

WHOOPING-COUGH: ITS PREVALENCE AND MORTALITY IN ABERDEEN.

By JAMES S. LAING, M.D., D.P.H.,
Resident Physician, City Hospital, Aberdeen.

Revised and extended by PROFESSOR MATTHEW HAY, M.D.,
Medical Officer of Health, Aberdeen.*

WHOOPING-COUGH, as is generally known, is one of the most widely prevalent and one of the most fatal of the commoner infectious diseases, and a fresh investigation of its attack-incidence and mortality may, I hope, be welcomed.

It is only within comparatively recent years, since the introduction of the compulsory notification of infectious diseases, that records of the incidence of infectious diseases have become available.

Under the Notification Act of 1889, whooping-cough is not included in the list of notifiable diseases, although there is power given to any local authority to add it. But exceedingly few authorities have taken advantage of this power.

Aberdeen obtained, under its Corporation Act of 1881, power to compel the notification by the medical attendant of all the principal infectious diseases, inclusive of whooping-cough, and since the commencement of 1882 there exists for the city a complete record of all the cases of whooping-cough notified to the medical officer of health.

In 1891, in order to obtain such advantages as might accrue from dual notification, the Town Council adopted the Notification Act of 1889, and added measles and whooping-cough—the notification of these diseases under this Act commencing on August 1st, 1891.

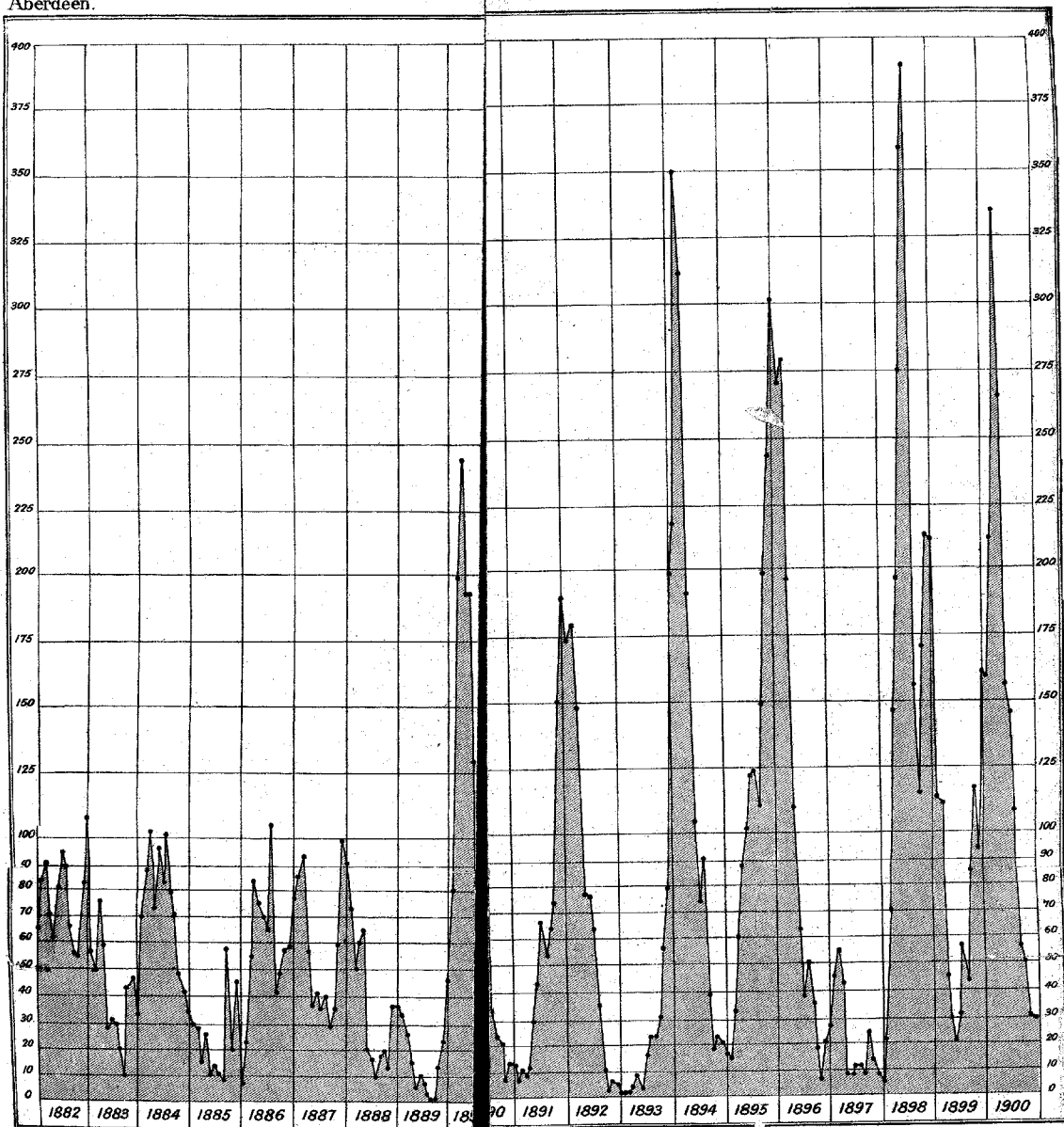
Statements are to be found in the works of various authorities as to the prevalence of whooping-cough in so far as it can be judged from an examination of the recorded deaths from the disease, but I am not aware that hitherto there has appeared any sufficient statement of the incidence and other points in relation to whooping-cough as determinable from notified sicknesses.

I have therefore, at the suggestion of Professor Hay, medical officer of health for the city, and under his direction, undertaken a

* This paper was prepared by Dr. Laing in 1901 as a thesis for his Doctorate of Medicine in the University of Aberdeen. Owing to his sudden and lamented death soon afterwards, it has fallen to me to revise the paper for publication, and to make some additions which he would himself have made had he survived.—M. H.

Aberdeen.

Chart 1



WHOOPIING COUGH - Monthly Attack Incidence per 100,000 of Population from 1882 to 1900.
(The vertical lines coincide with the month of January.)

study of the records of whooping-cough in Aberdeen, the results of which I now venture to submit.

Of course, it is to be borne in mind that the following paper deals only with notified cases. No doubt, as with all zymotics, several cases have escaped notification, but the number escaping is not believed to be large. The record, therefore, is not an absolutely complete record of all the cases, but it is probably sufficient for such purposes as the present, and is, in any event, the fullest that is obtainable.

The population of Aberdeen was at the last census 153,503.

A. ATTACK-INCIDENCE (MORBIDITY).

- I. *In respect of Time and Season.*
- II. *In respect of Age and Sex.*
- III. *Second Attacks.*
- IV. *Relationship to Measles.*

I. IN RESPECT OF TIME AND SEASON.

In Aberdeen, since the commencement of the year 1882 up to the end of 1900, altogether 20,405 cases of whooping-cough have been notified, and it is with these cases that the following data and accompanying charts are concerned.

1. *General Progress of Incidence since Notification began.*

Chart I. exhibits in graphic form the monthly attack-incidence of whooping-cough since 1882, the cases being stated as per 100,000 of population, in order to eliminate the effect on the diagram of the considerable growth of population during the period.

(a) It will be observed that the disease seems to have become distinctly more prevalent in Aberdeen during the past ten years than it was in the years 1882-1889, an almost abrupt change taking place in 1890. The prevalence would appear to be still on the increase, for the number of cases notified within the past five years exceeds considerably the number within the preceding five years.

It is, of course, open to suggestion that this increase may be due to increasing thoroughness of notification by medical practitioners, and especially to the change from single to dual notification. The medical officer of health is, however, of opinion that these possible influences have not been operative in any marked degree.

There is no reason for believing that medical practitioners were less conscientious in notifying in the earlier years than in the later

years. Owing to the notification of cases of whooping-cough being rarely followed by their removal to hospital, there has never been any inducement to medical practitioners to withhold the notification of cases in order that the patients or their parents might escape what they might regard as a disagreeable prospect. But even if it had to be admitted that medical men had become more careful in course of time in notifying, the change would have been gradual and not abrupt.

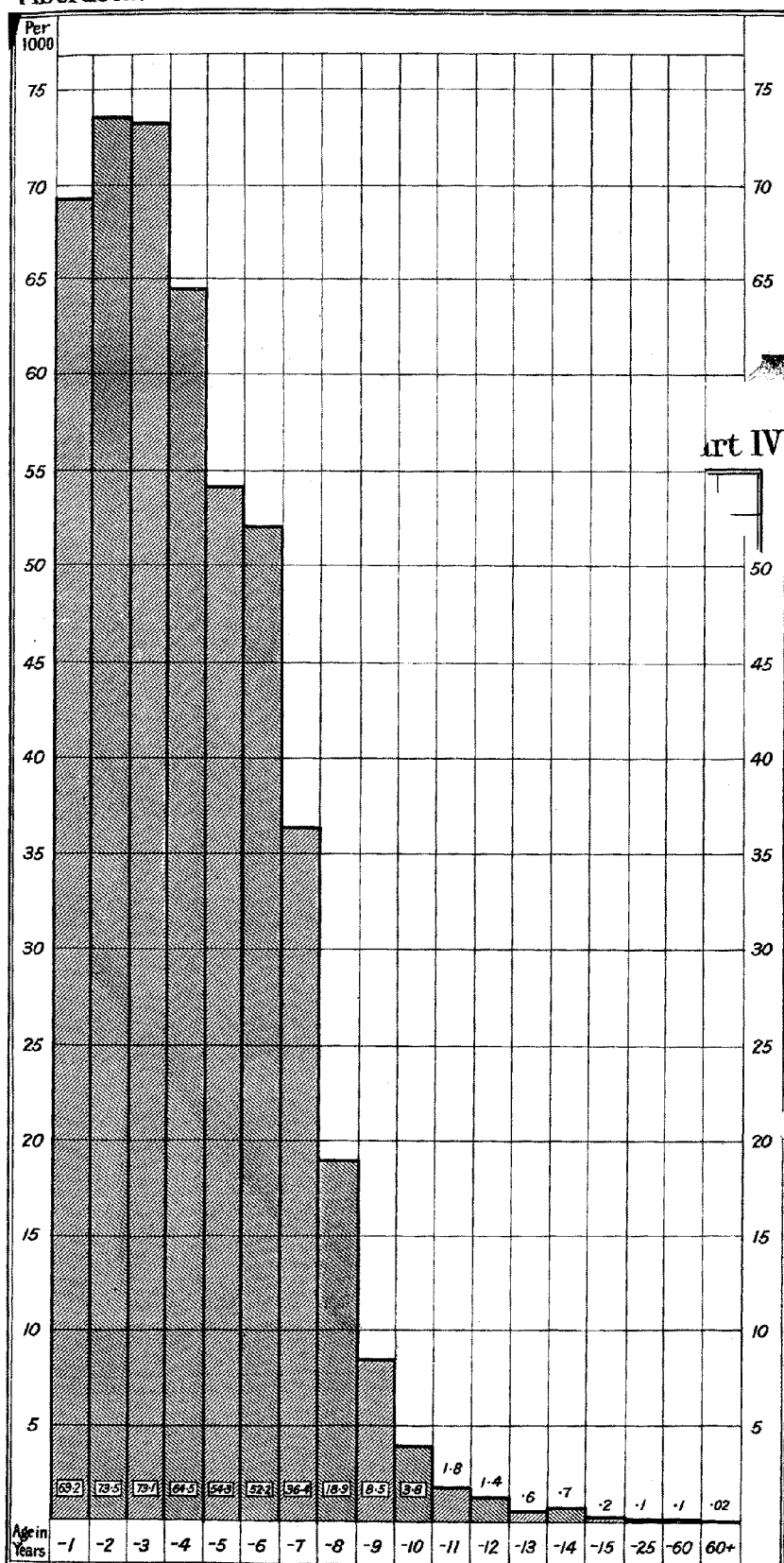
As to the effect of dual notification, while it is admitted that since its introduction some cases have been notified by the householder which would probably have escaped being reported under single notification, the medical officer of health is of opinion that the number is small, and does not materially affect the course of incidence as shown in the chart. As strengthening this opinion, it will be found, on looking at the chart, that the change of incidence, both in kind and degree, took place in 1890, while dual notification was not introduced, as already, remarked, until late in 1891.

In further proof of the view that the changes in the progress of the incidence of attacks, as shown in Chart I., are not due to defects in notification, a comparison may be made with the corresponding incidence of deaths exhibited in Chart VI., regarding the completeness and accuracy of which there cannot, of course, be any doubt.

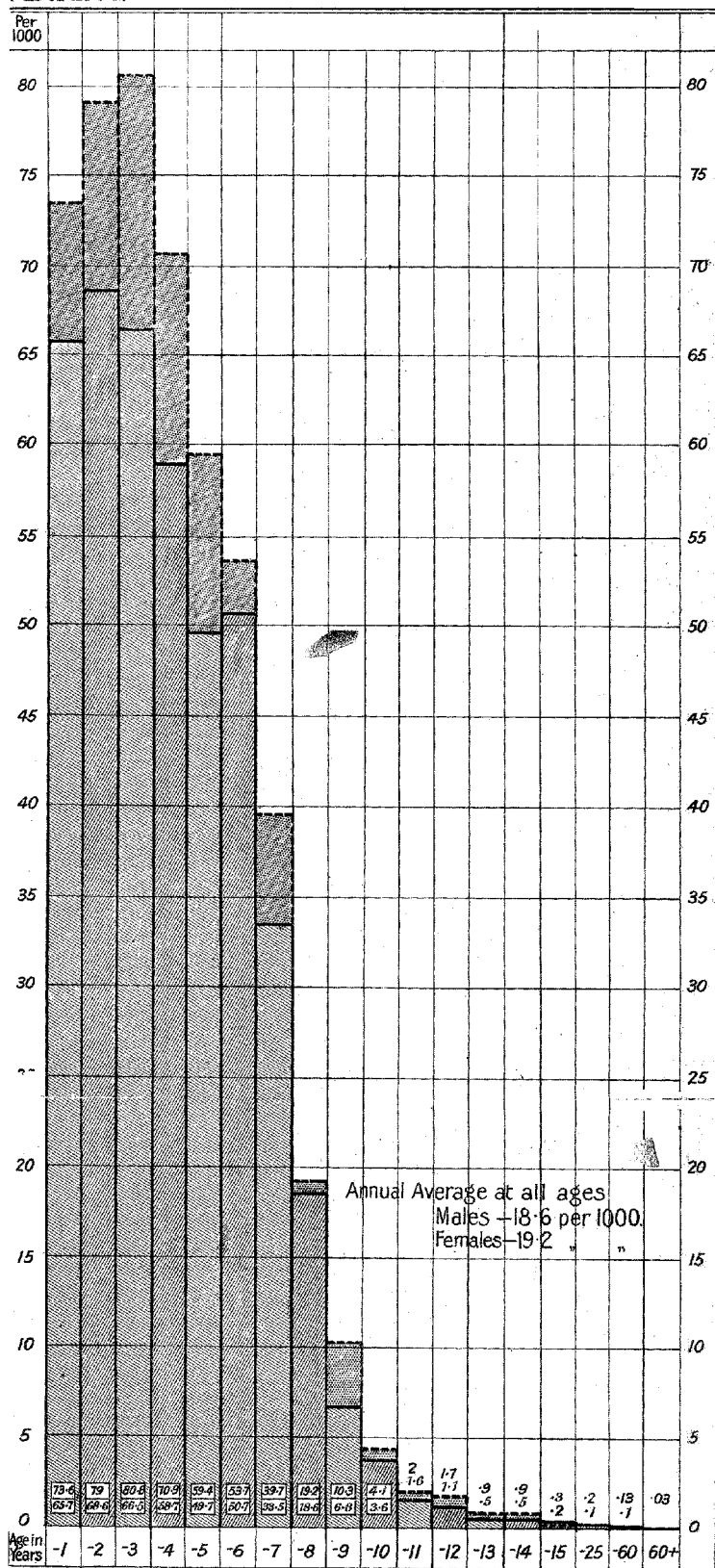
(b) Chart I. shows not only an increasing prevalence of the disease, but also a remarkable change in the type of the epidemic rise. Before 1890 the crest of each epidemic height exhibits a number of peaks of moderate and nearly equal altitude. From 1890 onwards, the height terminates almost invariably in one outstanding peak of great altitude. Indeed, the altitude of the peak is rather misleading as an index of the total volume of the epidemic, for it often rests upon a narrow base. Compare, for example, the epidemic of 1890 with that of 1884. The number of cases in each epidemic differed by scarcely more than 100, yet the peak of 1890, as shown in the chart, is nearly two and a half times as high as the series of peaks in 1884.

Epidemics have, evidently, run a more rapid course in recent years than formerly, and quickly attained a great height, and have nearly as quickly fallen. From what cause I cannot say.

(c) Chart I. also shows that while the periodicity of the epidemics before 1889, so far as the record of case-incidence goes, was somewhat ill-defined, it has been remarkably clear since that year, and is substantially biennial. Reference to Chart XII., in which the mortality rates are given in graphic form for Aberdeen since the



WHOOPIING COUGH.- Attacks per 1000 of Population living at each age, (average of 10 years-1891-1900)



WHOOPING COUGH.~ Attacks per 1000 of Population at each age and of each sex. (average of 10 years 1891-1900)

MALES

FEMALES

commencement of the civil registration of deaths in Scotland in 1855, reveals a similar though less regular periodicity. The mortality rates of the other principal Scottish towns exhibited in the same chart do not, however, in several instances, give the same periodicity. The tendency with most is towards a longer interval—as, for example, Edinburgh and Perth with about three years, Glasgow with three to four years, and Dundee with four years.

Returning to Chart I., it is equally interesting to note that, since the periodicity began in 1889 to be well defined, every second epidemic is marked by a considerably higher incidence peak than the immediately preceding epidemic.

In connection with these observations on periodicity, it is noteworthy that since the chart was prepared the further progress of whooping-cough incidence in Aberdeen up to the present time (June, 1902) reveals a heavy epidemic, commencing in October, 1901, and reaching its greatest height in March last, when the attack-rate per 100,000 of population was 472, as compared with 335 in April, 1900, and 390 in August, 1898—the highest point previously reached. There was thus a further heightening of the epidemic peak, with the usual alternation of higher and lower peaks just referred to.

It is also worthy of observation in Chart I. that, as might be expected, the alternate higher-peaked epidemics are preceded by a longer interval of quiescence than the lower-peaked epidemics. Since 1887 up to the present year the intervals preceding the higher peaks have been 28, 26, 31, and 23 months; while the intervals preceding the lower peaks have been 21, 22, and 20 months.

(*d*) As has already been remarked, the height of the epidemic peak is not always a true measure of the actual volume of the whole epidemic. So it will be found, on comparing the total volumes of the successive epidemics since 1889, that they do not alternate in the same way as the epidemic peaks; *e.g.*, the high-peaked epidemics of 1890 and 1893-94 have each a smaller volume than the immediately succeeding low-peaked epidemic.

(*e*) All the well-defined epidemics reach their highest incidence point in the first quarter of the year, with the exception of the epidemic of 1898, which had its highest point in August. It will be seen, on comparing Chart I. with Chart VI., that the highest point of mortality is usually a month later than the highest incidence point, although in some instances they both occur within the same month.

2. *Incidence in relation to Season.*

In Chart II. is represented the average attack-incidence of whooping-cough per 100,000 of population in each of the twelve months of the year, based on the notification returns for the twelve years ending 1900.

It will be seen that the disease is most prevalent during the spring months, and least so in the autumn months of the year. April (132), closely followed by March (128), shows the maximum prevalence, and September (47), closely followed by October (50), the minimum prevalence. The first five months of the year have each more than the average number of cases (which is 88); while the last five months have each less than the average. June and July have an average number.

II. INCIDENCE IN RESPECT OF AGE AND SEX.

1. *Incidence in Respect of Age (the Sexes being combined).*

Chart III. shows graphically the attack-incidence of whooping-cough per 1,000 of population living at different ages, the sexes being taken together. The years are given individually up to the age of fifteen years. Above that age the cases are arranged in three groups, the age-periods being fifteen to twenty-five years, twenty-five to sixty years, and sixty years and over.

The incidence of attack is heaviest among children in the second and third years of life, being respectively 73·5 and 73·1 per 1,000 living at these ages. Next in order come children under one year of age, their figure standing at 69·2 per 1,000, followed by children in their fourth year of age, whose attack rate is 64·5. After the fourth year of life the attack-incidence falls rapidly till it reaches 3·8 per 1,000 for children between nine and ten years of age. Beyond the age of ten the incidence becomes very low, and above the age of fifteen years it is almost negligible. Above the age of sixty years only one person in 50,000 is attacked by whooping-cough.

The apparently small liability to attack at the higher ages is, of course, partly due to the fact that so many persons living at those ages have suffered from the disease as children, and are therefore protected.

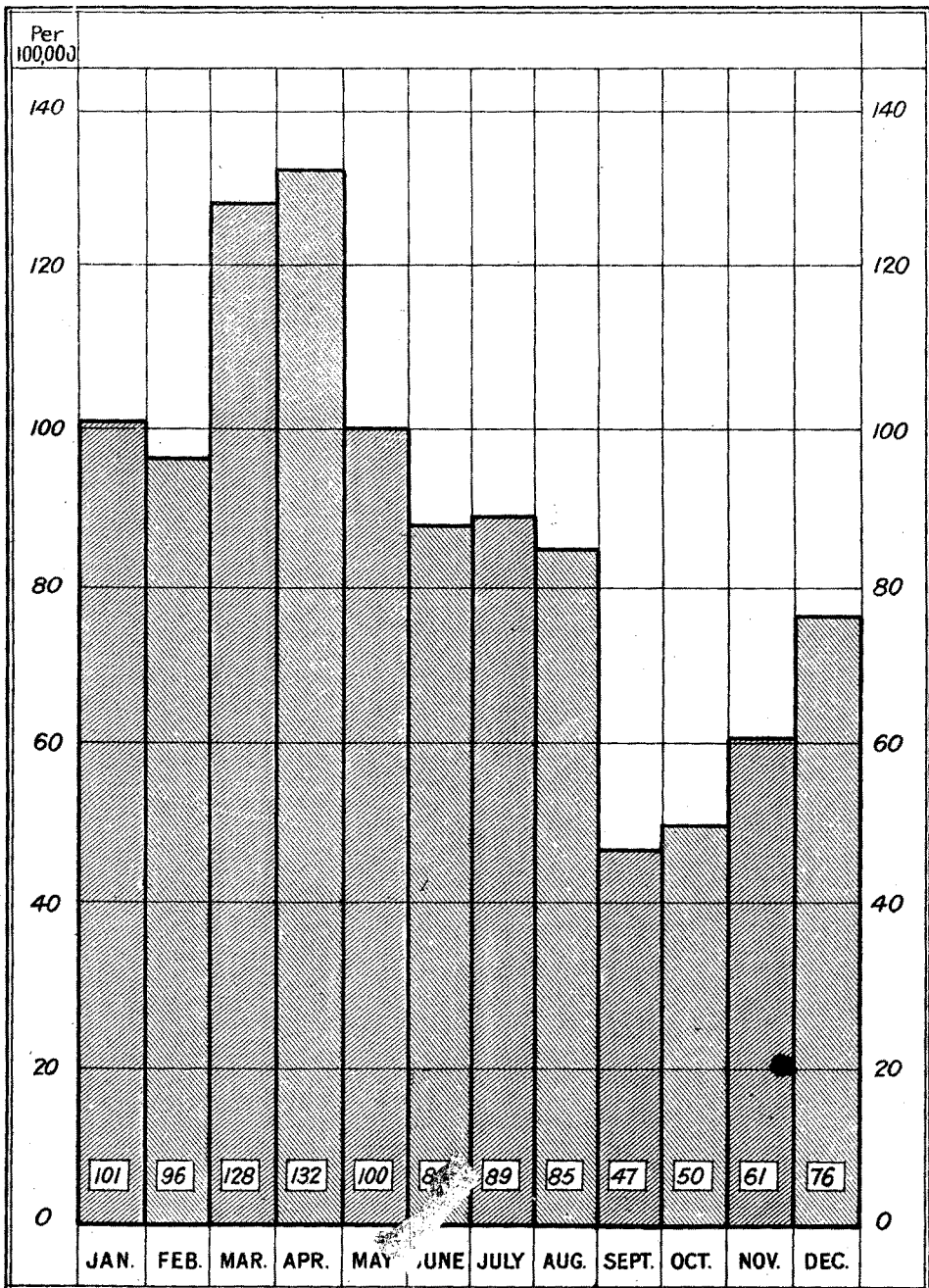
2. *Incidence in Respect of Age (the Sexes being taken separately).*

Chart IV. deals with the attack-incidence of whooping-cough in respect of both age and sex.

It will be observed that the liability to attack is constantly higher among females than among males, the difference being most

Chart II

Aberdeen.



WHOOPIING COUGH.~ Number of attacks per 100,000 of Population in each of the twelve months of the year (average of 12 years -1889-1900)

pronounced at the ages under four years, at which ages about 118 females are attacked for every 100 males. The only exception is at the fifteenth year, but the difference is here very slight, and is based on a small number of cases.

Among males the liability to attack is greatest in the second year of life, the rate of incidence being 68·6 per 1,000. Next in order come the third and first years of life, with 66·5 and 65·7 per 1,000 respectively. After the age of three years the attack-incidence falls rapidly, and after fifteen years it practically disappears. In the age-period above sixty years no male is recorded as having had whooping-cough during the ten years under review.

Among females the susceptibility towards whooping-cough is greatest (80·8 per 1,000) in the third year of life as contrasted with the second year of life in the case of males. The next age in order of liability to attack in the case of females is the second year with 79 per 1,000. Then come the first and fourth years with 73·6 and 70·9 per 1,000 respectively. As in the case of males, the liability to attack is very slight after the age of fifteen years. Two females above sixty years of age are recorded as having had whooping-cough during the period under consideration (1891-1900).

III. SECOND ATTACKS.

Second attacks of whooping-cough are known to be of somewhat rare occurrence, though in what proportion they occur has not hitherto been definitely determined.

It is the practice in Aberdeen in connection with all notified zymotics to inquire whether the patient is suffering from a first or subsequent attack. The accompanying table has been prepared from the record of such inquiries in so far as they relate to whooping-cough.

Table A.

Age-Periods.	MALES.			FEMALES.			BOTH SEXES.		
	Total Number of Cases.	Number of 2nd Attacks.	2nd Attacks per 1,000 Cases.	Total Number of Cases.	Number of 2nd Attacks.	2nd Attacks per 1,000 Cases.	Total Number of Cases.	Number of 2nd Attacks.	2nd Attacks per 1,000 Cases.
Under 5 years...	5,356	0	0	5,697	5	·9	11,053	5	·45
5—15 years...	1,905	10	5·2	2,047	18	8·8	3,952	28	7·0
15—25 years...	7	0	0	35	1	28·5	42	1	23·8
25 years + ...	10	1	100	37	5	135	47	6	127·6
All Ages ...	7,278	11	1·5	7,816	29	3·7	15,094	40	2·6

The table deals with second attacks among the cases notified during the ten years ending 1900, and shows the total number of notified cases, the number of second attacks among these, and the proportion of second attacks per 1,000 cases. The numbers for each sex and for the combined sexes are given, for all ages and at different age-periods.

It will be observed that, as might have been expected, the proportion of second attacks to total cases rises steadily with increase of age. Thus, for the four age-periods given in the table the figures for the combined sexes are 0.45, 7.0, 23.8, and 127.6 per 1,000 respectively.

It will also be observed that males suffer less frequently from second attacks than females. This applies to each of the different age-periods, as well as to the ages taken collectively. In 1,000 cases at all ages among males the proportion of second attacks is only 1.5, while among females the proportion is 3.7.

The higher proportion of second attacks among females is, no doubt, especially among the older females, due in great part to greater exposure to infection in nursing infected children.

No third attacks are recorded.

IV. ASSOCIATION OF WHOOPING-COUGH AND MEASLES.

Most writers assert that there is an intimate association between epidemics of measles and epidemics of whooping-cough, and that an epidemic of the former disease strongly predisposes to the subsequent development of the latter.

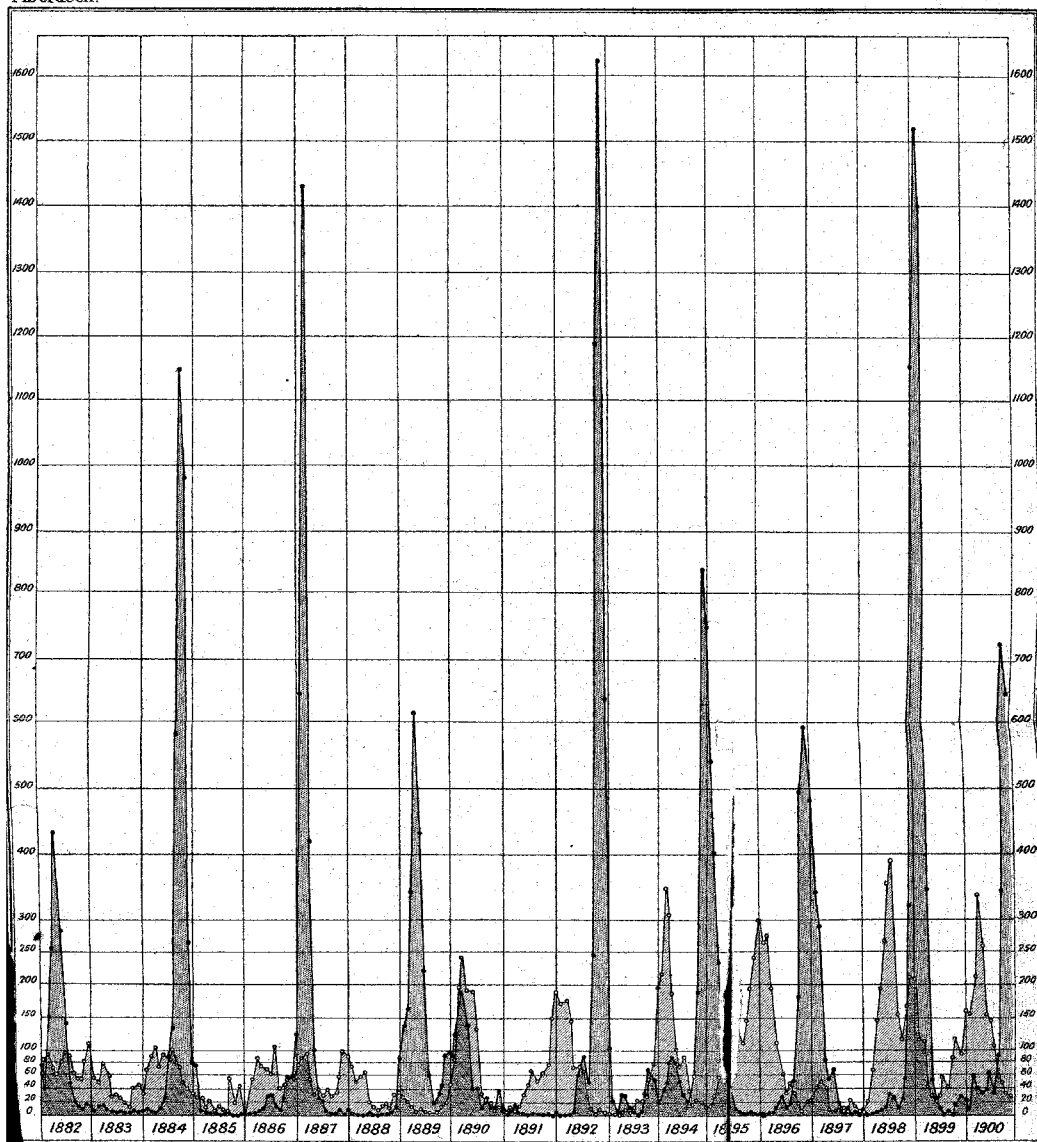
In order to see if any such relationship between the diseases exists in the case of Aberdeen, I have prepared Chart V., in which the monthly notifications of the two diseases per 100,000 of population since 1882 are graphically represented.

If an attack of measles predisposes to whooping-cough, one would expect to find the latter disease following closely on an epidemic of the former, and that, in the chart, the line representing the decline of the measles epidemic would be overlapped by the ascending line of a commencing epidemic of whooping-cough. This is seen in only one instance during the period represented in the chart—namely, in 1895. The chart, however, reveals several instances of the line of decline of a whooping-cough epidemic being intersected by the line of rise of a measles epidemic.

Again, if measles predisposes to whooping-cough, the space separating the peak of an epidemic of measles from the peak of the succeeding whooping-cough epidemic ought to be narrower than the space between an epidemic of whooping-cough and the next

Aberdeen.

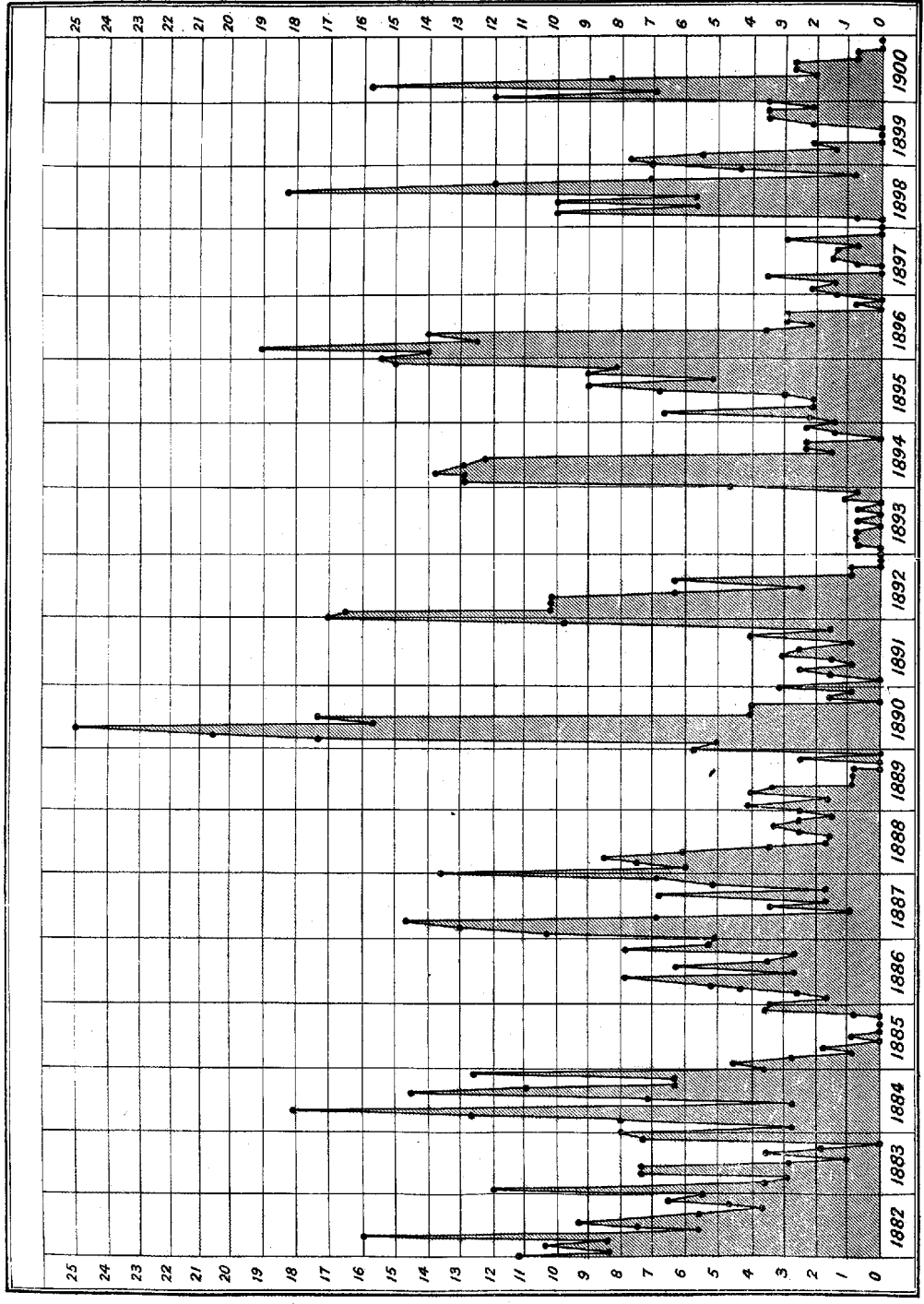
Chart V



Monthly Attack-Incidence of WHOOPING COUGH and MEASLES from 1882 to 1900,
(per 100,000 of Population.)

Chart VI

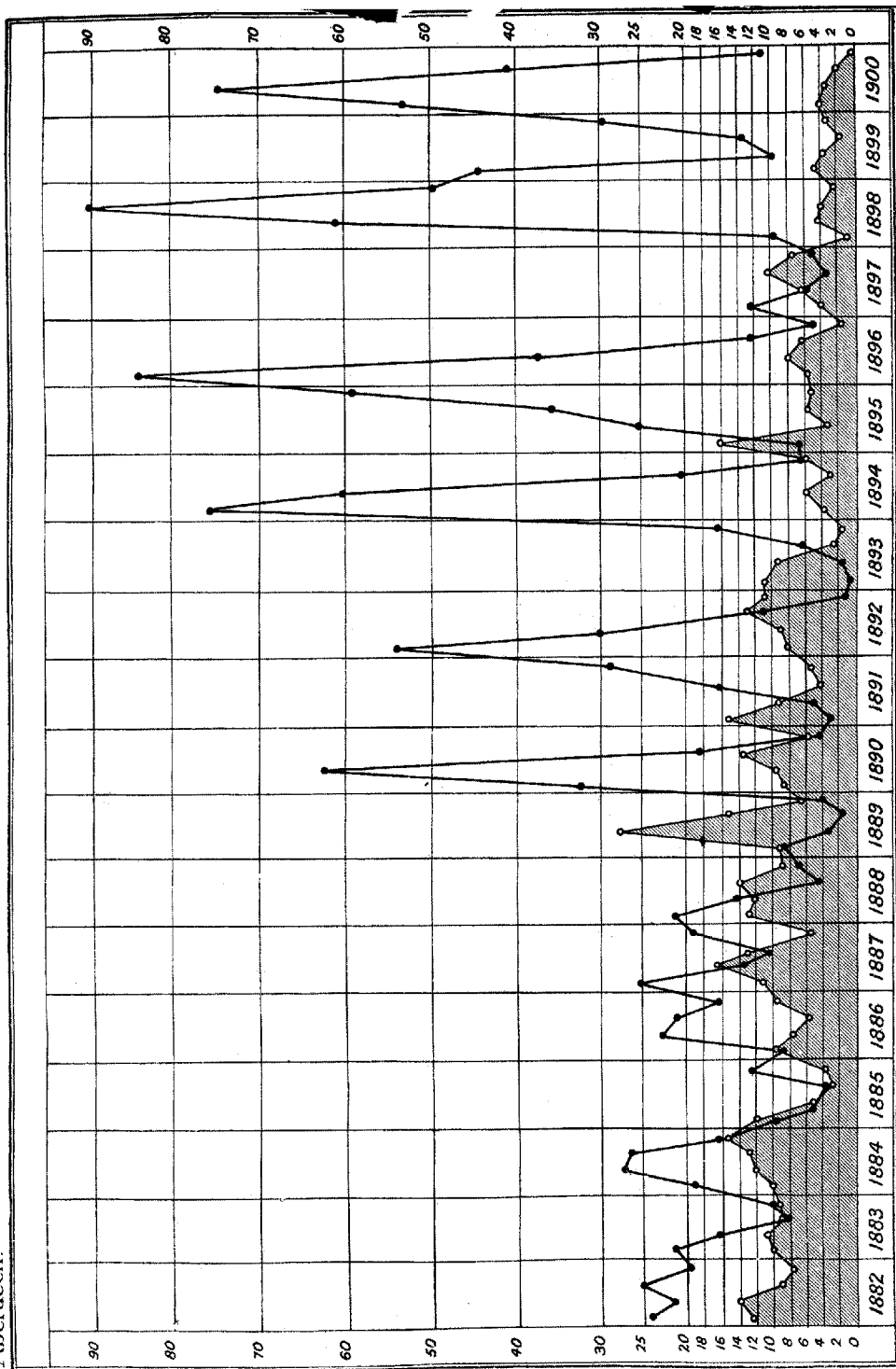
Aberdeen.



WHOOPIING COUGH _ Monthly Death-rate per 100,000 of Population from 1882 to 1900.

Chart VII

Aberdeen.



WHOOPIING COUGH - Attack-Incidence per 10000 of Population } in each Quarter of the years 1882-1900.
Case Mortality per 100 cases.....

of measles. Quite the reverse of this is seen in the chart. In the former case the average interval is 8·6 months, and in the latter 14·8 months. It would thus appear as if whooping-cough rather paved the way for measles than measles for whooping-cough.

B. MORTALITY.

In Chart VI. the death-rate per 100,000 of population in each month since notification of sicknesses began—that is, during the nineteen years ending 1900—is graphically shown.

It will be seen that this chart bears a close resemblance to Chart I., which deals with the morbidity, or incidence of attacks.

Although the mortality-rate runs to greater heights in the 1890-1900 period, owing to the occurrence of well-marked epidemics, yet the spaces indicating a low rate of mortality are deeper and wider in this period than in the 1882-1889 period. The average annual mortality for the earlier period is 67·7 per 100,000 of population, while in the later period it is 53·6 per 100,000—a reduction of fully one-fifth. Within the later period, however, there has been no fall, if the last five years are compared with the preceding five years, the average mortality-rate being about the same in both.

Chart XII. gives the mortality from whooping-cough since 1856, but the mortality is represented for each year and not for each month, as in Chart VI. Reference will be made to this chart later on. It may be mentioned here that in each of the two decades preceding 1882 the average annual mortality was 67.

C. CASE-MORTALITY.

- I. *In respect of Time and Season.*
- II. *In respect of Age and Sex.*
- III. *In relation to Attack-Incidence.*
- IV. *In relation to Size of House.*

I. CASE-MORTALITY IN RESPECT OF TIME AND SEASON.

1. *General Progress.*

Chart VII. represents graphically the progress of case-mortality from 1882 to 1900. The deaths occurring in each quarter of the year are stated as a percentage of the cases notified in the same quarter. In the same chart, for purposes of comparison, there is a line representing the incidence of attack per 10,000 of population in each quarter.

It will be observed that, while the proportion of persons attacked

by whooping-cough has become greater in recent years, the case-mortality has fallen very decidedly. The average case-mortality for the eight years 1882-1889 was 10·5 per cent. The average for the eleven years 1890-1900 was 5·3 per cent., or almost exactly half of the case-mortality for the earlier period; while for each of the three years ending 1900 it was only 3·6, or scarcely more than one-third of what it formerly was.

During 1901 and the first five months of the present year, in which there has been an epidemic of over 3,000 cases—now on the decline—the case-mortality has averaged only 2·8 per cent.

2. *Relation to Season.*

Chart VIII. shows graphically the average percentage mortality among cases notified in each month of the year. It deals with 16,723 cases and 886 deaths which occurred during the twelve years 1889-1900.

It will be seen that the case-mortality is considerably higher in the earlier months of the year than in the later.

There are, strictly speaking, three maxima in the course of the year, viz., in February, May, and September, with corresponding minima in March, July, and November. The sudden fall in March is curious, and difficult to explain.

The mortality is highest—namely, 6·9 per cent.—among cases notified in February, and is lowest—namely, 3·8 per cent.—in November, being closely followed by October with 3·9 per cent.

In the months of February (6·9 per cent.), April (6·3 per cent.), May (6·5 per cent.), and September (5·4 per cent.), the case-mortality is above the average; whilst in January (5 per cent.), March (5 per cent.), June (4·8 per cent.), July (4·7 per cent.), August (5 per cent.), October (3·9 per cent.), November (3·8 per cent.), and December (4 per cent.), it is below the average.

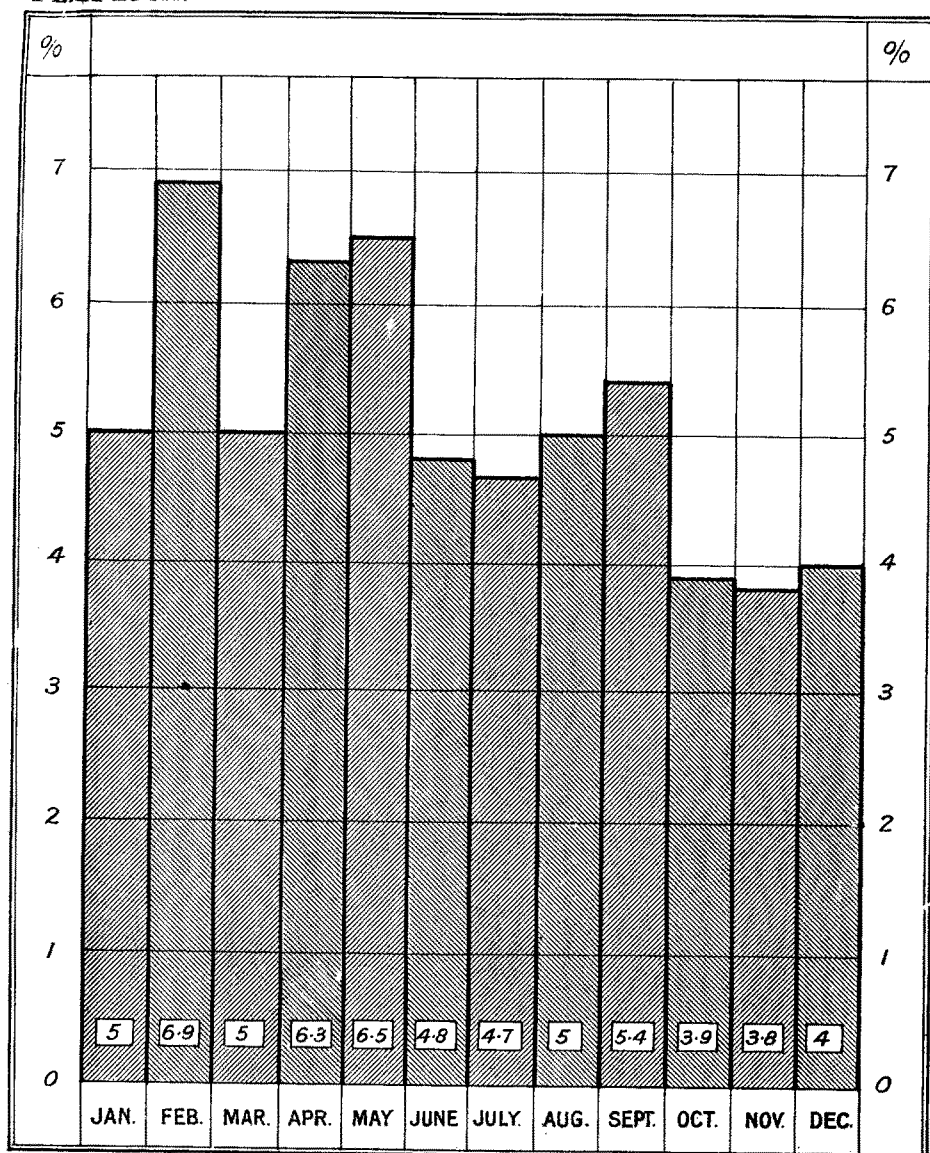
II. CASE-MORTALITY IN RESPECT OF AGE AND SEX.

1. *In respect of Age (the Sexes being combined).*

Chart IX. represents graphically the deaths from whooping-cough per 100 cases at all ages and at different ages during the ten years ending 1900, males and females being taken together. The case-mortality is shown for each year of life up to the age of fifteen years. Above this age the cases are arranged in three groups, the age-periods being fifteen to twenty-five years, twenty-five to sixty years, and sixty years of age and upwards. The first year of life has been subdivided to show the case-mortality in each of its four quarters.

Chart VIII

Aberdeen.



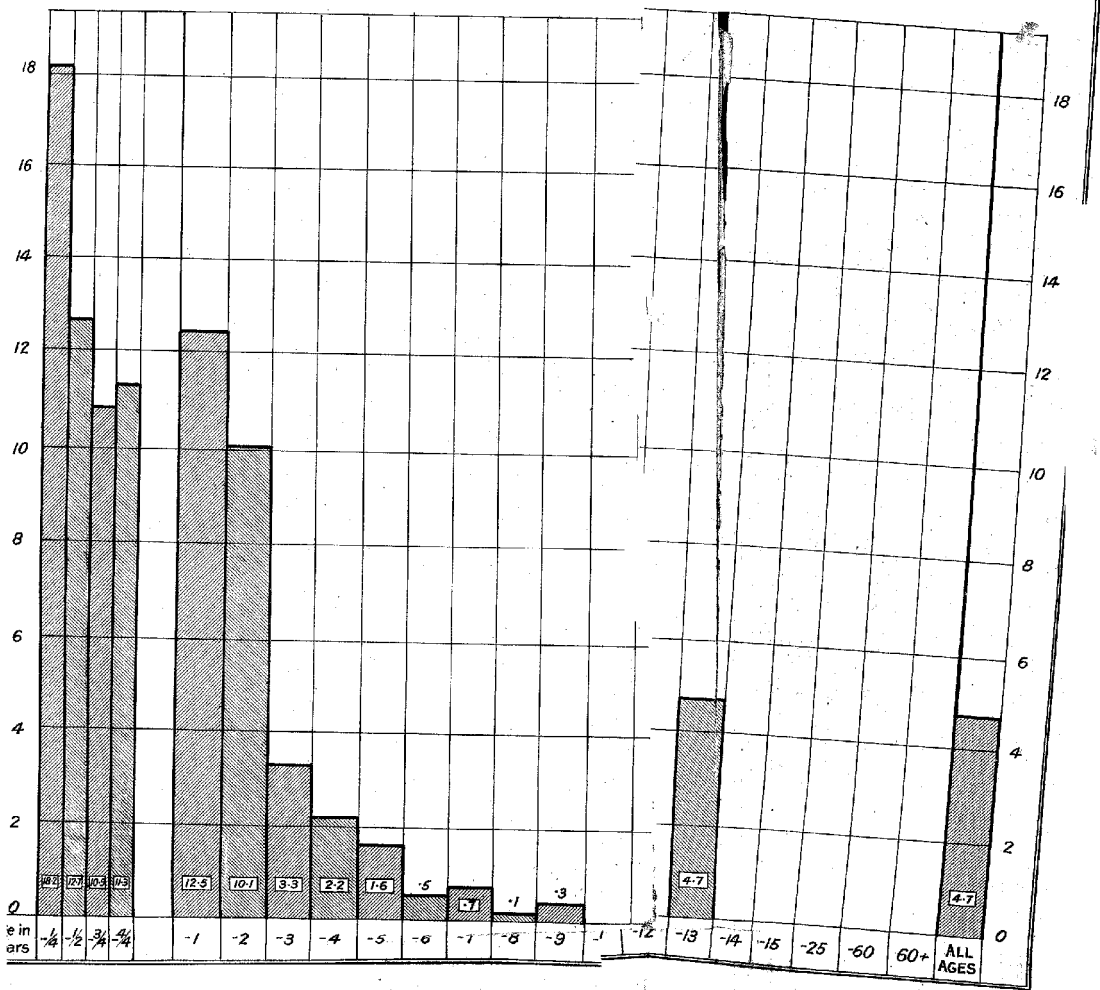
													TOTAL
CASES	1628	1524	2028	2092	1582	1390	1407	1361	758	787	956	1210	16,723
DEATHS	82	106	102	133	103	67	67	68	41	31	37	49	886

Number of Cases and Deaths dealt with

WHOOPIING COUGH.—Case-Mortality Deaths per 100 cases in each of the twelve months of the year, (average of 12 years-1889-1900.)

Aberdeen.

CHART 17A



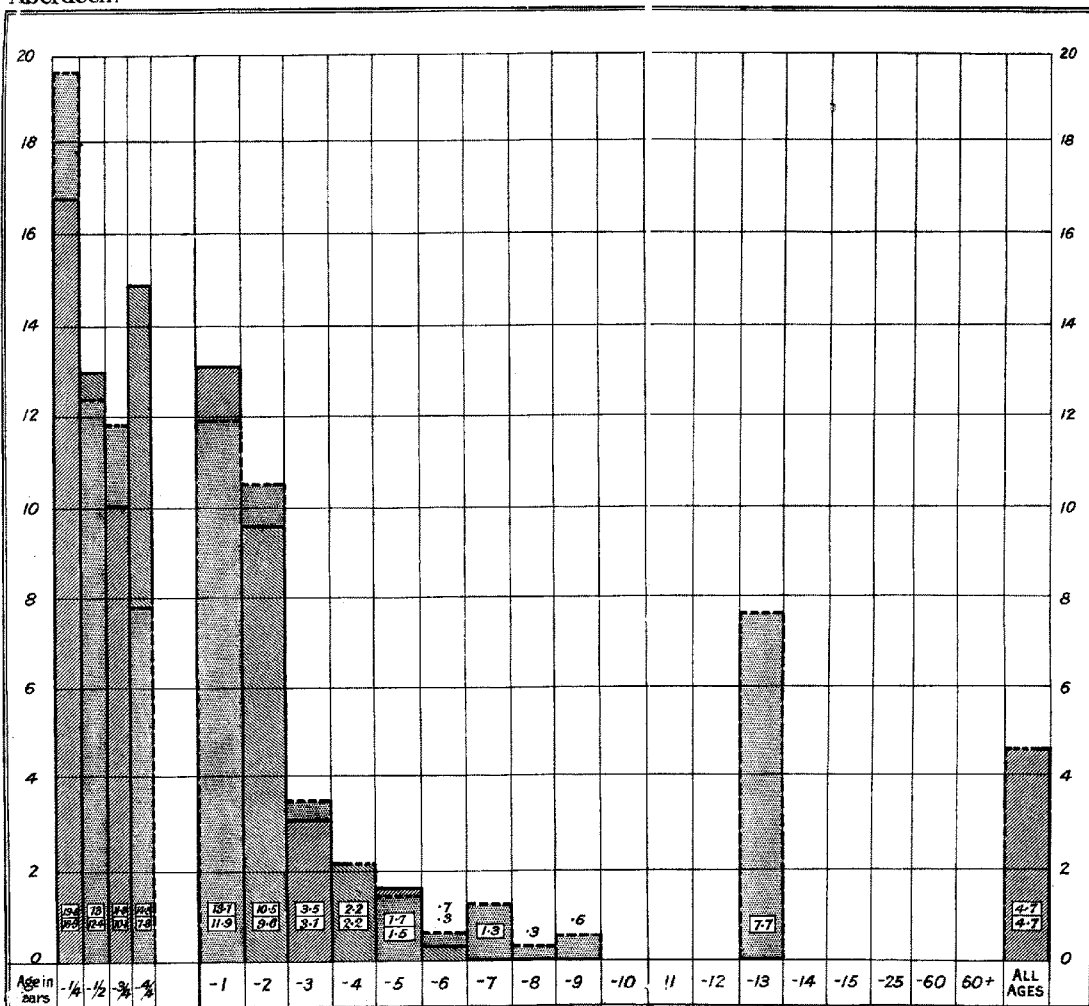
SES	340	785	803	644	2492	2327	2297	2129	1808	1676	1163	584	266	112	4	21	21	7	42	45	2	Total.
THS	62	90	88	73	313	235	76	48	30	9	8	1	1	-	-	1	-	-	-	-	-	15,093
																						722

Number of Cases and Deaths dealt with in each age.

WHOOPING COUGH.- Case Mortality, being the deaths per 1000 cases at each age (average of 10 years.) (Sexes Combined). (1891-1900)

Aberdeen.

Chart A



Males	CASES	177	359	396	324	1256	1114	1128	1010	847	836	561	288	105	54	25	17	8	8	4	7	10	-	7278
	DEATHS	20	47	40	48	165	107	35	23	15	3	-	-	-	-	-	-	-	-	-	-	-	-	348
Females	CASES	163	346	407	320	1236	1213	1169	1119	961	840	602	296	161	60	31	26	13	13	3	35	35	2	7815
	DEATHS	32	43	48	25	148	128	41	25	15	6	8	1	1	-	-	-	1	-	-	-	-	-	374

Number of Cases and Deaths dealt with at each age.

WHOOPING COUGH.- Case Mortality, being the deaths per 100 cases at each age and for each sex (average of 10 years)

MALES 9.6

FEMALES 10.5

(1891-1900)

Dealing first with the case-mortality for all ages taken together, it will be seen that it stands at 4·7 per cent. This, of course, applies to the decade ending 1900. Anterior to this period it will be recollected that the general case-mortality stood considerably higher.

Coming next to the case-mortality at different ages, it is clearly seen that the first and second years constitute the period of life in which whooping-cough is by far the most fatal, the rates for these years being 12·5 per cent. and 10·1 per cent. respectively.

In the third year of life there is a great fall in the case-mortality to 3·3 per cent., this rate being a little more than one-fourth of the rate in the first year, and less than one-third of that in the second year of life. The rate continues to fall in subsequent years. After the fifth year it never rises above 1 per cent. Indeed, after the age of seven years, the mortality is absent, or so small as to be negligible. The apparent rise at the age of thirteen is due to one death in a small number of cases.

On analysing the case-mortality in the first year of life, one finds that the rate is highest—namely, 18·2 per cent.—in the first quarter. There is a considerable drop to 12·7 per cent.—about the average for the whole of the first year—in the second quarter. The third and fourth quarters stand at nearly the same level, the fourth (11·3 per cent.) showing a slightly higher figure than the third (10·9 per cent.).

On looking at this table it is obvious that no effort should be spared to protect children from whooping-cough during the first and second years of their life. In the later years their chances of recovery, if attacked by the disease, are greatly increased.

2. *In respect of Age (the Sexes being taken separately).*

Chart X. shows the case-mortality of whooping-cough at different ages and for each of the two sexes, the male mortality being indicated by continuous lines and the female by dotted lines.

The average case-mortality at all ages during the period under review is the same for each sex—namely, 4·7 per cent.

As regards the case-mortality at different ages, the rate for males is higher than the rate for females in the first and fifth years of life. In the fourth year the rates are equal for the two sexes. In the second, third, and sixth years of life the mortality is higher among females than among males. Above the sixth year there were no deaths among males, although there were several among females, especially at the seventh year, with one each at the eighth, ninth, and thirteenth years.

The apparently high rate (7·7 per cent.) among females in the

thirteenth year is got by one death among thirteen cases. As the number of cases is so small, no importance need, therefore, be attached to it.

With regard to the four quarters of the first year, it will be noticed that the case-mortality is, for each sex, highest in the first quarter, with a preponderating height for females in the first and third quarters, and for males in the second and fourth quarters. Among females the mortality rapidly falls in each succeeding quarter. Among males there is also a rapid fall in the second and third quarters, with, however, a considerable rise in the fourth quarter, so that during this quarter the mortality is almost twice as high among males as among females.

III. CASE-MORTALITY IN RELATION TO ATTACK-INCIDENCE.

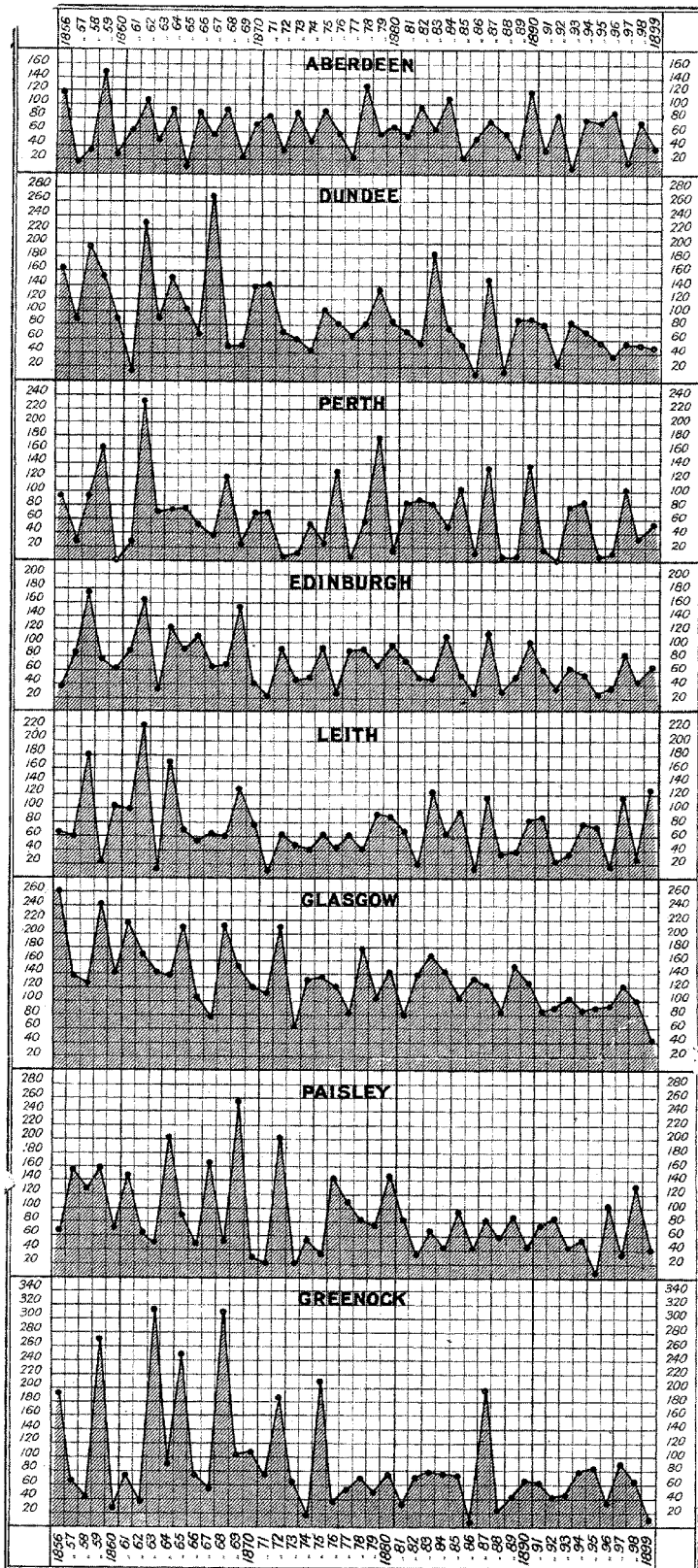
The relationship of case-mortality to attack-incidence is mainly a question as to whether a high or low attack-incidence influences the case-mortality, and as to whether the case-mortality tends to vary in different directions during the progress of an epidemic. Chart VII. supplies an answer to the question, though it has to be admitted that it is defective in so far as the notified cases during one period are, in order to avoid much additional labour in preparing the chart, compared with the recorded deaths during the same period in place of with the deaths among such cases, whether occurring during the period or in a subsequent period. As the periods are, however, quarterly and not monthly periods, the error arising from this is probably not great.

The chart cannot be said to demonstrate any tangible relationship between the size of an epidemic and the case-mortality, if we keep out of view the gradual fall in case-mortality which has been concurrent with increasing attack-incidence during the past ten years. If immediately succeeding epidemics of different magnitude be compared, no corresponding and consistent differences in case-mortality are traceable.

As to the variations in case-mortality during the progress of an epidemic, the chart shows that the case-mortality tends, as a rule, to increase with the progress of the epidemic, and may become twice or three times as high in the last quarter of the epidemic as it was in the first quarter. This increase is, however, not noticeable in the last two epidemics shown in the chart.

Further, the case-mortality is usually highest in the intervals between epidemics, though it is possible that this is due to a larger proportion of cases of the disease escaping recognition and notification in such intervals than when the disease is epidemic and is

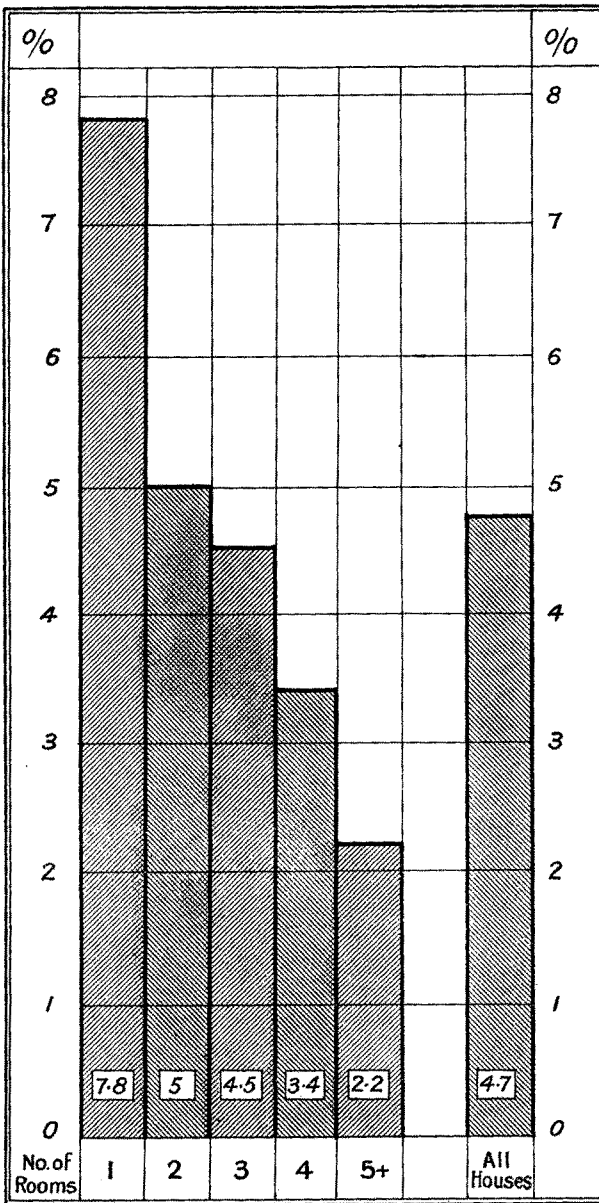
Chart XII



WHOOING COUGH—Annual Mortality per 100,000 of Population in eight towns in Scotland, from 1856 to 1899, (44 years).

Chart XI

Aberdeen.



CASES	1174	7564	3837	1079	1354	15,008
DEATHS	92	385	174	37	30	718

Number of Cases and Deaths dealt with.

WHOOPIING COUGH.— Case-Mortality in different sizes of houses. (1891-1900)

a subject of everyday remark and expectation. This heightening of the case-mortality is also not to be observed between the last two epidemics shown in the chart.

IV. CASE-MORTALITY IN RELATION TO SIZE OF HOUSE.

Chart XI. has been prepared for the purpose of demonstrating the influence of social status on the case-mortality of whooping-cough. The size of house, as a readily ascertainable and fairly accurate indication of social status, forms the basis of classification of the cases.

The cases, which were those notified in the decade ending 1900, are arranged in five groups, according to the number of rooms in the houses in which they occurred, all the cases occurring in houses of five or more rooms being placed together in the last group.

The case-mortality among cases in one-roomed houses (7·8 per cent.) is greatly in excess of the average for all sizes of houses (4·7 per cent.); while in two-roomed houses the rate (5 per cent.) is slightly above the average. Cases occurring in three-roomed houses show about the average mortality (4·5 per cent.). Among cases in four-roomed houses the case-mortality (3·4 per cent.) is distinctly below the average, and among cases in houses with five rooms and upwards the rate (2·2 per cent.) is far below the average.

The above figures show that whooping-cough is three and a half times more fatal in children living in one-roomed houses than in children living in houses of five or more rooms.

D. COMPARISON OF ABERDEEN WITH OTHER SCOTTISH TOWNS IN RESPECT OF MORTALITY FROM WHOOPING-COUGH (1856-1899).

Chart XII. exhibits, in graphic form, the annual mortality from whooping-cough per 100,000 of population in eight of the principal towns of Scotland since 1856, or the year following the commencement of the civil registration of deaths. Table B gives the average annual mortality in each town for the whole period from 1856 to 1899, and for the component two periods, 1856-1872 and 1873-1899.

It will be observed, in the first place, that there are considerable differences in the general rate of mortality between the different towns. The mortality in Glasgow is by much the highest, Dundee and Greenock coming next, followed in order by Paisley, Leith, and Edinburgh. Aberdeen and Perth have the lowest rates, the rate for each of these towns being less than half the rate for Glasgow.

It will also be observed that in all the towns except Aberdeen the mortality runs much higher in the earlier years than in the later. Thus, the average annual rate per 100,000 of population for all the towns together was 105 in the 1856-1872 period, and only 70 in the 1873-1899 period.

Generally speaking, the towns which had the highest rates in the earlier period are those in which the rate has fallen most.

Aberdeen differs from the other towns in showing only a very slight fall in the later period. For the earlier period the rate was 65 per 100,000, and in the later, 63. But it has to be noted that, though the fall is small, Aberdeen was considerably the lowest in the earlier period, and is still low.

Table B.

AVERAGE ANNUAL MORTALITY PER 100,000 OF POPULATION.			
	1856-1872.	1873-1899.	1856-1899.
Glasgow	162	112	131
Dundee	121	72	91
Greenock	133	65	91
Paisley	112	70	88
Leith	86	63	72
Edinburgh	87	61	71
Aberdeen	65	63	64
Perth	72	57	63
All the towns ...	105	70	84

Some of the towns exhibit great irregularity in the altitude of the epidemic peaks—for example, Dundee, Perth, Greenock, and Paisley; while others, like Aberdeen and Glasgow, show comparatively little irregularity.

But the most interesting question is whether the epidemic peaks in the different towns are of coincident occurrence, thus indicating the possibility of some generally operative changes, atmospheric or otherwise, determining the simultaneous development of whooping-cough in the various towns. A careful comparison of the diagrams in Chart XII. reveals no general agreement in epidemic incidence, except in the case of Edinburgh and Leith, which are so closely contiguous as to form virtually one town, and to a less extent in the case of Dundee and Perth, which are comparatively near to each other. Paisley and Greenock, though separated only by a few miles, and enjoying a similarity of situation and climatic conditions, show scarcely any correspondence in the

chronicity of their epidemics. Obviously, the epidemicity of whooping-cough is virtually wholly determined by local conditions, which mainly turn upon the accumulation of a sufficient proportion of unprotected children.

SUMMARY.

ATTACK-INCIDENCE (MORBIDITY).

1. The prevalence of whooping-cough in Aberdeen has increased considerably since 1890 (Chart I.).

2. The numerical intensity of the epidemic at its height, as obtained from a monthly record, has shown a remarkable increase since 1890 (Chart I.).

3. The periodicity is substantially biennial (Charts I. and XII.), and has become in recent years more clearly defined (Chart I.).

4. Since 1890 every alternate epidemic has at its height exhibited a higher numerical intensity than the immediately preceding or immediately succeeding epidemic (Chart I.).

5. The disease is most prevalent in spring and least prevalent in autumn (Chart II.).

6. The rate of attack-incidence is heaviest among children in the first three years of life, and subsequently rapidly falls. After the tenth year it is very small, and by the fifteenth year is so small as to be negligible (Chart III.).

7. At practically every age females are more freely attacked than males (Chart IV.).

8. Second attacks occur in 2·6 per 1,000 cases, and are more frequent among females than males, and at the later than the earlier ages (Table A.).

9. An epidemic of whooping-cough is usually the immediate precursor of an epidemic of measles (Chart V.).

MORTALITY.

10. In Aberdeen the average annual mortality from whooping-cough per 100,000 of population has, during the period of notification, fallen from 67·7 in 1882-1889 to 53·6 in 1890-1900. In each of the two decades preceding 1882 the mortality-rate was 67.

CASE-MORTALITY.

11. The case-mortality has during the same period shown a much greater decline, having fallen from 10·5 per cent. of notified cases in 1882-1889 to 5·3 in 1890-1900. In each of the three years ending 1900 it was only 3·6 (Chart VI.). In 1901-1902 to date, it was 2·8.

12. The case-mortality shows three maxima in the course of the year—in February, May, and September, the highest being in February (Chart VIII.).

13. The case-mortality is highest, by far, in the first and second years of life, and highest of all in the first quarter of the first year (Charts IX. and X.).

14. The average case-mortality at all ages is exactly the same for both sexes, though there are slight differences between the sexes at different ages (Chart X.).

15. The case-mortality does not appear to vary with the size of an epidemic. It tends, however, to increase as an epidemic progresses, and is much higher towards the end of an epidemic than at its commencement. It is usually highest of all in the intervals between epidemics (Chart VII.).

16. Case-mortality is affected by social condition, as determined by the size of house in which the cases occur. Thus, in one-roomed houses the case-mortality was 7·8 per cent., whereas in houses of five rooms and upwards the mortality was only 2·2 per cent. during the decade ending 1900 (Chart XI.).

COMPARISON OF ABERDEEN WITH OTHER PRINCIPAL SCOTTISH TOWNS
IN RESPECT OF MORTALITY FROM WHOOPING-COUGH (1856-1899).
(Chart XII. and Table B.)

17. The towns differ considerably in their average mortality-rate from whooping-cough, reckoned as per 100,000 of population, during 1856-1899, Aberdeen being one of the lowest and Glasgow the highest.

18. Each town shows a decrease of the mortality-rate during the period, the decrease being greatest in Greenock and least in Aberdeen.

19. The periodicity of the epidemics varies much in the different towns, and is in none so regular as in Aberdeen. Intervals of three years between successive epidemics are not infrequent.

20. There is no evidence of atmospheric or similarly widespread conditions determining the simultaneous occurrence of epidemics in various towns. The epidemicity appears to be determined wholly by local conditions.

It may be of interest to add a short note of the uses which have been made of the notification of whooping-cough in Aberdeen.

Each case is, immediately after notification, visited by a sanitary officer, who sees to its proper isolation, in so far as it can be carried out with only a small percentage of removals to hospital, and leaves

with the parents or guardians a printed set of instructions as to the precautions to be taken, and as to the hygienic treatment of the case. The case is then notified to the headmaster of the school attended by the patient, if at school, and to the headmasters of schools attended by other members of the family. Under Section 57 of the Public Health (Scotland) Act, 1897, all the children of the family are prevented from attending school until the patient has recovered, and a certificate has been granted by the medical attendant or the medical officer of health, stating that the child or children desiring to return to school are "free from disease and infection, and that the house and everything therein exposed to infection has been disinfected." The disinfection of the house is always carried out by the sanitary staff, who remove the infected bedding and clothing to the disinfecting station for disinfection.

It is evident from the statistics supplied in this paper that the notification of whooping-cough, with the measures consequent upon it, have not led in Aberdeen to any diminution of the prevalence of the disease. On the contrary, there is an increase. But this is equally true of scarlet fever, in which the proportion of cases removed to hospital runs from 70 to 90 per cent., and in regard to which a high standard of isolation is insisted upon among cases nursed at home.

The one gratifying feature is the great reduction of the case-mortality, which, perhaps, may be claimed to be due in part to the supervision of cases by the sanitary department, and the issue of instructions as to the hygienic treatment of the patient and as to the danger from exposure to cold. No known case of whooping-cough in Aberdeen is permitted to move about outside so long as the patient is infectious, and prosecutions for such exposure have been undertaken.

SCHOOLS IN THEIR EFFECTS ON THE HEALTH OF GROWING GIRLS.—After physicians have pointed out the faults in the present system of education as applied to girls, it remains for educators to devise means for their correction. In educational matters the opinion of a physician has much weight in a community, and he should make every effort to place school hygiene upon a proper scientific basis. This is one of the public duties which clearly devolves upon physicians because of their special training, and it cannot be relegated to anyone else. Besides this, public duty to the girls of a community, the physician must also face the question as it applies to the individual girl. The family physician must never cease to warn parents of the dangers to which developing girls are exposed from overstudy, insufficient out-of-doors life and deficient sleep, and he must make every effort to obtain as good physical development as possible for every girl, knowing that in so doing he is also making the best provision for mental growth and equilibrium.—*Journ. Am. Med. Assoc.*, May 3rd, 1902.