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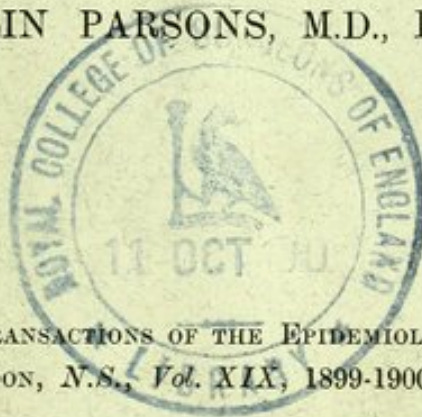


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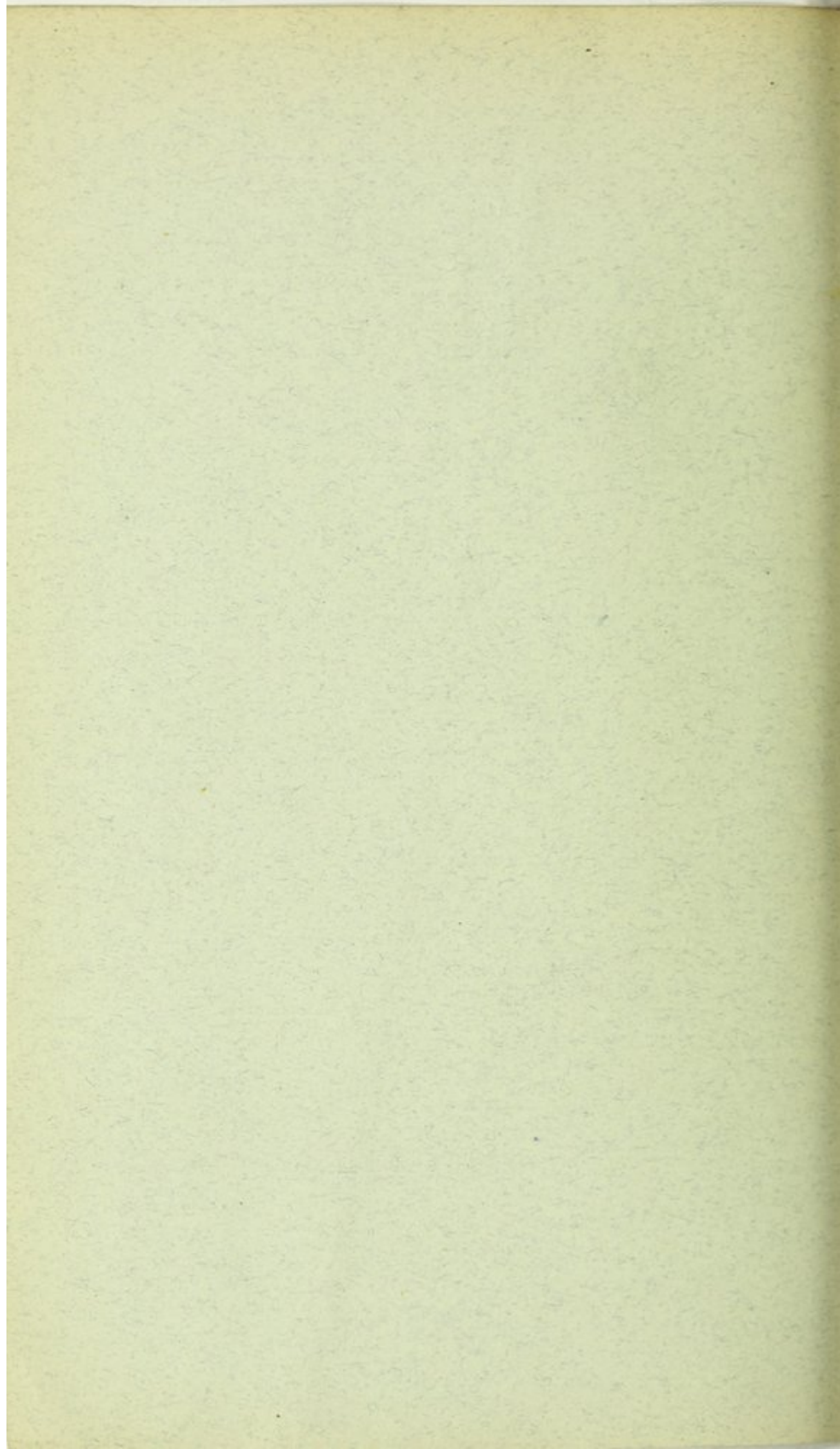
AN ADDRESS BY
H. FRANKLIN PARSONS, M.D., PRESIDENT.



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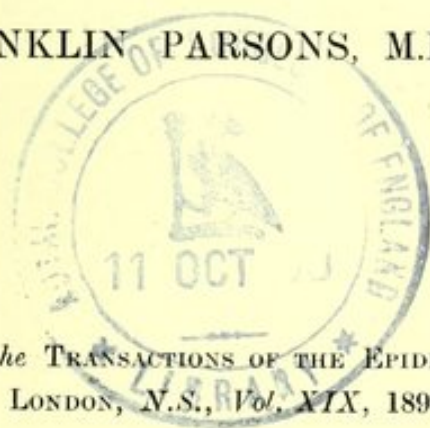


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INAUGURAL ADDRESS OF SESSION 1899-1900.

ON THE COMPARATIVE MORTALITY OF ENGLISH DISTRICTS.

BY H. FRANKLIN PARSONS, M.D., PRESIDENT.

(Read: November 17th, 1899.)

IN the address which I had the honour to read before you a year ago, I recounted the history of the efforts which have been made in England during the past fifty years for the improvement and protection of the public health; and I endeavoured to estimate the degree of success which these efforts had attained. We found that—partly, no doubt, through the general amelioration of social conditions, but partly also, as there was good reason to believe, as the result of efforts specially directed towards the improvement of the public health—there had been, during the half-century under review, a marked decline of the death-rate, it having fallen from 23.1 per 1,000 inhabitants per annum in the five years 1847-51, to 18.1 in the five years 1892-96. This fall, moreover, has taken place in spite of the increasing aggregation of the population in towns, a circumstance which of itself would have tended in a contrary direction.

But the satisfaction which we might otherwise feel at this achievement is subdued when we examine the contemporary mortality statistics of different districts, for we find that at the present time the death-rate in the unhealthiest districts of England and Wales exceeds that in the ~~un~~healthiest districts by a far greater amount than that by which the death-rate of England and Wales fifty years ago exceeded the death-rate of the present day. Thus while, as I have said, in England and Wales the average annual death-rate was 23.1 in 1847-51 and 18.1 in 1892-96, a difference of 5 per 1,000 persons living, the average annual death-rate in the great towns of England

during the ten years 1888-97 varied from 14.4 in Croydon to 25.5 in Liverpool: a difference of 10.1 per 1,000 inhabitants, or more than double the difference between the death-rates for the whole kingdom in 1847-51 and in 1892-96. If, therefore, we ascribe the reduction of mortality during the past fifty years to the improvement which has taken place in the sanitary and social conditions of the community, it is difficult to avoid the confession that the sanitary and social conditions of the most unhealthy of our towns fall short of the standard attained in the healthiest towns, in a much greater degree than that in which the sanitary and social conditions of the whole country fifty years ago fell short of those of the present day. The causes of these differences between the mortality in different districts at the present day, I propose to discuss briefly to-night.

COMPARATIVE MORTALITY OF TOWN AND COUNTRY DISTRICTS.

Speaking generally, the death-rate is higher in towns than in country districts, and it is higher in large towns than in smaller ones. In the ten years, 1888-97, the average annual death-rate in England and Wales was 18.4, viz.; in town districts 19.3, and in country districts 16.8.* In the three years, 1896-98, the average annual death-rates were in England and Wales 17.4 per 1,000 inhabitants, in the thirty-three largest towns 19.0, in the sixty-seven towns of next size 17.2, and in the rest of England and Wales 16.3.† The difference between the death-rates in town and country is increased when we take into consideration the constitution of the respective populations as regards age and sex: the towns have, as a rule, a larger proportion than country districts have of young inhabitants, *i.e.*, of persons at ages at which death is less frequent; and hence, *cæteris paribus*, they should show a lower death-rate than country districts; whereas, in fact, the reverse is the case. Thus, in the seven years 1892-98, the average annual death-rate recorded in the thirty-three largest towns of England and Wales was 20.2 per 1000 inhabitants, and in England and Wales less the thirty-three towns 16.9; but corrected for age and sex distribution, these rates become 21.3 in the thirty-three towns, and 16.7 in the rest of the country.‡ It is to be noted, however, that the difference between

* Sixtieth Annual Report of the Registrar-General. Table 29.

† Quarterly Reports of the Registrar-General.

‡ Annual Summaries of Weekly Reports of the Registrar-General. Table 4.

the rates of mortality in town and country districts is diminishing; the proportional rates in equal numbers living were, in 1851-60, 124 deaths in town districts to 100 deaths in country districts; in 1861-70, 126 in towns to 100 in country; in 1871-80, 122 in towns to 100 in country; in 1881-90, 117 in towns to 100 in country; and in 1891-7, 115 in towns to 100 in country.* The higher mortality in towns as compared with country districts is very largely due to the unfavourable conditions affecting child life in towns, and especially to the prevalence of infantile diarrhoea. In the three years 1896-8, the average annual death-rate in the thirty-three great towns of England and Wales was 19.0, and in England and Wales, less the one hundred largest towns, 16.3: a difference of 2.7 per 1000 persons living. Of this difference more than half, viz., 1.4, was due to the greater mortality in the large towns from the infectious and diarrhoeal diseases included under the term "zymotic," which caused in the aggregate a death-rate of 2.86 per 1000 in the great towns, and 1.46 in the country, less the one hundred towns. Measles caused a mortality per 1000 persons of .61 in the great towns, and .34 in the country districts; scarlet fever caused death-rates of .18 and .12 respectively; diphtheria of .33 and .20; whooping-cough of .47 and .29; "fever" of .19 and .15; and diarrhoea of 1.08 and .50. It is noteworthy that diphtheria, which was formerly a disease of rural districts and rare in towns, is now much more fatal in the large towns than in the rural districts and small towns. It causes the largest proportional mortality in London, while some of the great provincial towns, which are unhealthy in other respects, have but a low rate of mortality from diphtheria, as Preston and Sunderland. On the other hand, "fever," a term which includes chiefly enteric fever, is now not much more prevalent in the great towns than in the country districts, but diarrhoea is nearly twice as fatal in the great towns as in the less populous districts. The sixty-seven towns of second rank occupy an intermediate position between the thirty-three great towns and the country districts, except as regards "fever," which caused an equal death-rate in the thirty-three largest towns and in the sixty-seven towns of second rank; and small-pox, which caused a higher mortality in the sixty-seven towns of second rank than in either of the other groups of districts, owing to the

* Sixtieth Annual Report of Registrar-General, p. 29.

epidemics which occurred at Gloucester and Middlesbrough. The mortality among infants in their first year of life is much larger in the great towns than in the country districts, being in the former 174 and in the latter 138 out of every 1000 born. As the birth-rate is greater in towns than in country districts, the greater proportion of those born who die during the first year of life will have so much the greater effect in raising the general death-rate. It used formerly to be a subject of warm discussion whether the tendency of a high birth-rate was to raise or to lower the death-rate. A high birth-rate implies, in order that so many children may be begotten, that a high proportion of the population must consist of married persons of reproductive age, *i.e.*, of persons at ages at which the mortality is low; and though the mortality among young children is higher than that at the age-periods next following, yet where the conditions of life are favourable, a comparatively large proportion of those born will survive to the years of childhood at which mortality is at its lowest. Hence, where sanitary and social conditions are favourable, the existence of a high birth-rate indicates that the age-constitution of the population is such that the death-rate ought to be low. On the other hand, where sanitary and social conditions are unfavourable, a large proportion of the children born die in infancy, and do not reach the ages of low mortality, nor live to be enumerated among the population.

COMPARATIVE MORTALITY IN DIFFERENT COUNTIES.

If now we compare the death-rates prevailing in different parts of the kingdom, we find differences between the death-rate in one part and that in another part, greater than the difference between the aggregate death-rate of the great towns and that of the country districts. Thus, during the ten years 1887-96, the average annual death-rate per 1000 persons living, varied in the eleven divisions of the Registrar-General from 15.8 in the South Eastern, and 15.9 in the South Midland divisions, to 19.0 in Yorkshire, 19.3 in Wales, 19.6 in London, and 20.9 in the North Western division. In the individual registration counties the range was, of course, still greater, *viz.*: from 14.8 in Surrey, to 21.8 in Lancashire (see Map I and Table XV). If the crude death-rates be corrected for age and sex, by applying the actual death-rates in each county, at each age-period, to an equal population of standard age and sex constitution, the disparity between the death-

rates in different counties is increased; for the agricultural counties, which have low death-rates, have a larger proportion of elderly inhabitants, as compared with the urban and industrial counties; and hence the result of the correction is to reduce the comparative mortality figure in the former, and to increase it in the latter. The order of the counties is also somewhat altered: Rutlandshire comes first with a rate of 13.2; Huntingdonshire, Cambridgeshire and Dorsetshire also have rates below 14.0, and eight other counties have rates below 15.0. On the other hand, the rate in Lancashire is increased to 23.6, and the West Riding, London and Durham all have rates above 20.

A line drawn across England, from the mouth of the Severn to the Wash, will roughly divide the counties of high mortality from those of low mortality. The Registrar-General's divisions I to V, viz., London, South Eastern, South Midland, Eastern and South Western, containing 22 counties or vice-counties, lie to the S.E. of this line, and divisions VI to XI, viz., the West Midland, North Midland, North Western, Yorkshire, Northern and Wales, containing 23 counties or vice-counties, lie to the N.W. of it. All the counties with crude death-rates under 16, with the exception of Westmoreland, lie to the S.E. of this line, and all the counties with death-rates above 18 lie to the N.W. of the same line, except London and Cornwall. Speaking generally, the counties which are purely agricultural and contain no large towns have low death-rates; this is so with Rutlandshire in the North Midland, and with Westmoreland in the Northern division; though other counties in those divisions, which contain large towns and manufacturing or mining populations, have much higher death-rates. On the other hand, the counties which have a high death-rate are those which contain a predominant urban population, and especially a manufacturing or mining one, *e.g.*, London, which is wholly urban, with a density of population in 1891 of 56.5 persons to an acre, and Lancashire, Staffordshire, Warwickshire, the West Riding of Yorkshire, Durham, Northumberland, Monmouthshire, and South Wales, with their great towns and populous mining and manufacturing communities. It may be remarked that a high mortality prevails in those parts of the kingdom in which there is a considerable Celtic element in the population, as Wales and Monmouthshire, and to a less extent in Cornwall, and also in the large towns of Lancashire in which there are many Irish, as Liverpool and Preston. It may be remarked,

too, that the line between the counties of low and of high mortality corresponds approximately with the lower border of the outcrop of the Jurassic system of rocks; except in Lincolnshire and Yorkshire, the areas occupied by the Oolitic, Cretaceous, and Tertiary strata lie to the S.E. of that line in the region of low mortality; while the areas occupied by the new red sandstone, the coal measures, and the older Palæozoic rocks lie to the N.W. of the line in the region of high mortality. In the S.E. half of the kingdom the principal water supplies are usually derived from springs or wells in the chalk or the Oolitic limestones; whereas, in the N.W. half, most of the large towns and the surrounding populous districts are supplied with upland surface water; hence, in the former region we may say, that the bulk of the population drink hard water, in the latter soft water. It would, however, be going too far to attribute the low or the high death-rate to the presence or absence of lime in the drinking water, for there are towns which, like Cardiff and Huddersfield, are supplied mainly or wholly with soft water, and have a low death-rate; while there are others which, like Sunderland, are supplied with hard water and have a high death-rate. London, however, which is supplied with hard water, can hardly be considered an exception to the rule: for, in spite of its size and density of population, its death-rate is below the average of the largest towns, and far below the death-rates of Liverpool and Manchester, the two towns which come next to it in population, and which are supplied with soft water. London, it may be noted, ranks both as a county and a town. As a county it has a high death-rate compared with other counties, for these contain large rural areas, while London is wholly urban; but as a town, compared with other large towns, its death-rate is low, especially considering its vast extent and closely-aggregated population.

In the N.W. half of the kingdom, the birth-rate is considerably higher than in the S.E. half. In registration divisions I to V, *i.e.*, London, S.E., S. Mid., E. and S.W., in nineteen counties out of twenty-two, the average annual birth-rate in the ten years 1887-96, was under 30 per 1000 inhabitants, and in only three, *viz.*: London, Essex, and Northamptonshire, was it above 30. In registration divisions VI to XI, *viz.*: W. Mid., N. Mid., N.W., Yorks., N., and Wales, out of twenty-three counties, in eight the birth-rate was below 30, and in fifteen above 30, per 1000 inhabitants (see Map II).

TABLE I.—1887-96.

Registration Divisions.	Counties in which Birth-rate per 1000 inhabitants was above—												
	24	25	26	27	28	29	30	31	32	33	34	35	36
I to V ...	—	2	3	9	3	2	1	2	—	—	—	—	—
VI to XI ...	1	—	2	2	2	1	4	2	4	2	1	1	1

The proportion of infants who die in their first year of life is greater in the N.W. than in the S.E. half of the kingdom. During the years 1887-96, in the twenty-two counties of registration divisions, I-V, the proportion of deaths under one year old to 100 births, was less than 14 in twenty-one counties, and above 14 in one only, viz.: in London, where it was 15.5. In the twenty-three counties of registration divisions VI-XI, the proportion was below 14 in eight counties, and above 14 in fifteen, the highest rate being 17.3 in Lancashire (see Map III).

TABLE II.—1887-96.

Registration Divisions.	Counties in which Infant Mortality per 100 Births was above—								
	9	10	11	12	13	14	15	16	17
I to V ...	1	3	8	4	5	—	1	—	—
VI to XI ...	—	1	3	3	1	4	6	4	1

If then in the N.W. half of the kingdom a greater proportion of children are born to a given number of inhabitants than in the S.E. half, and of those born a greater proportion die in the first year of life, we have in these circumstances a partial explanation of the higher death-rates in the former than in the latter portion of the kingdom.

The higher birth-rate in the divisions of the kingdom which contain the principal manufacturing and mining centres will also partly explain the circumstance that these are the divisions which experience the highest mortality from the most fatal infective and diarrhoeal diseases of childhood. Whooping-cough and diarrhoea are most fatal in the first year of life; measles in the second year; scarlet fever and diphtheria in the third and fourth years of life; and therefore we might expect that these diseases would find their largest number of victims in the districts where the birth-rate was highest, and in which, therefore, children of susceptible ages were relatively most numerous.

Among other circumstances which may be thought of as conducing to the greater fatality of the infectious diseases of childhood in the manufacturing and mining counties, are the popular fatalism and recklessness as regards infection which, as my experience has led me to believe, prevail

there, as compared with the greater carefulness in this respect usual in the south; the frequency of yards common to a number of houses, an arrangement which facilitates the spread of infection from household to household; and the less favourable circumstances in which child life is placed when the mother goes out to work in a factory.

From *Measles* the average annual death-rate per 1000 inhabitants during the ten years 1887-96 in the counties of the first group was under .4 in nineteen, and over .4 in three; while in the counties of the second group it was under .4 in ten, and over .4 in thirteen (see Map IV).

TABLE III.—1887-96.

Registration Divisions.	Counties in which the Average Annual Death-rate per 1000 Inhabitants from Measles was above—					
	.1	.2	.3	.4	.5	.6
I to V. ...	2	12	5	2	—	1
VI to XI ...	5	2	3	8	4	1

The counties in which the measles death-rate was highest were Lancashire, London, Staffordshire, Durham, Cumberland and Monmouthshire, all largely urban, manufacturing or mining; while those in which the measles death-rate was lowest were Huntingdonshire, Rutland, Cambridgeshire and Herefordshire, all agricultural counties.

From *Scarlet fever*, the average annual death-rate during the same period in counties of the first group was under .1 per 1000 inhabitants in fourteen, and above .1 in eight. In the counties of the second group, the scarlet fever death-rate was under .1 in three, and over .1 in twenty.

TABLE IV.—1887-96.

Registration Divisions.	Counties in which the Average Annual Death-rate per 1000 Inhabitants from Scarlet Fever was—			
	Under .1	.1	.2	.3
I to V ...	14	6	2	—
VI to XI ...	3	11	7	2

The counties in which the death-rate was highest were Lancashire, South Wales, the West Riding, and Monmouthshire; those in which it was lowest were Sussex, Surrey, Suffolk, Oxfordshire and Dorset.

The mortality from *Whooping-cough* was somewhat more evenly distributed; but the counties in which it was highest, viz., London, Lancashire, Warwickshire, Monmouthshire and Cornwall, are urban, manufacturing, or mining; and those in which it was lowest, viz., Westmoreland, Dorset, Wiltshire and Berkshire, are agricultural.

TABLE V.—1887-96.

Registration Divisions.	Counties in which the Average Annual Death-rate from Whooping-cough per 1000 Inhabitants was—				
	.1	.2	.3	.4	.5
I to V ...	1	8	9	3	1
VI to XI ...	1	4	11	6	1

From *Diarrhœa* the death-rate varied greatly in different parts of the country during the ten years 1887-96; the average rate in Leicestershire (1.0 per 1000 inhabitants) was five times as great as that (.2) in the adjoining county of Rutland.

TABLE VI.—1887-96.

Registration Divisions.	Counties in which the Average Annual Death-rate from Diarrhœa, per 1000 Inhabitants was—								
	.2	.3	.4	.5	.6	.7	.8	.9	1.0
I to V ...	3	11	5	2	1	—	—	—	—
VI to XI ...	4	4	1	5	1	3	2	2	1

The counties in which the diarrhœal death-rate was highest were Leicestershire, the East Riding, Lancashire, Warwickshire, Staffordshire, Durham, Nottinghamshire, the West Riding, and London; those in which it was lowest were Rutland, Westmoreland, Hereford, Wilts. and Dorset (see Map V).

The distribution of *Enteric fever* is similar to that of diarrhœa, being high in the manufacturing and mining counties of the north and midlands, and low in the agricultural counties of the south (see Map VI).

TABLE VII.—1887-96.

Registration Divisions.	Counties in which the Average Annual Death-rate from Enteric Fever per 1000 Inhabitants was—			
	Under .1	.1	.2	.3
I to V. ...	8	14	—	—
VI to XI ...	3	12	7	1

The county in which the mortality from enteric fever was highest was Durham; next come Lancashire, Nottinghamshire, and the North Riding; and after these Cheshire, the East and West Ridings, Leicestershire, and South Wales. It was lowest in Herefordshire, Rutlandshire, Wiltshire and Oxfordshire and in other agricultural counties, and, unlike the death-rate from diarrhœa, it was comparatively low in London. Generally speaking, we may say that enteric fever is most fatal in the parts of England in which the midden-privy is the prevailing method of excrement

disposal. Water-closets are in general use in most southern towns; and in country places, for some reason or other, the vault-privy of the south of England does not seem to favour the spread of enteric fever so much as the midden-privy of the north.

In its distribution *Diphtheria* follows no such rule as do either the diarrhoeal or the more specially infectious diseases. Although diphtheria presents points of resemblance to scarlet fever in its clinical features and in its age-incidence, and the two diseases are, indeed, not unfrequently found in association with each other, yet their geographical distribution, as Dr. Longstaff has pointed out, is quite different; the counties which have a high mortality from the one having in many instances a low mortality from the other. Thus Sussex, Suffolk, and Surrey, which are among the counties having the lowest death-rates from scarlet fever, have all high death-rates from diphtheria. The West Riding, which has a high death-rate from scarlet fever, has a low one for diphtheria; and Lancashire, with the highest death-rate from scarlet fever of any county, has only a moderate one from diphtheria. London, Middlesex, and Monmouthshire, however, have high death-rates from both diseases. Generally speaking, the mortality from diphtheria during the years 1887-96 was lower in the populous mining and manufacturing counties of the north than in the agricultural counties of the south. But it is a peculiar feature of diphtheria that it is apt from time to time to attack particular localities in the form of protracted or recurring epidemics; and again, after being prevalent there for a series of years, it may subsequently die out, and the locality then remain for a term of years comparatively free from diphtheria.

One such focus of the disease at present is to be found in London and the neighbouring counties, and another in South Wales; and in both of these regions the disease has in recent years been prevalent in large urban communities. Indeed, as I have before mentioned, diphtheria, which was formerly specially a disease of country districts, is now becoming more and more a disease of towns.

TABLE VIII.—1887-96.

Registration Divisions.	Counties in which the Average Annual Death-rate from Diphtheria per 1000 Inhabitants was—			
	.1	.2	.3	.4
I to V ...	11	9	—	2
VI to XI ...	22	1	—	—

The two highest were London and Essex (see Map VII).

Influenza.—The county death-rates from this disease are not given in the reports of the Registrar-General. I have, however, calculated them, taking the period of eight years from the first reappearance of the disease as a notable cause of mortality in 1890 to 1897, the latest year for which figures are available.

TABLE IX.—1890-97.

Registration Divisions.	Counties in which the Average Annual Death-rate from Influenza per 1000 Inhabitants was—					
	Below .2	.2	.3	.4	.5	.6
I to V ...	—	—	14	7	1	—
VI to XI ...	1	9	6	5	1	1

The counties in which the influenza death-rate was highest were, in order: Herefordshire, Shropshire, Wiltshire, Westmoreland, North Wales, Rutland, Northamptonshire and Buckinghamshire. The counties in which it was lowest were, in order: Durham, Northumberland, Leicestershire, Lancashire, Staffordshire, Nottinghamshire, and South Wales. In a paper which I had the honour to read before the Society in 1894, "On the Distribution of the Mortality from Influenza in England and Wales," I said: "Speaking generally, we may say that the mortality from influenza was below the average in the manufacturing and mining counties of the North and Midlands, and above the average in the Southern and Midland agricultural counties, and in the hilly counties towards the west coast." These words, which referred to the mortality during the three years 1890-92, hold good for the more extended period now under review, the order in which the counties stand having hardly altered (see Map VIII).

The mortality from *Phthisis* is somewhat equally distributed among the different counties, the average annual death-rate from this disease in the ten years 1887-96 ranging between 1.08 per 1000 inhabitants in Worcester-shire and Rutlandshire, and 1.89 per 1000 in Northumber-land. It was also high in London, North and South Wales, Lancashire and the West Riding, and low in Westmoreland and Buckinghamshire.

The deaths from *diseases of the respiratory organs* form a large item in the total mortality: during the ten years 1887-96, they equalled an average annual rate of 3.5 per 1000 inhabitants out of a total death-rate of 18.6; that is to say, a mortality nearly a fifth of the whole, and more than half as large again as the aggregate mortality (2.1) caused by the "seven principal zymotic diseases."

TABLE X.—1887-96.

Registration Divisions.	Counties in which the Average Annual Death-rate from Diseases of the Respiratory Organs per 1000 Inhabitants was—					
	2.0-2.5.	2.5-3.0.	3.0-3.5.	3.5-4.0.	4.0-4.5.	Above 4.5.
I to V ...	—	18	3	—	1	—
VI to XI ...	2	3	10	4	3	1

The counties which had the highest death-rate from these diseases were: Lancashire, 4.9; Monmouthshire, 4.2; the West Riding and Staffordshire, 4.1; and London, 4.0. The counties with the lowest death-rates were: Rutland and Westmoreland, 2.3; Norfolk, Cambridgeshire, Oxfordshire and Hertfordshire, 2.6; and Bucks, Lincolnshire, Suffolk and Dorset, 2.7. Generally speaking, it may be said that the mortality was low in the agricultural counties, and high in the counties containing large smoky towns, and especially in those in which the inhabitants are largely engaged in dusty occupations. Thus, in Staffordshire the death-rate from respiratory diseases was 4.1 per 1000, in Leicestershire it was only 3.0. Both are manufacturing counties; but in Leicestershire the staple industries are bootmaking and stocking-weaving, clean trades which do not employ great mechanical power in proportion to the number of hands engaged; while in Staffordshire the heavy iron trade and the pottery works require great furnaces, and are responsible for a large amount of smoke, and some branches of the pottery manufacture are exceedingly dusty.

The mortality from diseases of the respiratory organs is chiefly made up of the two items of bronchitis and pneumonia, and a fourth part of the mortality under this heading takes place in the first year of life. Hence, the mortality from diseases of the respiratory organs will tend to be high where the birth-rate is high, and where child life is under unfavourable conditions. But this consideration will not account for the whole of the difference between the mortality from respiratory diseases in one and another county. Thus, the birth-rate and the infant mortality per 100 births were both, in the ten years 1887-96, higher in the East Riding than in the West Riding; yet the death-rate from respiratory diseases in the West Riding was 4.1, and in the East Riding only 3.3; the higher mortality in the West Riding being probably attributable to town smoke and to the dusty occupations in which many of the inhabitants are employed.

Notwithstanding the frequency with which influenza is

followed by inflammations of the lungs, and the great mortality from these affections during epidemics of influenza, no direct relation is apparent between the mortality in different counties from influenza and that from diseases of the respiratory organs. The reason is doubtless to be found in the different periods of life at which the principal mortality occurs, influenza being most fatal at the later life periods, and therefore in counties containing a large proportion of elderly persons.

Diseases of the heart and circulatory system, being largely due to the degenerative changes of advancing years, are fatal chiefly to persons in the later periods of life; and hence we might expect to find the mortality from these diseases greatest in the counties in which elderly persons predominate—that is to say, in the agricultural counties. This is, to some extent, the case; but the counties in which the mortality from diseases of the heart and bloodvessels is highest are the hilly counties of the West—viz., those of the S.W. division, Gloucestershire, Herefordshire, Shropshire, Cumberland, Westmoreland, and North Wales. In the ten years, 1887-96, the highest rate was 2.3 in Herefordshire, and the lowest 1.2 in Middlesex.

Cancer.—The various forms of malignant disease also attack chiefly people in the middle and later stages of life; hence, we find that cancer occasions a greater mortality in a population containing a larger proportion of persons at such ages, than in one in which children and young adults preponderate. During the ten years 1887-96, the average annual death-rate from cancer per 1000 inhabitants was 1.11 in Huntingdonshire, .92 in Cambridgeshire, and above .80 in North Wales, Rutland, Herefordshire, Devonshire, Shropshire, Norfolk, Sussex and Cornwall. It was only .53 in Durham, and was below .60 also in Monmouthshire, Derbyshire, Staffordshire and Lancashire. These latter are all counties having a high birth-rate, and their population must, therefore, contain a large proportion of children, and of adults at the reproductive age; whereas the counties with a high cancer death-rate have all low birth-rates. Of the counties in the South of England, Essex and Middlesex are the only ones with a cancer death-rate below .7 per 1000 inhabitants: Essex has a comparatively high birth-rate, and part of the cancer mortality of both Essex and Middlesex, as well as of other home counties, is probably transferred to London, through persons from those counties dying in Metropolitan hos-

pitals. It has been contended by Mr. Haviland that cancer mortality is greatest in alluvial districts, near large estuaries. The high cancer mortality in Huntingdonshire and Cambridgeshire (which, as the Registrar-General has pointed out,* form with the adjacent low-lying parts of Northamptonshire and Lincolnshire a distinct cancer area), is in favour of this view, but the low mortality in Essex is against it, and in the other counties which I have mentioned as having a high cancer death-rate, no large proportion of the population resides on alluvial soil.

It may be of interest to compare the two counties at the opposite ends of the scale of mortality—viz., Surrey, with an average annual crude death-rate in 1887-96 of 14.8 per 1000 inhabitants, and Lancashire, with an average rate of 21.8—nearly half as much again—and note what are the principal factors which go to make up the excess in the latter county. When the death-rates in the two counties are corrected for the age and sex-constitution of their respective populations, that of Surrey is raised to 15.0, and that of Lancashire to 23.6. Surrey thus loses its place at the head of the list of English counties, which is taken by Rutland with a corrected death-rate of 13.2; followed close by Huntingdon, Cambridgeshire and Dorset; but, on the other hand, the bad pre-eminence of Lancashire is increased, the counties with the next highest corrected death-rates being the West Riding (20.8) and Durham (20.1). As regards the physical features of these two counties, we may observe that in Surrey the greater number of the inhabitants reside on porous soils, as the alluvial and tertiary gravels, the chalk and green sand; while in Lancashire probably the greater number reside on the clays of the coal measures and the boulder clay; and that in Surrey people are supplied mostly with hard water from the chalk or the Thames, while Lancashire people mostly use soft upland water. In Surrey, the density of population is 1.4 persons per acre; in Lancashire 3.3. In Surrey, 60 per cent. of the population in 1891 lived in urban districts, and 40 per cent. in rural districts; the density being 7.6 persons per acre in the urban districts, and .75 persons per acre in the rural districts. In Lancashire, 92 per cent. of the population lived in urban districts, and only 8 per cent. in rural districts; the average number of persons per acre being 8.9 in the urban, and

* Supplement to Fifty-fifth Annual Report, Part I.

only .35 in the rural districts. There is also in Lancashire a considerably greater tendency than in Surrey to overcrowding in houses. Taking the Registrar - General's standard of overcrowding in tenements—viz., a proportion of more than two persons per room—we find that in Surrey less than a third, and in Lancashire more than half, of the tenements consist of fewer than five rooms, and that the proportion which are overcrowded, in the above sense, is much greater in the latter county.

TABLE XI.

Rooms.	SURREY.		LANCASHIRE.	
	Percentage of Total Tenements.	Percentage of such Tenements overcrowded.	Percentage of Total Tenements.	Percentage of such Tenements overcrowded.
1	3.6	13.7	1.18	33.9
2	6.2	10.4	7.7	26.1
3	6.6	7.25	6.2	17.7
4	15.8	4.15	38.5	5.7
	<u>32.2</u>	<u>35.5</u>	<u>54.2</u>	<u>83.4</u>

The population of Lancashire has on the whole a younger age-constitution than that of Surrey; the proportion of persons under five years old being, in Surrey 11.3, and in Lancashire 12.5 per cent.; while persons over sixty form in Surrey 7.5 per cent., and in Lancashire 5.7 per cent., of the population.

Marriages are more frequent in Lancashire, the average annual rate of persons married being, during the ten years 1887-96, 12.6 in Surrey and 16.1 in Lancashire. Of the women living in Surrey at ages fifteen to forty-five, 40 per cent. are married; in Lancashire, 47.6 per cent. Female domestic servants, who are usually unmarried, constitute 15.8 per cent. of the total female population in Surrey, and 6.3 per cent. in Lancashire. Of 1000 females married in the ten years 1887-96, 131 in Surrey and 193 in Lancashire were under twenty-one years of age. Yet notwithstanding the tendency to early marriage in Lancashire, the proportion of illegitimate children is slightly higher than in Surrey: 4.2 per cent. as against 4.0 per cent., and

the death-rate from venereal diseases is also higher. Popular education is more backward in Lancashire than in Surrey, especially among women. During the ten years 1887-96, of 1000 males married, 37 signed the marriage register by mark in Surrey, and 60 in Lancashire; of 1000 females married, 24 signed by mark in Surrey, and 99 in Lancashire. Of the females in Lancashire, 13.7 per cent. were returned in 1891 as engaged in the cotton manufacture.

Among the children thus born of immature, improvident and ignorant parents, and largely deprived of proper maternal care, it is not to be wondered at that many fail to survive. Of 1000 infants born, 173 in Lancashire die within their first year of life, against only 113 in Surrey. Multiplying the birth-rate by the proportion of infants who die within their first year, we get for every 1000 of the population 2.9 deaths of infants under one year old in Surrey, and 5.5 in Lancashire.

But the heavier mortality in Lancashire is not confined to infants; it affects persons of all ages except extreme old age, as the following Table shows:

TABLE XII.—1887-96.

		Average Annual Death-rates per 1000 persons living at each of the undermentioned ages—											
		0	5	10	15	20	25	35	45	55	65	75	85
Surrey	..	37.1	3.6	2.2	3.1	4.1	5.8	9.7	15.9	27.8	59.3	131.6	284.6
Lancashire	..	69.0	5.7	3.1	4.5	5.6	8.1	14.0	23.4	43.4	88.0	163.4	280.1

Table XIII shows the average annual rates of mortality in the two counties during the ten years 1887-96, from the principal causes of death.

It will be seen that in Lancashire the death-rate from almost every cause exceeded that in Surrey. To the total excess of 7 per 1000 in Lancashire, deaths from the seven principal zymotic diseases together contributed a quota of 1.60; tubercular diseases .62; and diseases of the respiratory organs 2.50. The only diseases in the list which caused a lower proportional mortality in Lancashire than in Surrey are diphtheria, influenza, cancer, and nervous diseases other than convulsions. The less fatality from adult nervous diseases in what would appear to be—so far as the masses are concerned—the less-educated community, is worthy of notice, though the difference is small.

Alcoholic diseases, venereal diseases, puerperal diseases, childbirth, premature birth, and congenital malformations are all proportionally more fatal in Lancashire than in

Surrey. The greater proportion of deaths in childbirth may possibly be in part an after-result of the prevalence of rickets, a disease common among badly-nourished children, but which makes little show in mortality statistics as a direct cause of death. We are prepared to find deaths

TABLE XIII.—*Average Annual Death-rates per 1000 Inhabitants, 1887-96.*

	Surrey.	Lancashire.	Excess in Lancashire.	Excess in Surrey.
Small-pox00	.01	.01	1.60
Measles ...	.28	.66	.38
Scarlet fever ...	.06	.36	.30
Fever ...	.10	.30	.20
Diphtheria ..	.26	.20	—	
Whooping-cough32	.50	.18	.62
Diarrhœa ...	.33	.92	.59
Phthisis ...	1.36	1.70	.34	
Tabes mesenterica ...	.15	.30	.15
Other tubercular diseases ...	.34	.47	.13
Respiratory diseases ...	2.41	4.91	2.50	.12
Influenza (1890-97) ...	.38	.26	—
Cancer ...	.70	.57	—
Diseases of circulation ...	1.58	1.67	.09	
„ digestive system ...	.89	1.33	.44
„ urinary system...	.40	.47	.07	.10
„ generative system ...	.04	.05	.01
Venereal diseases ...	.06	.09	.03
Puerperal diseases ...	.05	.10	.05
Childbirth ..	.05	.09	.04	
Premature birth46	.59	.13	.10
Other congenital affections ...	.09	.12	.03
Debility ...	.37	.83	.46
Convulsions and laryngismus ...	.38	.90	.52
Other nervous diseases ...	1.85	1.75	—	
Alcoholism and cirrhosis of liver.	.06	.10	.04	.41
Violence ...	.52	.74	.22
Old age ...	.68	.72	.04
Other causes ...	.63	1.09	.46
Total ...	14.80	21.80	7.41	
		14.80	.41	
		7.00	7.00	

from violence more numerous in a coal-mining and manufacturing county, but one would hardly have expected to find a larger proportion, however slight, of deaths from old age in Lancashire than in Surrey.

The question now arises, what are the circumstances

which conduce to the prevalence of the diseases to which the high mortality of Lancashire is due? Some of these, already alluded to, are of a social nature, and little under control by local authorities. Others fall within the category of sanitary conditions, as commonly understood. In Lancashire a great increase of population, due to the development of cotton-spinning, took place in the earlier part of the present century, before public attention had been given to questions of health; and the houses erected at that period for people of the working class were often constructed with little consideration beyond that of getting the largest return for the money. Hence, in the older parts of Lancashire towns, the structure and arrangement of the dwellings of the poorer classes are often very defective. In some Lancashire districts which I have visited, a common defect of the houses is that the windows are not made to open, or at most open only to an inadequate extent. The frequent arrangement of houses with a common court or back yard favours the propagation of infectious disease, as also do the careless habits, in many cases, of the people. The prevalence of the midden-privy has doubtless much to do with the prevalence of enteric fever and diarrhoea. The older middens are often deep and wet, with porous walls, and in the act of emptying them it is a common practice to throw out their contents (a mixture of excrement, ashes and filthy liquid) on to the surface of the yard, then to wheel the stuff away and deposit it in the street, and finally to shovel it up into the scavenger's cart. This process necessarily causes great fouling of the surface of the ground about houses, especially if unpaved; and it is easy to see how specific infection may be carried about, *e.g.*, on feet, in the form of dust, or by flies; and through food or otherwise be introduced into the human body.

The prevalent habit of keeping animals also conduces to a foul state of the precincts of houses; the Lancashire working-man has commonly little taste for gardening, which indeed the soil and atmosphere do not encourage; but he delights in keeping pigeons, rabbits, and other live stock.

In many Lancashire towns, and especially in Liverpool, there are quarters inhabited by low-class Irish, who live in poverty and great squalor, and among whom typhus fever still occurs.

The staple occupations in Lancashire are less healthy than those in Surrey. Thus, in 1891, in the former county 12.4 per cent. of the males were cotton operatives, and

5.4 per cent. coalminers: occupations which are practically unrepresented in Surrey, and which have a high mortality; the comparative mortality figure of the former being 1141 and of the latter 1069; that of all males being 1000. On the contrary, farmers, gardeners, and agricultural labourers—healthy classes, with comparative mortality figures respectively of 563, 553, and 666—formed collectively 12 per cent. of the population in Surrey, and only 3.3 per cent. in Lancashire. Cotton operatives are especially prone to bronchitis and other diseases of the respiratory organs, attributable to working in dust and in steam-heated weaving sheds, with subsequent exposure to cold air.

But in fairness to Lancashire I ought to add that I have good reason to believe that at the present time the local authorities of, at any rate, most of the more important places are thoroughly in earnest in seeking to improve the sanitary state of their districts. No county, indeed, has exhibited greater enterprise in carrying out works for the promotion of the public health: witness the magnificent water supplies of Liverpool and Manchester. Several Lancashire towns are endeavouring to disestablish the midden-privy, and many have provided efficient hospitals for the isolation of infectious diseases. The death-rate, which in the ten years 1867-76 was 26.7, has fallen to 23.0 in 1877-86, and 21.8 in 1887-96; and we may confidently hope that it will be still further reduced as the effect of the sanitary work now in progress makes itself felt.

Another pair of counties which we may contrast are Dorsetshire and Durham. Dorsetshire is a typical agricultural county: only 36 per cent. of the inhabitants live in urban districts, and 64 per cent. in rural districts; the density of population being only .37 persons per acre, viz., 5 per acre in the urban and 0.2 in the rural districts. In Durham, the chief industries have to do with coal, iron, and lead; 65 per cent. of the inhabitants live in urban as against 35 per cent. in rural districts, and the density of the population is 1.3 persons per acre, viz., 10 persons per acre in the urban and .52 in the rural districts. If it were not for the sparsely-populated moorland districts on the western border of the county, the density of the population of the rural districts would be greater still, for in the Durham coalfield the so-called rural districts contain many large aggregations of pitmen's cottages, which have sprung up with the development of the collieries, and unfortunately often without

much sanitary supervision. In Dorsetshire less probably has been done in the way of public sanitary work than in many other counties; but the scattered population, and the dry chalky soil on which much of the county stands, are favourable to health; and though wages are low, the habits of the cottagers as regards cleanliness and domestic economy would, I think, come out very favourably in comparison with those of the northern pitmen. The marriage-rate in Dorsetshire is low (13.7), in Durham higher (15.5), and marriage takes place earlier in the latter county, especially among women: in the ten years 1887-96, 13.6 per cent. of the women married in Dorset were under twenty-one years of age; in Durham 27.1 per cent., or double as many. In consequence, the birth-rate in Durham (36.1) is much higher than that in Dorset (26.7). The infant mortality, however, is also much greater in Durham: 161 out of 1000 infants born die within their first year, against only 97 in Dorset. The average annual death-rate in Dorset in 1887-96 was 15.8, in Durham, 19.2; but corrected for age and sex-distribution, the numbers become 13.9 in Dorset, and 20.1 in Durham: the age-constitution of the population in Dorset being older, in Durham younger, than that in the kingdom at large. As in the case of Lancashire compared with Surrey, the mortality in the mining county is higher than that in the agricultural county at all ages, except extreme old age.

TABLE XIV.—1887-96.

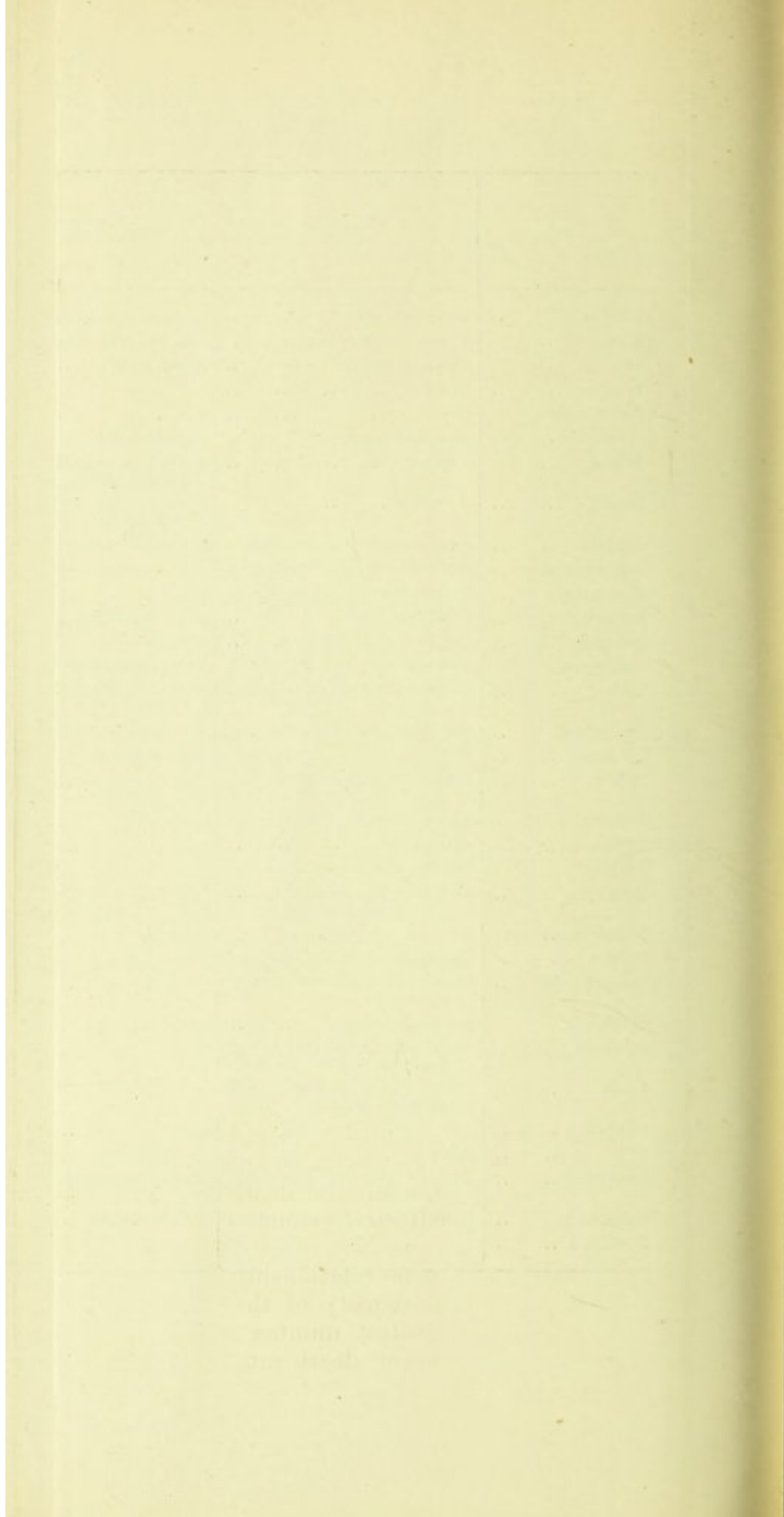
Average Annual Death-rate per 1000 of persons living at subjoined Ages—												
	0-	5-	10-	15-	20-	25-	35-	45-	55-	65-	75-	85+
Dorset ..	33.3	3.2	2.2	3.8	4.7	5.9	8.4	12.4	24.3	55.1	131.2	305.4
Durham ..	60.7	5.1	3.3	5.1	6.2	7.2	10.5	16.9	33.5	71.5	152.2	286.4

The infectious diseases of childhood—measles, scarlet fever, and whooping-cough—are much more fatal in Durham, causing annually in 1887-96 an aggregate mortality of 1.2 per 1000, against .49 in Dorset. This greater mortality in Durham is doubtless attributable largely to the greater number of persons living at the most susceptible ages, but other contributory causes may be found in the recklessness about infection characteristic of a rough mining population, and in the closer aggregation, facilitating spread of infection. The pitmen's houses are commonly in long rows, with a common yard at the back, which is the meeting-place for children of different families. Diphtheria was slightly more fatal in Dorset. Fever, mostly enteric, but with a

Divisions.	County.	Persons per acre, 1891.	Birth-rate per 1,000 Population
	England and Wales	.78	30.7
I.	London	56.5	31.2
II. S.E.	{ Surrey	1.24	25.9
	{ Kent .. ..	.83	27.9
	{ Sussex .. ..	.58	25.0
	{ Hampshire .. ..	.63	27.6
	{ Berkshire .. ..	.46	27.3
III. S. Mid.	{ Middlesex	2.57	29.4
	{ Hertfordshire .. ..	.49	27.0
	{ Buckinghamshire .. ..	.40	28.4
	{ Oxfordshire .. ..	.38	27.5
	{ Northamptonshire .. ..	.48	30.0
	{ Huntingdonshire .. ..	.24	26.5
	{ Bedfordshire .. ..	.53	27.8
	{ Cambridgeshire .. ..	.34	27.5
IV. N.E.	{ Essex .. ..	.84	31.6
	{ Suffolk .. ..	.35	29.0
	{ Norfolk .. ..	.35	28.8
V. S.W.	{ Wiltshire .. ..	.31	27.5
	{ Dorsetshire .. ..	.30	26.7
	{ Devonshire .. ..	.59	26.7
	{ Cornwall .. ..	.36	27.3
	{ Somersetshire .. ..	.47	28.0
VI. W. Mid.	{ Gloucestershire .. ..	.64	28.1
	{ Herefordshire .. ..	.21	26.8
	{ Shropshire .. ..	.26	27.6
	{ Staffordshire	1.40	35.2
	{ Worcestershire .. ..	.95	29.6
	{ Warwickshire	1.28	31.4
VII. N. Mid.	{ Leicestershire .. ..	.69	32.1
	{ Rutlandshire .. ..	.20	24.6
	{ Lincolnshire .. ..	.28	28.6
	{ Nottinghamshire .. ..	.82	33.0
	{ Derbyshire .. ..	.78	32.2
VIII. N.W.	{ Cheshire	1.09	30.2
	{ Lancashire	3.03	32.4
IX. York.	{ West Riding	1.40	30.8
	{ East Riding .. ..	.58	31.4
	{ North Riding .. ..	.28	30.3
X. N.	{ Durham	1.34	36.1
	{ Northumberland .. ..	.39	32.9
	{ Cumberland .. ..	.27	30.6
	{ Westmoreland .. ..	.13	26.2
XI. Wales.	{ Monmouthshire .. ..	.70	34.5
	{ South Wales .. ..	.39	33.8
	{ North Wales .. ..	.22	27.1

TABLE XVI.—Great Towns of England and Wales, 1888-97.

Town.	Soil.	Source of Water Supply.	Prevalent Means of Excrement Disposal.	Density. Persons Per Acre.	Assessable Value Per Head.	Birth Rate.	Infant Mortality per 1,000 Births.	Death-Rates per 1,000 Inhabitants.							
								Crude.	Corrected Age and Sex.	Measles.	Scarlet Fever.	Diphtheria.	Whooping Cough.	Fever.	Diarrhoea.
London	Gravel and clay	Thames and chalk wells ..	Entirely W.C.	60.3	4	30.5	155	19.7	21.0	.62	.23	.48	.56	.15	.67
West Ham	Gravel and alluvium	Lea and chalk wells	W.C.	60.9	3.4	34.3	154	17.4	18.7	.61	.24	.43	.55	.22	.76
Croydon	Chalk, gravel and clay	Chalk wells	Entirely W.C.	13.8	4.2	25.5	128	14.4	16.0	.36	.07	.29	.30	.11	.47
Brighton	Chalk	"	"	48.4	6.0	24.9	148	17.5	17.7	.35	.07	.17	.33	.12	.66
Portsmouth	Gravel	"	W.C. hand-flushed	40.0	3.5	30.1	150	17.4	17.8	.46	.60	.17	.33	.23	.82
Plymouth	Slate and limestone	Upland surface	W.C.	43.3	3.6	29.8	168	20.6	20.0	.52	.48	.16	.44	.16	.64
Bristol	Various	Springy in limestone and wells in red sandstone.	Entirely W.C.	27.1	4.6	28.9	144	18.5	19.2	.46	.15	.13	.45	.12	.50
Cardiff	Alluvium	Upland surface and wells in red sandstone.	"	29.3	4.8	35.9	160	18.4	21.3	.44	.21	.31	.47	.17	.82
Swansea	Coal measures and alluvium ..	Upland surface	"	20.1	3.5	32.6	157	19.0	20.8	.47	.57	.09	.45	.19	.36
Wolverhampton ..	Red sandstone and coal measures	Red sandstone wells	Pail closets and W.C.'s. ..	25.0	3.0	33.9	188	22.0	23.0	.44	.25	.30	.47	.23	1.20
Birmingham	Red sandstone	"	W.C. and pail closets	40.2	4.2	32.2	180	20.7	22.9	.51	.23	.21	.55	.16	1.11
Norwich	Chalk and gravel	River Wensum	Midden-privies	14.8	3.0	31.7	175	19.0	18.2	.34	.10	.21	.45	.24	.87
Leicester	Red marl and alluvium	Upland surface	Pail closets	24.5	3.1	31.7	190	18.4	20.0	.41	.19	.15	.39	.20	1.49
Nottingham	Red sandstone and alluvium ..	Red sandstone wells	"	21.5	3.7	28.8	174	18.8	20.2	.41	.19	.08	.43	.29	.98
Derby	Red marl and alluvium	Collecting tunnels in superficial gravel.	Midden-privies, pail closets, and W.C.'s.	30.4	3.3	29.2	152	17.4	17.9	.34	.14	.13	.39	.29	.70
Birkenhead	Red sandstone and boulder clay	Red sandstone wells	"	32.4	4.4	31.7	166	19.5	21.4	.54	.17	.19	.51	.32	.75
Liverpool	"	Upland surface	Entirely W.C.'s.	47.9	5.7	33.5	180	23.5	28.0	.70	.45	.17	.62	.35	1.17
Bolton	Coal shale and sandstone ..	"	Midden-privies, pail closets, and W.C.'s.	52.0	3.5	32.5	179	22.5	25.5	.79	.31	.12	.63	.29	1.26
Manchester	Red sandstone and boulder clay	"	Pail closets	41.8	5.4	33.9	185	24.8	28.2	.80	.35	.26	.61	.26	1.10
Salford	Clay and sand	"	Midden-privies	41.7	3.8	33.7	198	25.5	28.7	.99	.47	.41	.75	.41	1.40
Oldham	Boulder clay on coal shale ..	"	Pail closets	31.4	3.0	28.2	178	21.8	25.0	.71	.26	.16	.51	.16	.63
Burnley	Coal shale and sandstone ..	"	W.C.'s, slop-water closets and privies with earthenware tanks	27.9	3.0	32.2	209	21.0	24.1	.65	.29	.22	.38	.26	1.29
Blackburn	"	"	Midden-privies and W.C.'s ..	19.1	3.2	31.2	201	22.6	25.4	.97	.34	.65	.50	.27	1.23
Preston	Red sandstone and boulder clay	"	"	28.5	3.0	34.7	234	24.8	27.3	.92	.20	.13	.55	.33	2.05
Huddersfield	Shales and sandstone of coal measures.	"	Pail closets	8.6	3.9	22.9	158	18.3	21.3	.31	.23	.13	.36	.13	.30
Halifax	Sandstone and clay	"	Goux closets	11.3	3.5	25.4	158	19.3	21.8	.73	.15	.14	.38	.16	.25
Bradford	Shales and sandstone of coal measures and boulder clay	"	Midden-privies	21.7	4.6	26.8	171	19.5	22.4	.45	.24	.07	.43	.15	.87
Leeds	Shales and sandstone of coal measures and clay.	"	W.C.'s and trough closets ..	19.3	3.1	32.5	178	20.8	23.1	.46	.20	.11	.43	.22	1.10
Sheffield	Do. do.	"	Midden-privies	18.1	3.4	34.0	180	21.4	24.0	.49	.30	.16	.54	.23	1.21
Hull	Alluvium	Wells in chalk	"	25.6	2.6	33.1	173	19.8	20.8	.40	.17	.12	.37	.24	1.29
Sunderland	Boulder clay on magnesian limestone.	Wells in magnesian limestone	Chiefly midden-privies	43.7	3.0	35.6	169	21.7	22.8	.59	.21	.08	.46	.49	1.12
Gateshead	Boulder clay and coal measures	Upland surface	"	33.1	2.8	33.5	166	19.6	21.1	.49	.21	.13	.43	.22	1.01
Newcastle	"	"	Pail closets, midden-privies, and W.C.'s.	41.5	4.6	34.4	167	20.6	22.5	.57	.14	.20	.50	.15	.69



small proportion of typhus, was $3\frac{1}{2}$ times as fatal in Durham as in Dorset — in fact, as before mentioned, Durham heads the list of English counties as regards prevalence of enteric fever. This is partly due to there having been in Durham, during the period 1887-96, several extensive epidemics of enteric fever, due to specific contamination of public water services; but there is also an endemic prevalence of enteric fever in Durham, for which the midden-privy system is probably responsible. This system prevails in an aggravated form in Durham, where it is the custom to allow the colliers a quantity of coal gratuitously, or as part of their wages. Hence ashpits are made of large size, and scavenging is a difficult matter. Open channels are often used instead of covered drains at the backs of pit rows, and these channels, if blocked by rubbish or frost, are apt to lead to the surface of the yards being fouled with sewage. Diarrhœa is fatal in Durham, causing a mortality of .78, as against .24 in Dorset. Its prevalence is probably due to much the same causes as that of enteric fever. Phthisis is more fatal in Durham than in Dorset, and diseases of the respiratory organs are much more so. On the other hand, diseases more fatal to persons at later periods of life, such as diseases of the organs of circulation, influenza and cancer, killed a larger proportion of persons in Dorset than in Durham.

COMPARATIVE MORTALITY OF THE GREAT TOWNS.

Time will not allow me to say much under this heading, and many of the points have already been incidentally mentioned.

In the ten years 1888-97, among the thirty-three great towns the average annual death-rate was lowest in Croydon (14.4), followed by West Ham, Portsmouth, and Derby (17.4), and Brighton (17.5). It was highest in the Lancashire towns, especially in Liverpool and Salford (25.5), Manchester and Preston (24.8). The effect of correction for age- and sex-distribution is to raise the death-rate in all the large towns except Norwich and Plymouth; that of Croydon becomes 15.0, while the death-rates of Liverpool, Manchester, and Salford become 28.0 and over (see Table XVI).

On a superficial view no relationship is apparent between the death-rate and the density of the population; indeed, the town with the greatest number of persons per acre (West Ham) has a lower death-rate than Huddersfield,

which has the smallest number. But the proportion of the population to the acreage of the whole town is no guide to the actual density in the inhabited parts, as some municipal boroughs include a wide tract of surrounding sparsely-populated country. Thus, the borough of Sheffield embraces a wide and almost uninhabited moorland region, extending to the borders of Derbyshire, and the density of population, reckoned upon the whole area of the borough, is only 18.1 persons per acre; yet in North Sheffield, the most populous registration sub-district, the density is 224 persons per acre. Moreover, in two towns which have an equal density of the population within the municipal area, other circumstances being similar, that town of which the boundary adjoins the open country will have a purer air than that town which is surrounded by a ring of other populous urban districts. It also makes much difference to the death-rate of a town whether the residential suburbs in which the well-to-do people live are within the municipal area or not, for this is the section of the inhabitants among whom the death-rate is the lowest. The unhealthiness of the central parts of a large town as compared with the suburbs is well illustrated in the case of London. During the ten years 1889-98, the average annual death-rate in the central districts of London has been 23.1; in the poor and crowded eastern districts, 22.7; in the western, northern and southern districts, containing most of the residential suburbs, 18.3; and in the outer ring 14.5. The density of population in 1891 in these groups of districts was: Central, 116 persons per acre; Eastern, 128; Western, 71; North, 74; South, 35; Outer Ring, 4.

I had hoped to find that the rateable value* of the buildings in a town divided by the population, would form some test of the relative affluence or poverty of the inhabitants,

* In urban districts certain classes of property, viz., arable land, meadows and pastures, woodlands, market gardens and nursery grounds, land covered with water, canals and railways, are assessed to the general district rate on a fourth part only of their annual value; houses and other buildings being assessed on their full value. A return issued by the Local Government Board in 1896 gives for each district the "rateable value," i.e., the gross annual value and the "assessable value," i.e., the net annual value when the above-mentioned classes of property are assessed at one-fourth only of their annual value. If, therefore, in any given district we subtract from the assessable value one-third of the difference between this and the rateable value, we arrive approximately at the annual value of the buildings in the district. The figures given in the sixth column of Table XVI are the quotients when the annual values thus obtained are divided by the populations of the several towns.

but I have not been able to make out any relation between this quotient and the death-rate. The rateable value per head is lowest in Hull, and next in Gateshead and Norwich. It is highest in Brighton, and next in Liverpool and Manchester. It is much greater in Manchester than in Salford, though their death-rates are about equally high.

Nor is it easy to establish a connection between the prevalence of overcrowding and a high death-rate. Taking as overcrowding a proportion of over two persons per room, among the great towns of England overcrowding is most frequent in Gateshead, and almost least so in Preston; the proportion also of persons per acre is somewhat less in Preston than in Gateshead; yet the corrected death-rate, 1888-97, in Gateshead was 21.1, and in Preston 27.3. There are, indeed, not a few instances in which considerable differences, not easy of explanation, are observed between the death-rates of towns apparently similarly circumstanced. Thus, for some reason not lying on the surface, the Lancashire towns are much more unhealthy than those of the West-Riding. Bolton, Blackburn, and Burnley are not unlike Huddersfield and Halifax in many of their circumstances; yet the corrected death-rates in the three former towns are 3 or 4 per 1000 higher than those in the two latter, the difference being especially great in the mortality from diarrhoea. Again, it is not evident why Derby should have a death-rate some 2 per 1000 lower than its neighbours, Nottingham and Leicester; nor why Leicester should have a diarrhoeal death-rate so much higher than Nottingham and Derby, and Nottingham an enteric fever death-rate higher than that of Leicester and Derby. Plymouth has a death-rate more than 2 per 1000 higher than Portsmouth.

Of course I do not mean that such circumstances as crowding of houses upon the ground, and of persons within houses, and poverty of the inhabitants, have no influence in raising the death-rate of a town; on the contrary, there is abundant reason for believing that these are among the conditions which most powerfully conduce to a high mortality. I only mean that the data for the several large towns are so little comparable one with another, and individual towns are so little homogeneous in the different parts of their area, that this influence is not demonstrable when the town itself is taken as the unit: in order to demonstrate the relation, it is necessary to carry the investigation into smaller areas, and compare the several quarters of a single town one with another.

We may, I think, say that the healthiest towns are those of rapid modern growth, the development of which has taken place under proper regulation, and which have been sewered from the first, so that the bulk of the houses are built on clean soil which has never been polluted by soakage from privies and cesspools, and have about them a proper amount of open space. In most of the healthier towns the amount of open space about houses is regulated by bye-laws, on the model issued by the Local Government Board; that is to say, each newly-erected house is required to have in front of it an open space not less than 24 ft. across, and behind it an open space exclusively belonging to it of not less, in any case, than 150 square feet in area and 10 ft. across, a greater distance across being required as the height of the building increases. In some towns, indeed, as Croydon and Cardiff, still larger amounts of open space are required. On the other hand, in most of the less healthy towns, the amount of space about houses is regulated by local Acts and obsolete bye-laws, and is less than the standard of the model bye-laws. I think it likely that the prevailing arrangement of the houses upon the ground—*e.g.*, whether they are in regularly laid-out streets or in enclosed courts or narrow alleys—has much to do with the different rates of mortality in different towns. The prevalent method of excrement disposal and removal is doubtless a potent factor. The social circumstances and psychological habits of the population are, perhaps, a still more powerful one. When I commenced writing this address, I had intended to seek for information on these and other points, in the hope that I might be able to arrive at some more original and definite deductions than I have been able to place before you, but pressure of other duties has not permitted this; and, as it is, I have trespassed long enough on your time and attention.

English Miles

ANNUAL AVERAGE DEATH RATE PER 10000
1887 TO 1896

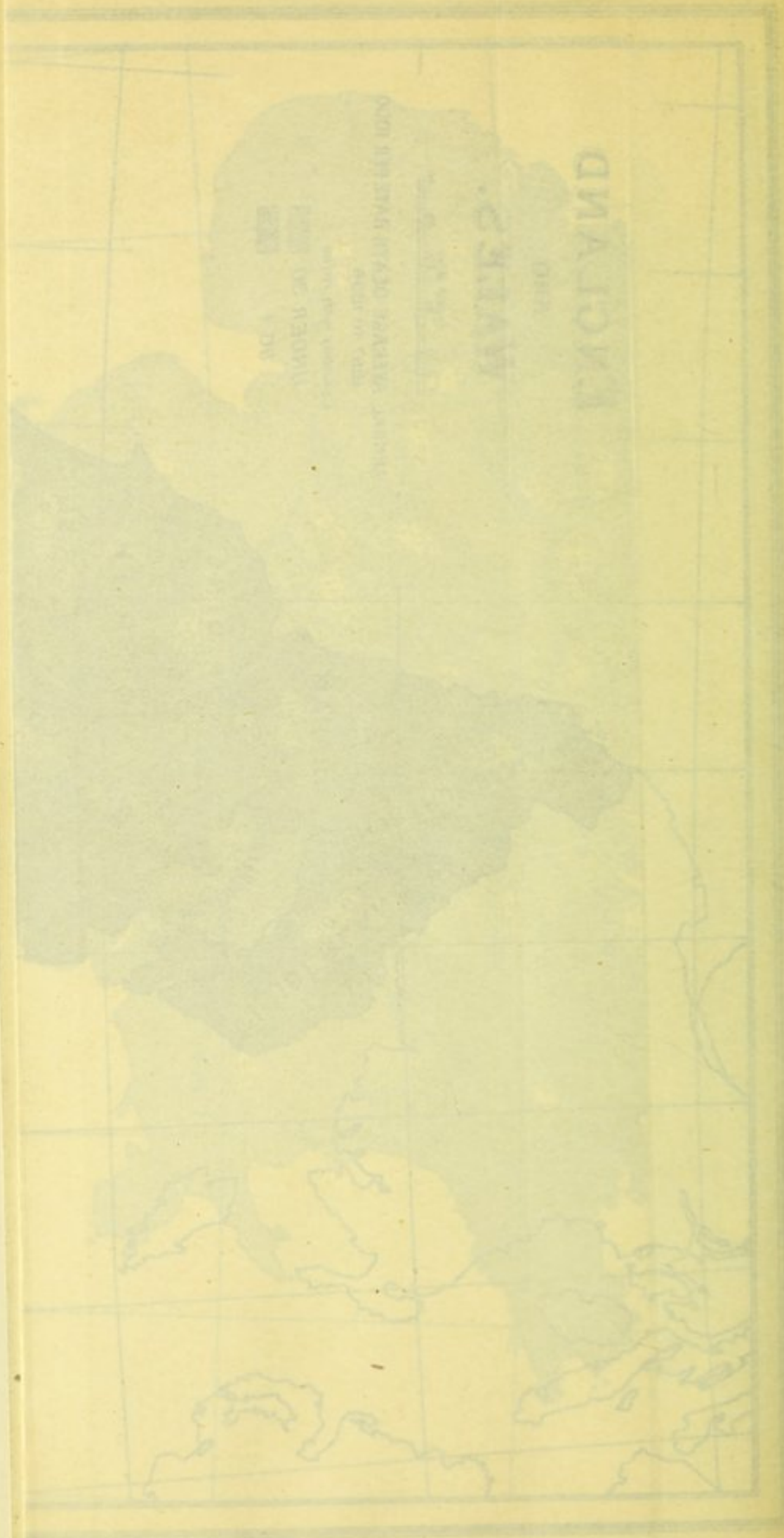
Couples with rates

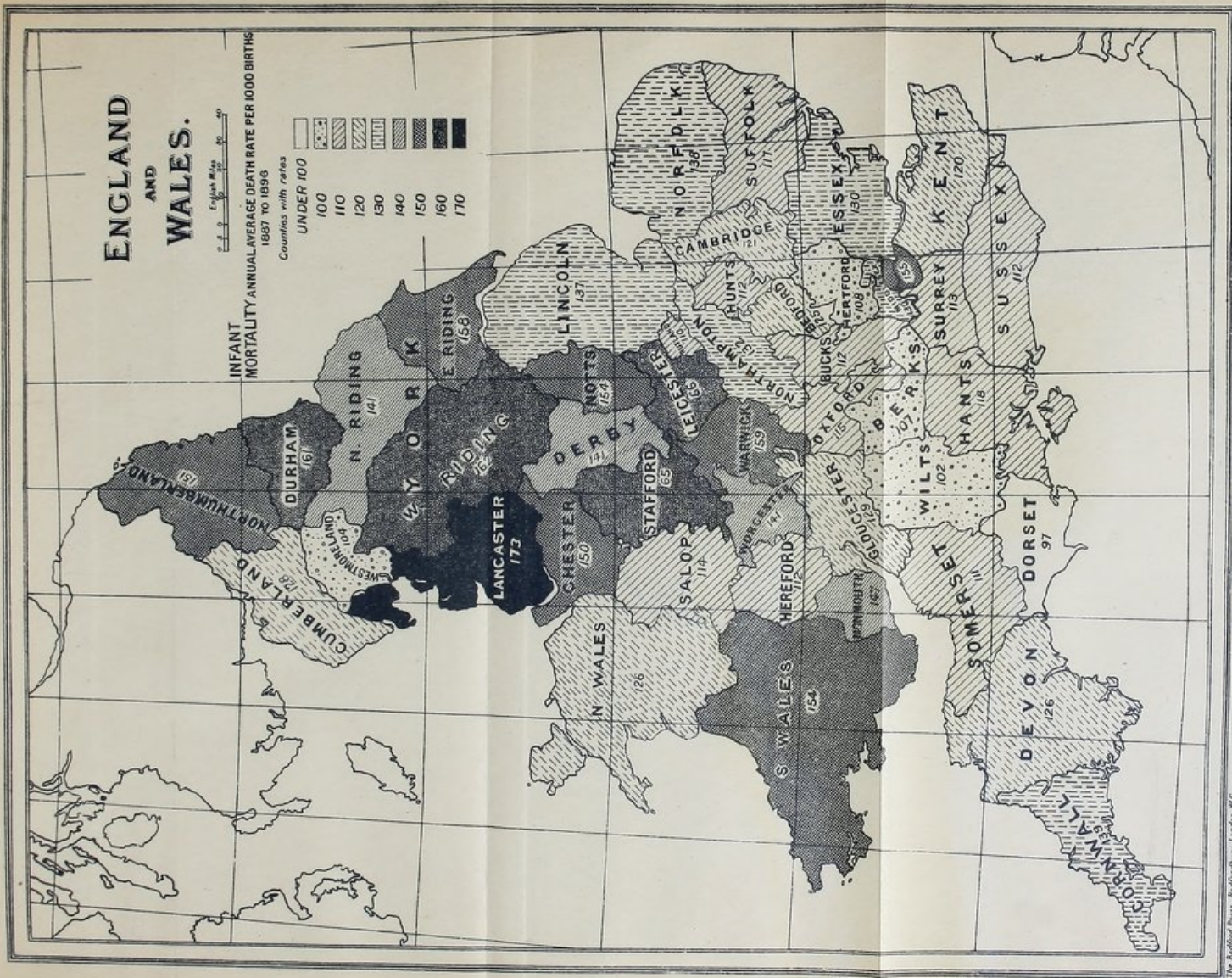


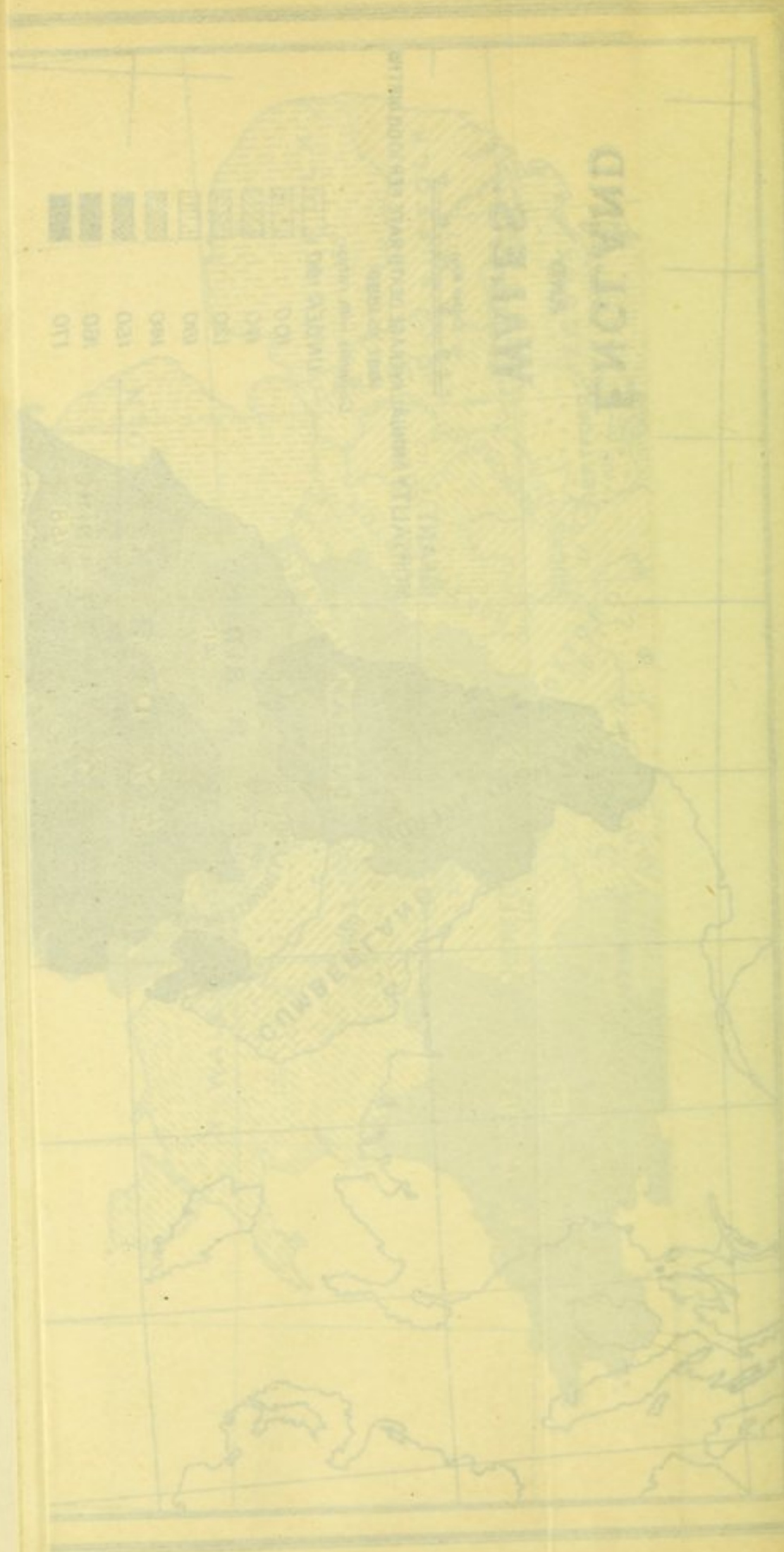
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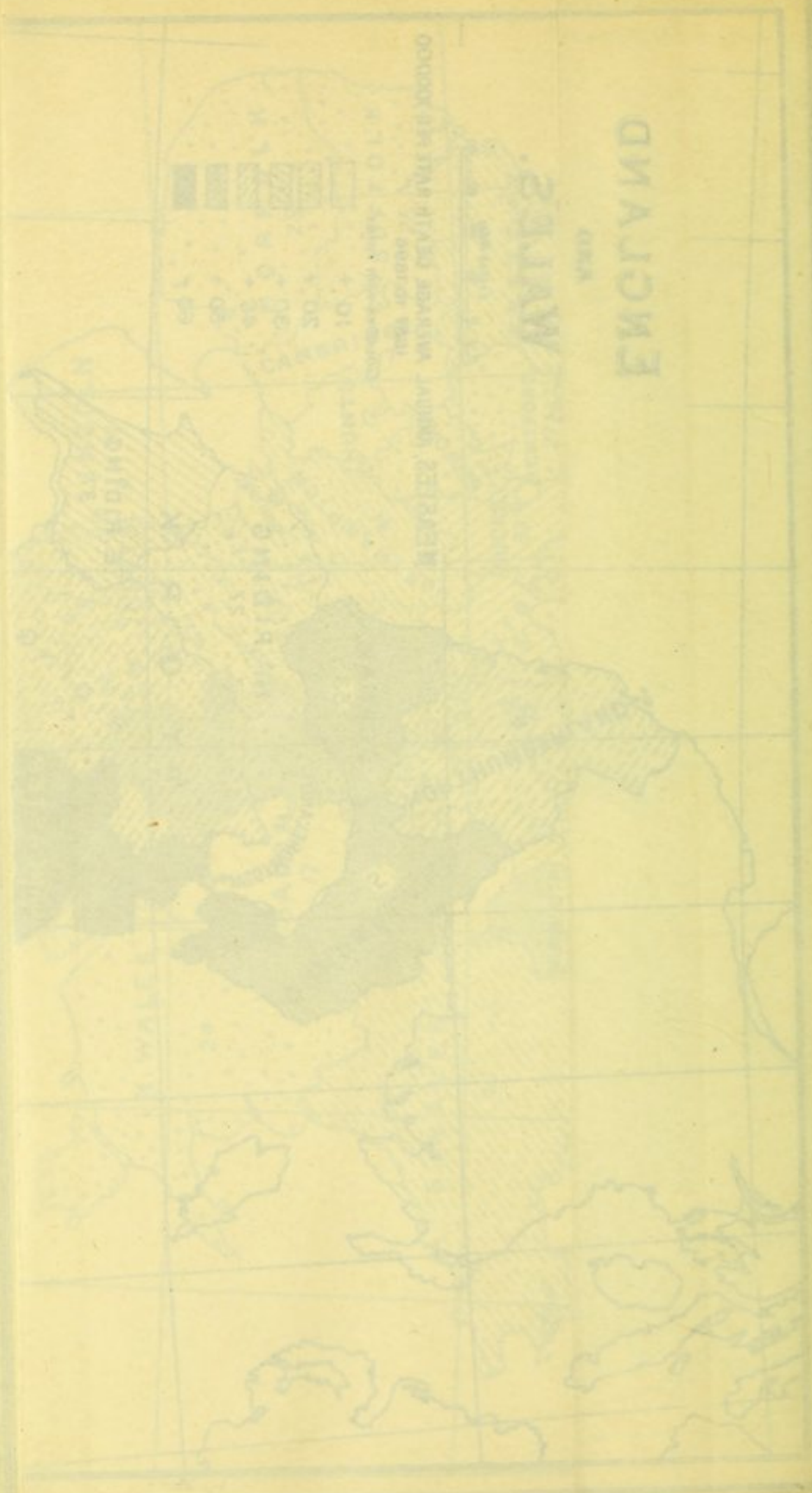
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ENGLAND AND WALES.

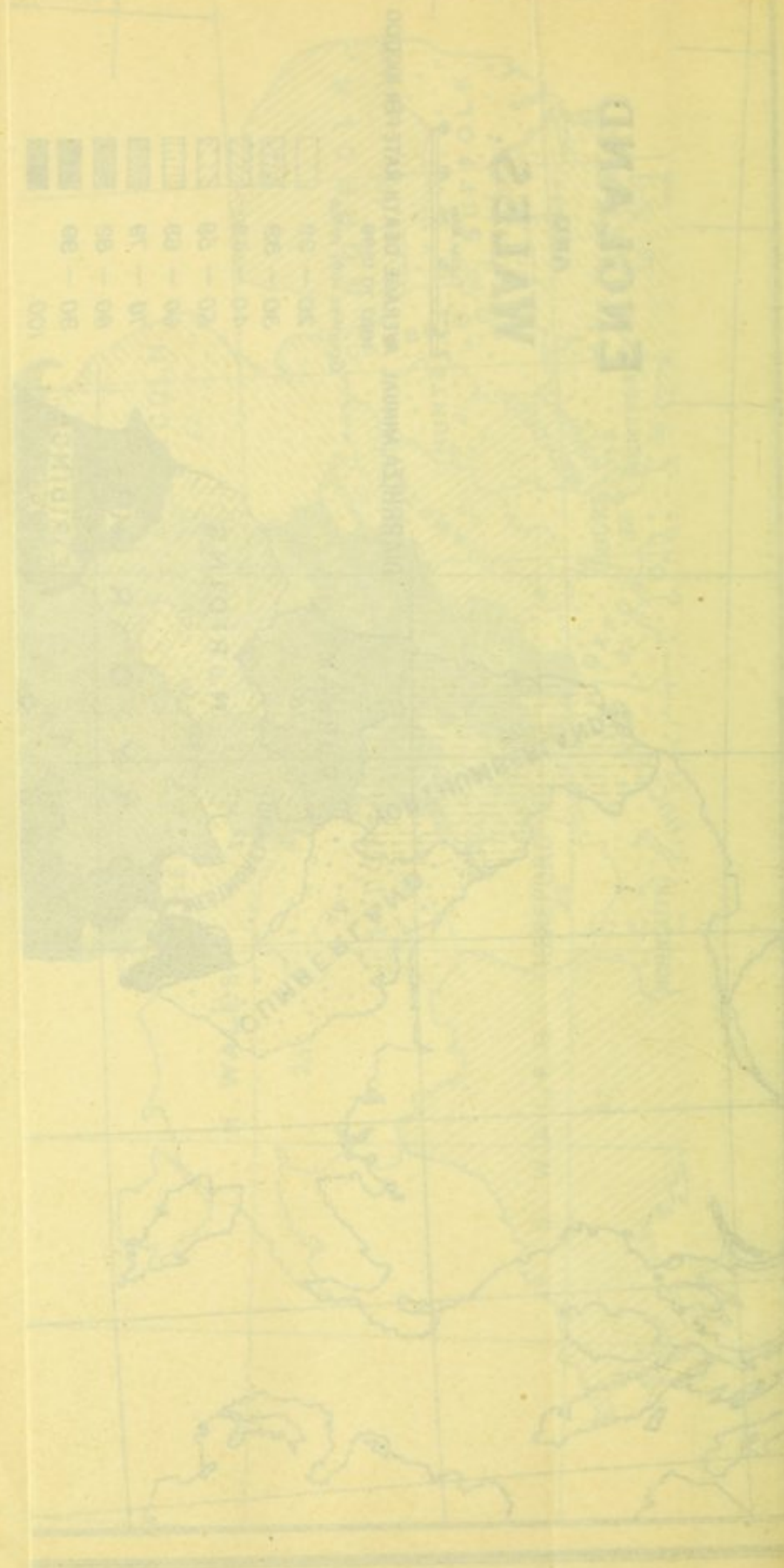
MEASLES, ANNUAL AVERAGE DEATH RATE PER 100000
1887 TO 1896







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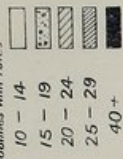


ENGLAND AND WALES.

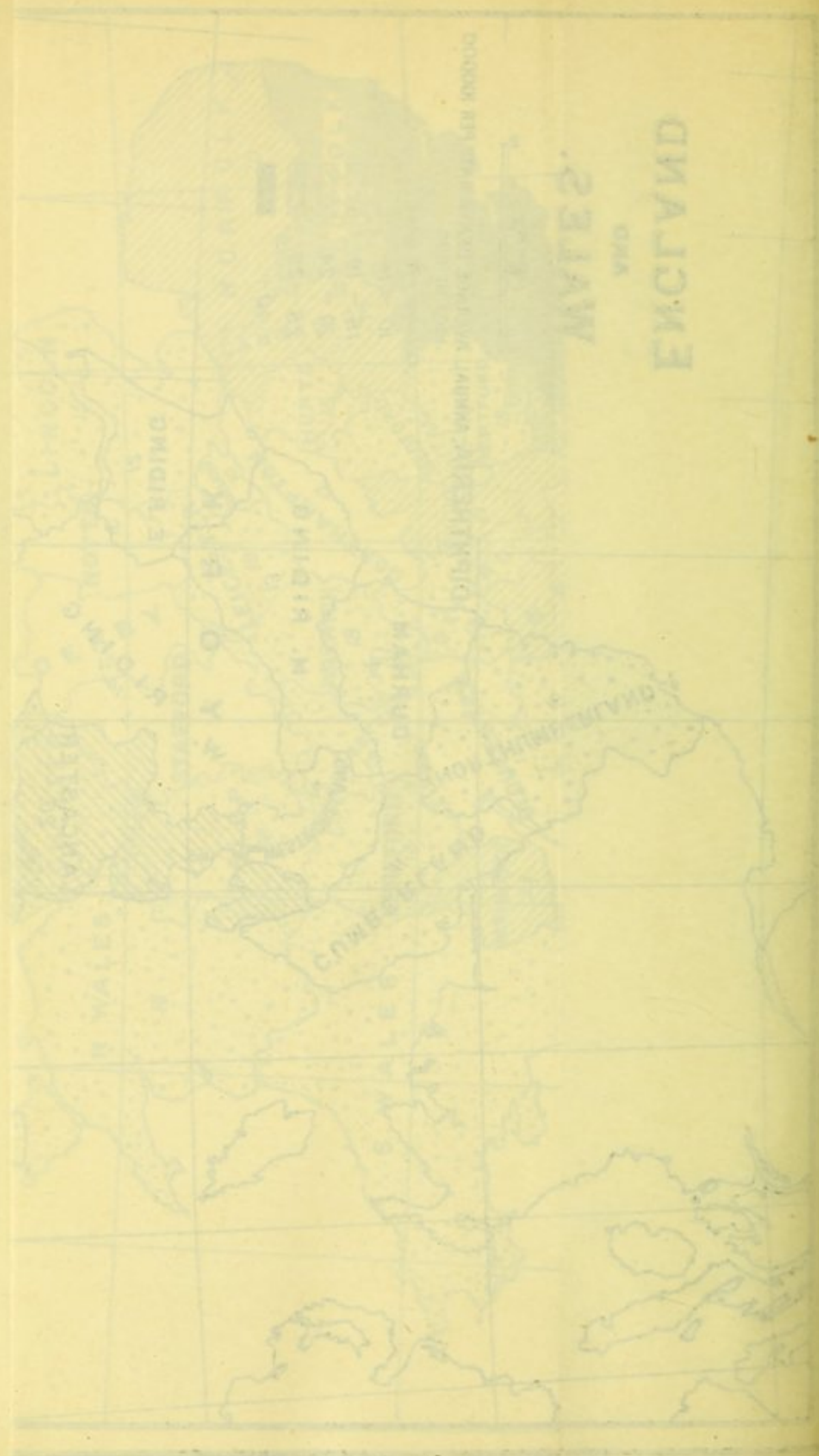
DIPHTHERIA. ANNUAL AVERAGE DEATH RATE PER 100000
1887 TO 1896

English Miles
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Countries with rates



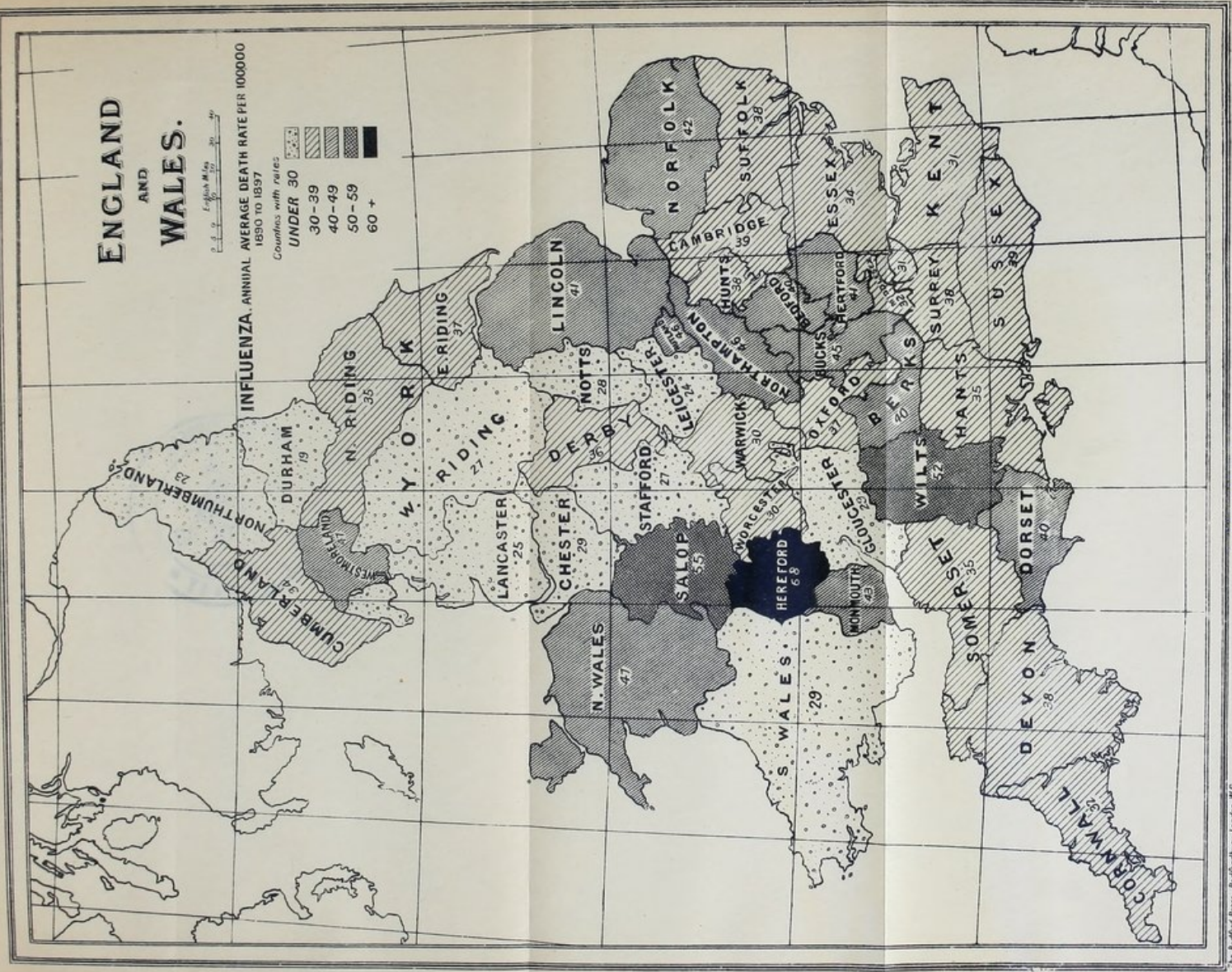
DIPHTHERIA.



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INFLUENZA.

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