

Commonwealth Bureau of Census and Statistics,
MELBOURNE.

OFFICIAL STATISTICS,
COMMONWEALTH OF AUSTRALIA.



APPENDIX TO
MONTHLY SUMMARY
OF
Australian Statistics

Bulletin No. 18. ❖ June, 1913.

Statistics of Small-pox and Vaccination in
Australia and Other Countries.

PUBLISHED UNDER THE AUTHORITY OF THE
MINISTER FOR HOME AFFAIRS,

BY

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At the time of issuing Bulletin No. 18. the full details of Statistics of Small-pox and Vaccination were not available. They are consequent now issued as an appendix.

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14th August, 1913.

No. 47—STATISTICS OF SMALL-POX AND VACCINATION.

At the present time the following statistics relating to small-pox and vaccination may be of public interest:—

Table I. shows the recoveries and deaths in 1000 cases in Great Britain (vaccinated and unvaccinated persons in different ratios), the number of persons subject to identical risks being, however, unknown. It contains also the results for Japan.

From the aggregate of the cases occurring in the epidemics of the United Kingdom, shown in Table I., it will be seen that the rates of recovery were as follows, viz:—

All Cases (46,136) ..	Recoveries 84.62%	Deaths 15.38%
Vaccinated (36,488) ..	90.28%	9.72%
Unvaccinated (9,648) ..	63.20%	36.80%

That is, the death-rate among the unvaccinated was 3.786 times as great as the death-rate among the vaccinated. The frequency of attack was, however, much greater among the vaccinated, the figures being as follows:—

Vaccinated attacked 36,488	Deaths 3,545 = 9.72%
Unvaccinated attacked 9,648	3,550 = 36.80%
(Japan—Vaccinated attacked)* 79,806	23,126 = 28.98%

That is, the number of vaccinated persons attacked was 3.782 times as great as the unvaccinated attacked. The significance of this relatively large frequency of attack on vaccinated persons may possibly be due to a great preponderance of vaccinated persons in the community. No figures are available showing these numbers, but to be able to say whether vaccination offers any degree of immunity requires that the number of persons vaccinated and unvaccinated, exposed to equal risk of infection, should be known.

Table II. shows the percentage of deaths of children under 10 years of age compared with the estimated percentage of children who had not been vaccinated in the ten years previous to the epidemic. The percentage of deaths decidedly increases with the percentage of children not accounted for by vaccination. See note immediately under table.

Table III. shows the attack rate of vaccinated and unvaccinated persons under an lower 10 years of age. The attack rate was ascertained by comparing the total number of cases of small-pox which occurred in the epidemics under review, with the total number of inmates of the dwellings in which such cases occurred, inmates and cases being each divided into vaccinated and unvaccinated. The table shows that the attack rate for children under 10 was about 6.8 per cent. for vaccinated, and 50.9 per cent. for unvaccinated, i.e., 7½ times as great. For persons over 10 the figures were about 28.1 per cent. and 52.4 per cent., that is, only about 1.8 times as great.

Table IV. shows the severity of the attacks on vaccinated and unvaccinated persons. In this table varioloid or mild and discrete cases are classified as "mild," and coherent or confluent as "severe." This table shows that with the vaccinated, about 83 per cent. of the cases were mild and about 17 per cent. severe, and with the unvaccinated about 27 per cent. were mild and about 73 per cent. were severe. That is, mild cases were about 3.1 times as frequent with the vaccinated as with the unvaccinated, and severe cases were about 4.2 times as frequent with the unvaccinated as with the vaccinated.

Table V. shows the percentage of deaths in cases of small-pox classified according to the number of vaccination marks borne by each patient. The table indicates that mortality was found to be less with an increase of the number of vaccination marks.

Table VI. shows the number of cases, deaths, and death rate of persons under and over 10 years of age, classified according to the number of vaccination marks borne by each patient.

There is no complete statistical information available as to the number of deaths or injuries attributable to vaccination itself, but it may be mentioned that in the classification drawn up by the eminent English statistician, Dr. Farr, and modified by his successor, Dr. Ogle (both medical men), provision was made for recording deaths arising from "cow-pox and other effects of vaccination," and Tables VIII. and IX. are given showing the numbers of deaths which are to be credited directly to vaccination. These are from the Registrar-General of England's reports. The numbers, for obvious reasons, are too small, since they include only cases directly referable to vaccination.

* See Table VII., page 5.

TABLE I.
RECOVERIES AND DEATHS PER THOUSAND CASES OF SMALL-POX
IN UNITED KINGDOM AND JAPAN.

PLACE.	RECOVERIES.	DEATHS.	TOTAL.		A	B
			RECOVERIES.	DEATHS.		
1.—SIX TOWNS (1887-90). Sheffield, Dewsbury, London, Warrington, Leicester, Gloucester (11,065 cases). Pop. 4,091,100. One case in 448 persons per annum.	Vaccinated ..	749	42	791	5.3	
	Unvaccinated ..	135	74	209	35.4	6.68
	Total ..	884	116	1,000	11.6	
2.—Sheffield (1887-8) (4,797 cases). Population, 310,500. One case in 66 persons per annum.	Vaccinated ..	840	43	883	4.9	
	Unvaccinated ..	59	58	117	49.6	10.12
	Total ..	899	101	1,000	10.1	
3.—Leicester (1892-3) (357 cases) .. Population, 180,170. One case in 505 persons per annum.	Vaccinated ..	552	6	558	1.1	
	Unvaccinated ..	389	53	442	12.0	10.91
	Total ..	941	59	1,000	5.9	
4.—Gloucester (1895-6) (1,979 cases). Population, 44,800. One case in 23 persons per annum.	Vaccinated ..	551	61	612	10.0	
	Unvaccinated ..	230	158	388	40.7	4.07
	Total ..	781	219	1,000	21.9	
5.—Homerton and Fulham Hospital (1877-85) (12,987 cases) ..	Vaccinated ..	718	87	805	10.8	
	Unvaccinated ..	110	85	195	45.6	4.04
	Total ..	828	172	1,000	17.2	
6.—Homerton and Fulham Hospital (1875-85), excluding 1,561 doubtful cases, of whom 440 died (11,426 cases) ..	Vaccinated ..	718	61	779	7.8	
	Unvaccinated ..	125	96	221	43.4	5.56
	Total ..	843	157	1,000	15.7	
7.—Glasgow (1892) (700 cases) .. Population, 668,400. One case in 355 persons per annum.	Vaccinated ..	889	30	919	3.3	
	Unvaccinated ..	44	37	81	45.7	13.85
	Total ..	933	67	1,000	6.7	
8.—Glasgow (1900-1) (1,765 cases). Population, 755,300. One case in 428 persons per annum.	Vaccinated ..	846	85	931	9.1	
	Unvaccinated ..	55	36	91	52.2	5.74
	Total ..	879	121	1,000	12.1	
9.—Basington (1901-2) (301 cases) ..	Vaccinated ..	688	96	784	12.2	
	Unvaccinated ..	116	160	276	40.3	3.80
	Total ..	804	196	1,000	19.6	
10.—Annual Report of the Metro- politan Asylums Board for 1901-2 (9,659 cases) ..	Vac. or doubtful	673	91	764	11.9	
	Unvaccinated ..	158	78	236	33.9	2.77
	Total ..	831	169	1,000	16.9	
11.—Annual Report of the Metro- politan Asylums Board for 1901-2 (9,659 cases) ..	Vaccinated ..	646	73	719	10.2	
	Unvac. or doubtful	185	96	281	34.2	3.35
	Total ..	831	169	1,000	16.9	
12.—London, 30th Nov., 1901. Ad- mitted to Metropolitan Asylum Board's Hospitals (330 cases) ..	Vaccinated ..	591	136	727	18.7	
	Unvaccinated ..	91	182	273	66.7	3.57
	Total ..	682	318	1,000	31.8	
13.—London to end 1901. Admitted to Metropolitan Asylum Board's Hospitals (954 cases) ..	Vaccinated ..	683	113	796	14.2	
	Unvaccinated ..	101	103	204	55.4	3.90
	Total ..	784	216	1,000	21.6	
14.—London, all cases 1901 (1,743 cases). Population, 4,505,000. One case in 2603 persons per annum.	Vaccinated ..	687	100	787	12.7	
	Unvaccinated ..	115	68	183	31.9	2.71
	Total ..	832	168	1,000	16.8	
15.—London, all cases 1902 (7,916 cases). Population, 4,559,400. One case in 576 persons per annum.	Vaccinated ..	670	89	759	11.7	
	Unvaccinated ..	161	80	241	33.2	2.84
	Total ..	831	169	1,000	16.9	
16.—Total cases above in 1, 5, 7, 8, 9, 10, 14, and 15 (46,136 cases)	Vaccinated ..	714	77	791	9.7	
	Unvaccinated ..	132	77	209	36.8	3.79
	Total ..	846	154	1,000	15.4	
17.—Japan (1896-1910) (79,906 cases). Population, 46,616,500. One case in 8762 persons per annum.	Vaccinated ..	710	290	1,000	29.0	
	Unvaccinated ..	None*	None*	None*	—	

Column A.—Percentages of deaths in cases of vaccinated and in cases of unvaccinated persons.
Column B.—Percentage of deaths of unvaccinated persons divided by percentage of deaths of vaccinated persons (i.e., factor of advantage of vaccination). * Probably non-

STATISTICS OF SMALL-POX EPIDEMICS IN ENGLISH TOWNS.*

TABLE II.

Towns	Date of Epidemic	Estimated Mean Percentage of Children Unaccounted for ascribed to Vaccination for Date 10 years earlier than Epidemic	Total Small-pox Deaths	Percentage of Deaths under 10 Years of Age to Total Deaths from Small-pox
Warrington	1892-93	4.8%	62	22.5%
Sheffield	1887-88	4.5%	580	26.0%
London	1892-93	9.9%	182	36.8%
Dewsbury	1891-92	32.3%	110	51.8%
Epworth	1895-96	67.6%	434	64.5%
Leicester	1892-93	68.1%	21	71.4%

The results in Table II. can approximately be expressed as follows: The percentage of deaths from small-pox of children under 10 years of age, to the total deaths from small-pox, is about 16.2 times the cube root of the percentage of children unaccounted for as to vaccination for a date 10 years earlier than the date of the epidemic, and the form of the curve suggests that if no children remained unvaccinated the number of deaths from small-pox would be very small. Japanese experience (Table VII. hereinafter) modifies, however, this view, inasmuch as it shows that epidemics occur in spite of compulsory and repeated vaccination. The numbers on which the percentages are based are so small, however, that any deductions are precarious.

TABLE III.

Towns	Date of Epidemic	Attack Rate of Children under 10 Years of Age		Attack Rate of Persons over 10 Years of Age	
		Vaccinated	Unvaccinated	Vaccinated	Unvaccinated
Sheffield	1887-88	7.0%	67.6%	28.3%	57.6%
Warrington	1892-93	4.4%	54.5%	29.9%	57.6%
Dewsbury	1891-92	10.2%	50.8%	27.7%	53.4%
Leicester	1892-93	2.5%	35.3%	22.2%	47.6%
Epworth	1895-96	8.8%	46.2%	32.2%	50.0%
Arithmetic Mean		6.8%	50.9%	28.1%	52.4%

The numbers on which the percentages are based are so small, however, that any deductions are precarious.

TABLE IV.

Towns	Mild		Severe	
	Vaccinated	Unvaccinated	Vaccinated	Unvaccinated
London	89.0%	35.2%	11.0%	64.8%
Sheffield	82.8%	18.2%	17.2%	81.5%
Dewsbury	82.0%	23.1%	18.0%	76.0%
Leicester	81.4%	27.2%	18.6%	72.8%
Warrington	78.2%	29.1%	21.8%	76.6%
Arithmetic Mean	82.7%	36.2%	17.3%	73.3%

The numbers on which the percentages are based are so small, however, that any deductions are precarious.

* See comment, page 2.

TABLE V.*

Proportional Mortality of Cases of Small-pox treated in the Highgate Small-pox Hospital in 1836-51 and 1852-67, among Patients bearing one or more Vaccination Marks.

Cases of Small-pox classified according to the Vaccination Marks borne by each Patient.	Percentage of Deaths.	
	1836-51.	1852-67.
Unvaccinated	35.5%	34.0%
Stated to have been vaccinated but having no certificates	21.7%	39.4%
Having one vaccine certificate	7.6%	18.8%
.. two vaccine certificates	4.3%	7.7%
.. three	1.8%	3.0%
.. four or more vaccine certificates	0.7%	0.9%

TABLE VI.*

Deaths from Small-pox in the Fulham Hospital of Persons under and over 10 years of age, with the Proportional Case Mortality among Patients with one or more Vaccination Marks.

Age.	One Mark.		Two Marks.		Three Marks.		Four or more Marks.		
	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	Cases.	Deaths.	
0-10	21	1	29	1	37	53	19	4.80%	
Over 10	584	41	509	46	459	396	19	4.30%	
All ages	465	42	10,37	538	47	8,73	496	19	4.23%

* See comment, page 2.

That small-pox may become epidemic not only when vaccination is restricted but also, in spite of vaccination, vaccination, and further "extraordinary" vaccination is shown by comparing the statistics of England and Wales and Japan in Tables VIII. and IX. and VII. Compulsory vaccination was instituted in Japan in 1876, and was rigorously enforced throughout the country under Imperial Ordinance No. 34, issued in November, 1885. This requires vaccination every five to seven years. The last ordinance was repealed by that of the 14th April, 1909, which requires that every child shall be vaccinated before the June of the year following its birth; if this vaccination be unsuccessful then it must be vaccinated before the following June. Second vaccination is required in the tenth year after birth; if unsuccessful, vaccination must be effected before December of the following year. These provisions are said to be rigorously enforced. The following table shows that Japan is still subject to well-marked small-pox epidemics. The table shows the varying percentage of deaths in (presumably) vaccinated persons, the range being from about 2 per cent. to 41½ per cent., and averaging 30 per cent.

TABLE VII.
OCCURRENCES OF SMALL-POX IN JAPAN.†

Year.	No. of Cases.	No. of Deaths.	Percentage of Deaths.	Year.	No. of Cases.	No. of Deaths.	Percentage of Deaths.
1896	10,704	3,388	31.65	1904	1,227	237	19.32
7	42,347	12,316	29.08	5	301	62	20.60
8	2,034	395	19.42	6	519	109	21.00
9	1,613	250	15.50	7	1,053	437	41.50
1900	527	10	1.90	8	18,076	5,837	32.29
1	508	10	1.97	9	134	28	20.90
2	307	18	5.86	1910	99	13	13.13
3	357	16	4.48				

† Figures taken from the Statistical Summaries of Japan.

Total Cases, 79,806; Total Deaths, 23,126; Percentage of Deaths = 28.98%. Total Cases = 1 in 8,762 of the Population; Deaths = 1 in 30,236 of the Population.

TABLE VIII.

DEATHS DUE TO SMALL-POX, CHICKEN-POX AND THE EFFECTS OF VACCINATION IN ENGLAND AND WALES.

Year.	Small-pox.			Total.	Chicken-pox.	Cowpox and other Effects of Vaccination.
	Vaccinated.	Unvaccinated.	Not Known.			
1876	..	..	..	2,408	109	21
7	..	..	..	4,278	110	32
8	..	..	..	1,856	106	39
9	..	..	..	536	89	36
1880	..	..	..	648	103	41
1	652	1,068	1,378	3,098	133	58
2	176	325	816	1,317	122	65
3	78	162	717	957	99	55
4	493	595	1,146	2,234	129	53
5	580	795	1,452	2,827	109	52
6	25	43	207	275	93	45
7	42	111	353	506	87	45
8	91	269	666	1,026	116	45
9	4	2	17	23	83	58
1890	4	..	12	16	95	43
1	3	17	29	49	91	43
2	55	106	270	431	123	58
3	150	253	1,054	1,457	127	59
4	153	176	491	820	108	50
5	33	61	129	223	86	56
6	45	118	378	541	151	42
7	6	5	14	25	103	36
8	107	59	87	253	116	26
9	4	5	165	174	124	34
1900	7	17	61	85	127	25
1	141	111	104	356	115	17
2	821	791	852	2,464	123	22
3	123	174	463	760	116	26
4	75	124	308	507	104	28
5	23	20	73	116	93	26
6	..	2	20	21	106	29
7	..	..	6	10	120	12
8	..	..	12	12	93	13
9	5	6	10	21	94	11
1910	3	2	14	19	97	8
Total	5,741*	7,973*	16,635*	30,349	3,800	1,309
Proportion Vaccinated	18.92%	26.27%	54.81%	100%	..	..

* For the years 1876-80 the proportion of vaccinated and unvaccinated were estimated on the figures for the years 1881-1910.

In the period 1894-1906 inclusive, there were 12,057,507 births, and of these 8,438,459 were vaccinated as children, *i.e.*, 70%. The percentages for successive years were as follow:—

1894.	5	6	7	8	9	1900.	1	2	3	4	5	6
70.7	67.7	65.9	62.8	61.0	66.5	68.7	71.4	74.8	75.3	75.3	75.8	73.4

TABLE IX.

DEATHS DUE TO SMALL-POX, CHICKEN-POX AND THE EFFECTS OF VACCINATION IN ENGLAND AND WALES.

Number of Deaths per One Million Persons.

(See also Table XIII. hereinafter).

Year.	Small-pox, per 1,000,000 Persons of the Population.				Chicken-pox, per 1,000,000 Persons.	Cowpox and other Effects of Vaccination, per 1,000,000 Vaccinated.
	Vaccinated.	Unvaccinated.	Not Known.	Total.		
1876	..	..	..	99	4	..
7	..	..	..	173	4	..
8	..	..	..	74	4	..
9	..	..	..	21	4	..
1880	..	..	..	25	4	..
1	25	41	53	119	5	..
2	7	12	31	50	5	..
3	3	6	27	36	4	..
4	18	22	42	82	5	..
5	21	29	53	103	4	..
6	1	2	13	11	3	..
7	2	4	13	19	3	..
8	3	10	24	37	4	..
9	*	*	*	1	3	..
1890	*	..	*	*	3	..
1	..	1	1	2	3	..
2	2	4	9	15	4	..
3	5	9	35	49	4	..
4	5	6	16	27	4	79
5	1	2	4	7	3	90
6	1	4	12	17	5	70
7	*	*	*	*	3	62
8	3	2	3	8	4	46
9	*	*	5	5	4	55
1900	*	1	2	3	4	39
1	4	3	3	10	4	26
2	25	24	26	75	4	31
3	4	5	14	23	3	36
4	2	4	9	15	3	39
5	1	1	2	4	3	37
6	..	*	1	1	3	42
7	*	*	*	*	3	..
8	..	..	*	*	3	..
9	*	*	*	*	3	..
1910	*	*	*	*	3	..
Average†	5.5	7.6	15.9	29.0	3.6	49.4‡

* In these years the number of deaths was not sufficient to produce a death-rate of more than 0.5, so the figures have been omitted.

† The average is based upon the totals of Table VIII. and the populations 1876-1910, the sole exception being final figure 49.4.

‡ Based upon the number vaccinated and number dying directly from that cause, 1894-1906.

It will be seen from this table that death as a consequence of vaccination is by no means rare; and the proportion of persons subjected to vaccination dying as a direct consequence thereof is about 14 times greater than the

number dying from chicken-pox, and 1.7 times greater than the number dying from small-pox itself under the average conditions existing between 1876 and 1910. For the interpretation of this result reference should be made to the evidence of other tables. The actual number dying are shown on Table VIII: 30,349 died of small-pox, 3800 of chicken-pox, and 1309 as a consequence of vaccination, in 35 years.

The extent of vaccination in Germany and Japan, which are probably the most thoroughly vaccinated countries in the world, is deducible from the figures given in the following tables:

STATISTICS OF VACCINATION.

TABLE X.

GERMANY (FOR THE FIVE YEARS 1900 TO 1904 INCLUSIVE).

	Number of Persons due for Vaccination.	Number Successful.	Percentage Successful.	Percentage not Successful or Results Unknown.	Not Vaccinated.
					Per. Contrary.
First vaccination	8,890,345	7,540,800	84.82	2.70	10.38
Revaccination	6,441,996	5,879,200	91.22	6.21	2.13
Total	15,335,341	13,420,000	87.51	4.18	6.91
Average per annum	3,067,068	2,684,000	...	...	...

Average population, 1900 to 1904, 57,724,500

TABLE XI.

JAPAN (FOR THE FIFTEEN YEARS 1895 TO 1909 INCLUSIVE).

	Total Number of Vaccinations.	Number Successful.	Percentage Successful.
First vaccination	22,807,919	19,241,153	84.36
Revaccination	37,940,845	12,904,901	34.01
Extraordinary vaccination	24,368,230	8,063,603	33.09
Total vaccinations	85,116,994	40,209,657	47.24
Average per annum	5,674,466	2,680,684	...

Average population, 1895 to 1909, 46,067,600.

TABLE XII.

Mortality from Small-pox in various Countries. Average for years 1862-1876 1882-1896, 1896-1910.

Period.	Prussia and Bavaria.	Austria.	Belgium.	England.	Sweden.	Japan.
1862-1876	51.6	75.2	79.5	25.3	26.9	..
1882-1896	0.7	38.6	18.2	2.9	0.5	..
1896-1910	..	..	..	..	..	3.31

The relatively insignificant place which Small-pox takes compared with other common diseases, such as measles and scarlet fever by other countries, is shown by Table XV.

DEATH THROUGH VACCINATION.

Complete Australian statistics of the death due to vaccination are not available, but it may be mentioned that in Victoria, in the 21 years 1880 to 1900 inclusive, there were 5 deaths from small-pox and 14 deaths from the effects of vaccination. The English results of 49.4 deaths directly attributable to 1,000,000 cases of vaccination furnish only the cases where death is a direct consequence, whereas, in order to properly estimate the tribute to death which has to be paid for vaccination, what is required is the number of deaths that would not have occurred but for the fact of vaccination. Such a number is the proper number for comparison with the number of deaths attributable to small-pox in an unvaccinated community, or with some modification with a partially or completely vaccinated community.

Table XIII furnishes the number of deaths from small-pox per million for different periods, and Table XIV, the number of deaths that, according to English experience, would be directly referable to vaccination, with the death-rate 49.4 per million cases of vaccination, if it were entered at the ages 6 months, 5½ years, 10½ years, 15½ years, and 20½ years.

TABLE XIII.

ANNUAL DEATHS IN ENGLAND AND WALES FROM SMALL-POX PER 1,000,000 PERSONS, 1851 to 1910.

1851	396	1861	66	1871	1,024	1881	119	1891	2	1901	10
1852	409	1862	81	1872	833	1882	50	1892	15	1902	75
1853*	174	1863	293	1873	102	1883	36	1893	49	1903	23
1854	153	1864	373	1874	92	1884	82	1894	27	1904	15
1855	136	1865	309	1875	40	1885	103	1895	7	1905	4
1856	121	1866	144	1876	99	1886	11	1896	17	1906	1
1857	206	1867	118	1877	173	1887	19	1897	8	1907	+
1858	335	1868	95	1878	74	1888	37	1898	8	1908	+
1859	197	1869	72	1879	21	1889	1	1899	5	1909	+
1860	140	1870	118	1880	25	1890	+	1900	3	1910	+

* First year of compulsory vaccination. † Less than 0.5 per million.

INCREASE OF DEATHS BY VACCINATION.

TABLE XIV.

Assuming that vaccination was compulsory at the ages of 6 months, 5½ years 10½ years, 15½ years and 20½ years, the number of deaths immediately attributable to the effects of vaccination would, on the basis of the English experience for the years 1894-1906, be as follows:—

AGE.	England and Wales 1910.	Commonwealth of Australia 1912.
	Approx. No. who attained each age in 1912.	Estimated No. of deaths from effects of vaccination.
6 months	836,465	42
5½ years	715,394	36
10½	694,065	35
15½	669,785	33
20½	636,415	32
Total	3,552,062	178
Mean Population	35,796,289	4,644,852
Death rate per 1,000,000 of mean population from vaccination effects on above assumption.	5.0*	5.2*

* The number of deaths properly attributable is larger than this for reasons above indicated.

COMPULSORY VACCINATION OF CHILDREN.

Compulsory Vaccination Acts exist in all States of the Commonwealth except New South Wales. Except in Victoria these Acts are, however, not generally enforced. (See Official Year Book of the Commonwealth, No. 6, p. 1097.)

The years in which vaccination for children became compulsory in the Australian States and in some of the countries of Europe and Japan are as follows:—South Australia, 1853; Victoria, 1865; Western Australia, 1878; Tasmania, 1882; Queensland, 1901; Bavaria, 1867; Denmark, 1810; Sweden, 1814; Württemberg, Hesse, and some other German States, 1818; Prussia, 1835; United Kingdom, 1853; Germany, 1874; Rumania, 1874; Hungary, 1876; Servia, 1881; Austria, 1886; Japan, 1873.

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GENERAL RESULTS.

The general deductions from the statistical results are as follow:

1. In England the death rates amongst unvaccinated persons actually attacked are about 34 times as great as among the vaccinated attacked.
2. There were 3½ times as many vaccinated persons attacked in England as unvaccinated, but this may be due to the larger numbers of vaccinated persons in the community.
3. Isolation has probably more effect than vaccination in preventing epidemics. (Compare results for Europe and Japan, and the experience of Australia.)
4. Epidemics may occur in spite of vaccination and re-vaccination, possibly due to insufficient care as to isolation. (Compare results for England, Japan, and Australia.)
5. According to the English results the proportion of deaths from vaccination to the total number vaccinated is at least 14 times as great as the proportion of deaths from chicken-pox to the entire population. This risk, however, is not annually repeated.
6. Between the years 1894 and 1906 inclusive, in the then state of vaccination of the community, and with the degree of isolation secured, the frequency of death directly attributed to vaccination (i.e., number of deaths to number vaccinated) was 3.3 times the frequency of deaths from small-pox (i.e., number of deaths to the total population). These results are for England.
7. The frequency of death properly attributable to vaccination in England is not accurately known, but is no doubt higher than 50 per million cases of vaccination.
8. Compulsory vaccination every five years up to the 21st year would, on the basis of English experience, result in Australia in not less than 24 deaths annually from the effects of the vaccination itself.
9. There were only 108 deaths from small-pox in Australia between 1881 and 1910. Deaths from vaccination according to English experience would number 150 with only one vaccination in each life-time.
10. The attack rate for small-pox appears to be greater amongst unvaccinated than amongst vaccinated persons. This appears also to vary with age, being, according to English experience, 7.5 times as great for persons under 10, and less than 1.8 times as great for persons over 10. (See Table III.)
11. Japanese experience appears to show that repeated vaccination does not ensure immunity from attack.
12. Thirteen years experience of vaccination in England and Wales, 1894 to 1906, shows that the risk of death following directly from vaccination is no less than one in 20,000, that is for every 20,000 persons subjected to vaccination, one person will probably die as a direct consequence.

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