3

The type 1 virus isolated in the Iowa-Nebraska epidemic showed considerable antigenic difference from the strains Brunhilde and Mahoney when compared as antigens for neutralizing antibody determinations. Only 1 of the “orphan” viruses came from a case with a serological diagnosis of poliomyelitis. Most of them came from paralytic cases which, together with their siblings, were found to be free from poliovirus or increasing polio antibodies.

*Olmsted County, Minn., and Baltimore, Md., 1952*⁴ (D. Bodian—personal communication). Type 1 virus was responsible for both outbreaks, no evidence being obtained of the presence of type 2 virus. One strain of type 3 was isolated.

The outbreak in Baltimore in 1944³ was a mixed epidemic due to types 1 and 3.

Boston, Mass. (S. Kilbrick, J. F. Enders & F. C. Robbins—personal communication)

Year	Poliovirus types		
	1	2	3
1949	16	0	1
1950	6	0	25
1951	11	1	3
1952	38	11	8
1953	34	3	0

Sixteen “orphan” viruses have been recovered from patients diagnosed as non-paralytic poliomyelitis and 1 from a patient with paralytic poliomyelitis from whom type 1 poliovirus was also recovered.

South Louisiana (J. P. Fox & H. M. Gelfand—personal communication). In 1951 and 1952, in a study of 31 infected households with at least one case (27 paralytic and 9 non-paralytic cases), type 1 virus was incriminated in 25 households, type 2 in 3, and an "orphan" virus in 1 household with a paralytic case. All three types of poliovirus were excluded in 2 households, in one of which there were 2 paralytic cases. In 2 other family episodes diagnosed as poliomyelitis with paralytic residuals there was no serological evidence of infection with any of the three types of poliovirus.

Ohio.¹⁷ The sharp outbreak in 1952 was due to type 1 virus; 33 strains were isolated, and no type 2 or 3 strains were recovered.

*Pittsburgh area, Pa.*⁵¹ (J. E. Salk—personal communication). Of 37 strains isolated during 1949-51, 28 were type 1 and 9 were type 3. In this area, although outbreaks seem to have been caused by one type, evidence has been obtained of the co-existence of all three types in the same vicinity. In one year type 3 has been the most prevalent. In another year types 1 and 2 have been equally prevalent, with type 3 not infrequent. In other years type 1 virus has been the most prevalent.

Oregon (A. W. Frisch—personal communication). In an epidemic in Bend, 6 type 1 strains were isolated.

US Army Medical Service Graduate School, Washington, D. C. (J. E. Smadel, H. E. Dascomb, N. Rogers & F. E. Payne—personal communication). Thirty-three cases occurring in 1953 within the continental United States of America have been studied. On the combined results of serological tests and virus isolation, 9 cases were attributed to type 1 infection, 4 to type 2, and 3 to type 3. Six type 1 and 1 type 2 viruses were isolated.

Asia

India

A number of strains of poliovirus have been isolated in Bombay^{13, 39} (P. V. Gharpure—personal communication) of which 5 have been typed: 4 type 1 and 1 type 2. Cocksackie viruses were isolated from 3 out of 20 faecal specimens positive for poliovirus (D. D. Banker—personal communication).

Israel^c (H. Bernkopf—personal communication)

Thirty-one strains of poliovirus have been isolated: these consisted of 29 type 1, 1 type 2, and 1 type 3. Fourteen "orphan" viruses have been isolated, including 11 from paralytic cases. Cocksackie virus infections have been found in about 15% of the cases studied.

^c See articles on pages 651 and 677.

*Japan*¹⁸

The classification has been reported of 5 strains selected from various parts of Japan: 1 type 1, 2 type 2, and 2 type 3.

Europe*Belgium*⁴² (J. D. Verlinde—personal communication)

The information available is tabulated below :

Year	No. of strains isolated	Poliovirus types		
		1	2	3
1952	5	4	1	—
1953	4	3	—	1
1954 (first half)	4	4	—	—
Total	13	11	1	1

Denmark (H. von Magnus—personal communication)

The outbreaks in 1952 and 1953 were due to type 1 virus. Up to the present only 1 type 3 strain has been isolated in the country—from a paralytic case in 1953—and only type 1 strains in 1954.

Seven strains of “orphan” virus have been isolated from clinical cases of poliomyelitis. Double infections with poliovirus and Coxsackie virus have been detected, but not in the form of coincident epidemics.

*France*²⁵ (P. Lépine—personal communication)

The information available covers the first 50 strains isolated and typed in 1952 and 1953. Forty-one strains were isolated in France itself : 27 from patients in Paris and 14 from the provinces. Of the remaining 9 strains, 3 came from South Viet Nam and 4 from French Equatorial Africa.

Thirty-one strains proved to be type 1, 3 type 2, and 8 type 3. The impression was gained that a type 3 epidemic occurred in France in 1952, but the small number of observations prevents any definite conclusion from being reached.

*Germany*⁴²

In 1952, 5 strains were isolated : 3 type 1 and 1 each of types 2 and 3. The outbreaks in Saarland²⁴ in 1951, and North Rhine-Westphalia in 1952, were due to type 1 virus.

Italy^{28, 29} (V. Monaci—personal communication)

In 1953-4, 23 strains of poliovirus were isolated in northern Italy : 14 type 1, 8 type 2, and 1 type 3. In general both types 1 and 2 were found

in the same locality. Sixteen "orphan" viruses have been isolated from cases diagnosed as paralytic poliomyelitis.

*Netherlands*⁴² (J. D. Verlinde—personal communication)

Relatively few strains have been isolated and typed, as may be seen from the following tabulation :

Year	No. of strains isolated	Poliovirus types			Not typed
		1	2	3	
1949	1	—	1	—	—
1950	1	—	1	—	—
1951	8	5	1	—	2
1952	7	6	1	—	—
1953	5	1	—	2	2
1854 (first half)	2	—	1	1	—
Total	24	12	5	3	4

The relatively high incidence in the country in 1951 and 1952 was apparently associated with a predominance of type 1 strains as was the case in the neighbouring parts of Belgium, Germany, and Luxembourg in 1952. This area was apparently involved in the same epidemic in that year (J. J. van Loghem—personal communication). No "orphan" viruses have been isolated. The 1951 epidemic of poliomyelitis coincided with an epidemic of Coxsackie virus infection.⁴⁴ In 3 cases mixed infection with type 2 poliovirus and a virus of the Columbia SK group has been observed.⁴³

Sweden

Virus isolation attempts (A. Svedmyr—personal communication) during the 1953 Stockholm epidemic gave the following results :

Clinical diagnosis	No. of cases	Poliovirus type 1	"Orphan" viruses
Paralytic poliomyelitis	175	127	1
Non-paralytic poliomyelitis (with meningitis)	86	61	1
Suspected poliomyelitis (without meningitis)	28	7	2

Approximately 150 more type 1 strains were isolated from this epidemic, bringing the total to about 350 strains (G. Olin—personal communication). Types 2 and 3 were found in only one case each.

A study of the 1952 Malmo epidemic (S. Gard—personal communication) has revealed that only 50% of the meningitic cases could be confirmed as poliovirus infections. One-third of the remaining 50% yielded either Coxsackie B 3 virus or an "orphan" virus. Simultaneous poliovirus—Coxsackie-virus infections were rare, 2 out of 150 patients yielding poliovirus and Coxsackie A virus.

*United Kingdom*¹⁴ (A. P. Goffe & G. L. Le Bouvier, and R. H. A. Swain—personal communications)

Both types 1 and 3 have been incriminated in recent outbreaks. In 1952 in England, 4 type 1 and 4 type 3 strains were identified. Type 2 was also isolated but usually from sporadic cases. In Scotland, type 1 virus was isolated in 1953, and 3 further strains have been identified in 1954. "Orphan" viruses have not been isolated but a number of strains of Cocksackie viruses have been identified although there has been no evidence of coincident epidemics.

Seventy-seven strains of poliovirus have been isolated from faeces and typed: 38 type 1, 30 type 2, and 9 type 3.¹⁹ This is a higher proportion of type 2 than has generally been found. All strains were isolated from paralytic cases.

Oceania

Australia^{41a} (E. V. Keogh & A. A. Ferris—personal communication)

Poliovirus type 1 was associated with epidemic prevalence in Victoria in 1949, 1951, and 1953-4. The epidemic in 1952-3 was caused by type 2 virus. However, all three types have been isolated throughout the period although type 3 has been responsible for sporadic cases only.

CONCLUSIONS

As has been stated in the introduction to this article, the world incidence of poliomyelitis in 1953 has been reviewed on the basis of the available statistical data, as an adjunct to a general study appearing separately on the evolution of the disease during the past 30 years, and as a contribution to a series of similar commentaries published by the League of Nations Health Organisation and by the World Health Organization in their respective epidemiological publications since 1935.

In Africa, 1953 saw a rise in the apparent incidence of the disease in the Middle Congo (French Equatorial Africa), Morocco (French Zone), Ruanda-Urundi, Tanganyika, Tunisia, the Union of South Africa, Upper Volta (French West Africa), and, in particular, in Angola and in Egypt. The rise in the latter country is believed to have been due largely to improved reporting. The figures for Kenya and Southern Rhodesia were lower than those for 1952, and there was a still more marked improvement in the situation in Mauritius and Uganda.

In America, Canada suffered the worst poliomyelitis epidemic in its history; Argentina, Rio de Janeiro and the State capitals of Brazil,

Colombia, El Salvador, Greenland, Mexico, Nicaragua, and Uruguay were all more or less seriously affected, but there was a substantial drop in apparent morbidity in Cuba, the United States of America, and, probably, Chile.

The available data with regard to Asiatic countries and territories are in most cases too incomplete to enable any conclusions to be drawn.

In Europe, Sweden suffered the most serious outbreak ever recorded there, and Finland was also severely affected. Both Austria and Switzerland suffered a relatively high incidence, and an upward trend was observed in France, the Republic of Ireland, Norway, the United Kingdom, and four southern European countries. Elsewhere the incidence was generally lower than in previous years.

It is clear that the information available regarding the virus types responsible for clinical poliomyelitis in most parts of the world is so fragmentary that no definite conclusions are justifiable. The total number of polioviruses isolated and typed from clinical cases since the different types were recognized is probably not much more than 3,000-4,000. The results for about 2,200 strains are given in this study and of these 84% are type 1, 7% type 2, and 9% type 3. This does not, of course, represent the relative prevalence of the different types. Serological studies have made it clear that all three types are widely distributed and that, as a generalization, antibodies are acquired to all three types at about the same rate. This implies that the three types are about equally common. The viruses in this study are a selected population (in the statistical sense) in that the great majority come from clinical cases, and in most instances from definite outbreaks, the majority being severe outbreaks. Furthermore, most of them have been isolated in tissue cultures and the ease with which the different types can be isolated in this way may vary. The areas in which they were isolated were also selected by the availability of facilities for virus isolation. All that can be said, therefore, is that in these selected areas type 1 virus has been most frequently isolated in tissue cultures, and that this type predominates in the majority of observed outbreaks, particularly in the most severe ones. Both type 2 and type 3 have been responsible for outbreaks, and in a number of outbreaks two or more types have been present at the same time in various proportions.

It is now widely recognized that many viruses other than poliovirus can cause the clinical picture of non-paralytic poliomyelitis, and, indeed, that considerable proportions of such cases are not due to poliovirus infection. Evidence is also accumulating which suggests that there are viruses other than the three recognized types of poliovirus which can cause the clinical picture of paralytic poliomyelitis, and that they may be more common than has been thought. However, a great deal more research into this possibility is needed.

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RÉSUMÉ

Cet article qui concerne l'incidence de la poliomyélite dans le monde en 1953 est fondé sur les données statistiques réunies par l'OMS, et complété par des informations reçues d'experts de la poliomyélite.

En Afrique : l'incidence apparente en 1953 a augmenté par rapport aux années précédentes principalement au Maroc (zone française), au Moyen-Congo (Afrique Equatoriale française), au Tanganyika, dans l'Union Sud-Africaine, et, surtout, en Angola et en Egypte (dans ce dernier pays cette augmentation est probablement la conséquence de notifications plus complètes). Au Congo Belge, au Kenya, en Rhodésie du Sud, les chiffres pour 1953 étaient inférieurs à ceux de 1952 et la situation dans l'Ile Maurice et dans l'Ouganda s'était nettement améliorée.

En Amérique : le Canada a connu l'épidémie la plus sévère de son histoire. L'Argentine, Rio de Janeiro et les capitales des Etats du Brésil, la Colombie, le Salvador, le Mexique et le Nicaragua ont été plus ou moins affectés, mais, en revanche, la morbidité apparente a baissé notablement à Cuba, aux Etats-Unis et probablement au Chili.

Les données disponibles pour l'Asie sont, le plus souvent, trop incomplètes pour justifier des conclusions. L'incidence semble avoir diminué dans de nombreux pays.

En Europe : la Suède a subi l'épidémie la plus grave qu'elle ait connue. La Finlande a été aussi sérieusement touchée. En Autriche et en Suisse, l'incidence a été relativement élevée. Elle a augmenté en Norvège, au Royaume-Uni, dans la République d'Irlande et dans quatre pays méridionaux. Ailleurs, elle a été généralement plus faible qu'auparavant.

Il est difficile de tirer des conclusions des données incomplètes et fragmentaires dont on dispose au sujet du type de virus responsable des épidémies. Le nombre total de virus poliomyélitiques isolés et typés, à partir de cas cliniques, ne dépasse guère 3000. L'analyse de quelque 2200 souches, dont les résultats figurent dans cette étude, indique 84% de type 1, 7% de type 2 et 9% de type 3. Ces proportions ne correspondent évidemment pas à une répartition réelle des cas cliniques dus aux divers types de virus. Les études sérologiques ont montré que les trois types sont largement répandus et que les êtres humains acquièrent des anticorps vis-à-vis des trois types, à peu près dans les mêmes proportions. Les pourcentages ci-dessus s'expliquent en partie par le fait qu'un grand nombre de virus ont été isolés dans les régions présentant des facilités pour le diagnostic de laboratoire. Dans ces régions, c'est le type 1 qui a été isolé le plus fréquemment en culture de tissus, et ce type prédomine dans la plupart des épidémies observées, en particulier dans les plus graves d'entre elles. Dans un certain nombre de poussées épidémiques, deux types ou plus étaient représentés en diverses proportions.

On sait maintenant que des virus autres que celui de la poliomyélite peuvent donner le tableau de la poliomyélite non paralytique. Un grand nombre de cas d'affections non paralytiques sont causés, en fait, par des virus différents du virus poliomyélitique. D'autres faits suggèrent également que des virus différents des trois types de virus poliomyélitiques reconnus peuvent donner le tableau clinique de la poliomyélite paralytique et que ces virus sont plus nombreux qu'on ne le pense. Toutes ces questions feront l'objet de recherches approfondies, car la « transformation de la paralysie infantile relativement rare du XIX^e siècle en poliomyélite épidémique qui sévit dans presque toutes les parties du monde pose de nos jours l'un des problèmes de santé publique les plus angoissants ».

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