ingly simple and easily to be understood, will obviate the dangers pointed out above, as I have certificates from several of the most respectable persons concerned in coal-mining, who spontaneously conferred these kindnesses upon me. Nor have I in any instance experienced the least opposition to my views, and the application of my discoveries, for preventing accidents. Several eminent persons concerned in the management of coal-mines, and who have not yet tried my new safety-lamps, have given me upon inspection their approval of them in the most satisfactory terms, and I have reason to expect that in addition to those first-rate coal-mines in which my safety-lamps have been tried, approved, and used effectually, managers of other coal-mines will, as may seem suitable to their convenience, adopt them. I may remark, *en passant*, that when the wire gauze in a Davy-lamp is more open in its texture than in the proportion of twenty-eight to thirty, in both warp and woof, as Davy himself proved, we shall find that the invisible flame will, by such apertures or meshes, be permitted to be formed outside the wire-gauze cylinder, which cylinder, in that case, cannot be considered a barrier to the progress of flame. Here, "cooling power" is out of the question, and, as in all other cases, does not afford the true explanation of the phenomenon.

As I have not drawn up this paper for the perusal of the learned readers of THE LANCET, in order to show the value of my new safety-lamp, but for the advancement of science, I will conclude by remarking, that by the use of my new safety apparatus, all the contingencies which are mentioned above in respect to the Davy may be avoided; and as the Davy is in general use in the coal-mines of the north of England, I considered it imperative upon me to add to the Davy in use the safety shield, so that the expense of new safety-lamps may be avoided. I am informed by all persons using my safety-lamps, that the wire which I employ for supporting the safety cylinders, *stands* to their satisfaction, when placed over the flame of the oil-lamp in the wire cage, but the moment fire-damp burns within the cylinder of wire gauze, the piece of fine wire is fused, and the whole cage is instantly surrounded by the safety cylinders.

Sunderland, Nov. 5, 1835.

THE printed Minutes of Evidence, and the Report of the Parliamentary Committee appointed to inquire into the lamentable catastrophes which are so constantly occurring in the *Mines* of Great Britain, with the view of ascertaining the means of preventing the recurrence of similar accidents, have just been issued. We shall shortly examine some parts of the document, which extends to 360 folio pages.

ON THE

LAW OF MORTALITY

IN

EACH COUNTY OF ENGLAND.

By T. R. EDMONDS, Esq., *B.A., of Trinity College, Cambridge.*

THE knowledge of the laws which regulate the collective vitality at different ages of the population in various districts of England, is evidently an object of the highest interest to physiologists. When those laws are established, and when the peculiar circumstances of each locality have been investigated, we may reasonably expect soon to arrive at a knowledge of some of the chief causes affecting the prolongation of human life. Having minutely examined the great mass of facts accumulated in the *English Population Returns* of the years 1821 and 1831, I can speak with confidence of the high value of the information which they contain. The results from *one hundred* separate observations of males and females, are consistent with each other, and in harmony with previous observations, when viewed in connection with the new theory of mortality which I have explained in Nos. 605 and 614 of THE LANCET. There exist, however, in different localities, considerable variations in the mortality at different ages, and in the relative mortality of the two sexes. The causes of these variations, whether dependent on atmospheric or other external circumstances, or whether dependent on original peculiarities of individual constitution, is a subject well worthy to exercise the ingenuity of physiologists.

Before proceeding to the general investigation of the subject, it may be interesting to state a few of the principal results hereafter to be established. In comparing together different counties, the characteristics of each peculiar law of mortality are marked by the mortality in three principal divisions of age; namely, in the period under five years of age, in the period between fifteen and sixty, and in the period above sixty years of age. In all counties, out of a given number living above the age of sixty years, the number dying in one year is nearly the same. In some counties the mortality between the ages of fifteen and sixty years is nearly half as much greater than in many other counties. In some counties, out of a given number born, nearly twice as many die under the age of five years as in some other counties. In all counties the mortality of males under the age of five years exceeds the mortality of females at the same age, in the proportion of seven to six nearly.

In the majority of counties, at ages greater than sixty years, the mortality of males seldom exceeds that of females more than three per cent. In the majority of counties the mortality of males between the ages of fifteen and sixty years is *less*, in a small degree, than the mortality of females. The most remarkable result presented by the population returns, is the fact that all the counties wherein the mortality of females between the ages of fifteen and sixty years is at a maximum, are found on or near the same straight line. A low mortality between the ages of fifteen and sixty years is the best index of a healthy population, because the individuals of this class are of much higher political value than the individuals under five years or above sixty years of age. As an index to the healthfulness of a locality, the law of female mortality is to be preferred to that of males, because the various occupations of the latter may exercise an important influence on the mortality. The line of greatest mortality of females between the ages of fifteen and sixty years, is a central one, running in a north-west direction from Brighton to Liverpool. The most healthy counties are those most distant from this line, with very few exceptions.

The materials on which the present observation is founded consist in a return of the ages of the *dying* in all England and Wales during the eighteen years 1813-30, combined with one enumeration of the *living*, and their ages made in the middle of the year 1821. The only important defect in these materials is the omission of a considerable and uncertain number of deaths. The returns made show the number of deaths which have been entered in the parish registers only; and we are left with very little information respecting the numbers omitted through negligence, or omitted because buried in the grounds of dissenters, or in private burial-grounds. Mr. Rickman, who compiled the returns, estimates the deficiency in the deaths to be 8 per cent. less than the true number for the whole of England and Wales. The results which I am about to give for thirty-nine counties of England, are founded upon the assumption that the registered deaths are deficient ten per cent. from the truth. I have supposed that, out of every twenty deaths which have occurred, one is omitted through negligence, and another because the burial occurred out of the church grounds. In the counties of Middlesex, Surrey, Monmouth, and in Wales, I have estimated the deficiency at 20 per cent.; Mr. Rickman having expressed his opinion that the deaths are more deficient in these than in other districts. The consequent deficiency for the whole of England and Wales will then amount to 12¼ per cent. nearly, instead of 8 per cent., the estimate of Mr. Rickman. The number of deaths which I have assumed as the true total, differs from the total assumed by Mr. Rickman only one-twentieth part.

It is certainly highly desirable that the number representing the absolute annual mortality at all ages should be correctly ascertained. I believe it to have been ascertained within 5 per cent. of the truth. But even if it should prove defective to the amount of ten per cent., the value of the results hereafter stated will be very little affected thereby: for they would in that case equally well indicate the *relative* mortality at different ages of life, and in different localities, which is the only important question to physiologists. The materials supplied enable us to establish, beyond dispute, the relation subsisting between the mortality at one interval of age, and the mortality at every other interval of age. If the absolute mortality at any one age, or at all ages, in the aggregate be known, the absolute mortality at every interval of age is also known.

In order to obtain the law of mortality prevailing in each county of England during the eighteen years 1813-30, the facts requisite are, the total number of deaths occurring during that period, distributed in quinquennial or decennial gradations of age, together with the mean population who have been alive during this period also distributed according to the same intervals of age. Dividing the number who have *died* in any interval by the mean number who have *lived* in that interval, we obtain the exact number who have died in eighteen years out of a given number constantly living in that interval. A series of numbers thus obtained for each consecutive interval of age would represent the true law of mortality of the population observed. Dividing the results by eighteen, we should have the law expressed for one year, in which form it is most easily compared with the results of other observations. If the results be also multiplied by 100, we should arrive at that form of expressing the fact which is adopted by the best authorities. For example, in the following table the mortality of females in England and Wales, during the eighteen years 1813-30, between the ages of fifty and sixty years, is stated to be 2·16, which is intended to represent the fact that this is the average number of deaths occurring annually for every 100 persons constantly living between the ages of fifty and sixty years. If the materials had been perfect, this number would have resulted from dividing the dying 132,918, by the living 352,160, and dividing the quotient by 18. The result of these operations however is 2·10, which differs from the number above stated, in consequence of necessary correction having been introduced for defects in the materials.

Having stated the nature of the materials as they would be if they were complete, it remains to state the degree and manner in which they are defective from the true

standard. The most important defect, arising from a considerable proportion of deaths not being entered in the parish registers, has been already alluded to. This defect concerns the absolute mortality only at each age, for it may be presumed that these omitted deaths would have been distributed according to age, in the same manner as the total of deaths whose ages are specified. If the defect at all ages be assumed to be 12½ per cent., the defect at each age will also be 12½ per cent. Two minor defects in the materials consist in the want of specification of the ages of a small proportion of the total number returned as living and as dying. The ages of one-eighth of the living population, and of one twenty-fifth part of the registered deaths, have not been specified. The correction necessary on these accounts at each age, is the same as for the total at all ages. In addition to these unavoidable defects, the enumeration of the male sex is defective, by the entire omission of the ages of the military and maritime population, and we have no information given respecting the total numbers of this large class, resident in, or attached to, each county. We are merely informed that the army, navy, &c. belonging to Great Britain, consisted of 300,000 men. This defect ought not to have existed, for it would have been easy to obtain the ages and number of the soldiers and marines resident in England, and attaching them to the summaries of their respective counties. There would probably have existed little difficulty in obtaining a similar enumeration of the sailors belonging to registered vessels. The utility of such an enumeration of seamen would be very little diminished by the fact that the same sailors do not always continue in the same port; because their places are usually supplied by seamen of some other English port, or by foreign seamen. After deducting the sailors and soldiers on foreign stations, I have estimated the amount of that portion which encountered risk of death in England and Wales at 160,000, so distributed that 100,000 are below thirty years of age, and 60,000 between the ages of thirty and sixty years. The effect of this correction, is to reduce the apparent mortality of males at all ages, from 2.23 to 2.17 per cent. per annum.

In the present inquiry, one of the two essential facts to be ascertained, is the mean number who have been alive at each interval of age, during the period of observation, or during the eighteen years 1813-30. The true mean population would certainly be indicated by eighteen annual enumerations of the living at each interval of age. Four enumerations of the living and their ages, made at intervals of six years, would, however, have been amply sufficient, in the opinions of all qualified persons, to determine the true mean population. But in the present case, we have only *one* enumeration of the living, and this made not at the best time, and yet there seems no reason to doubt that it is nearly as valuable as eighteen enumerations would have been. It appears to be a fact founded upon experience, that in any extensive population, the increase or decrease of the number living in any decennial interval of age, is so uniform throughout a period of eighteen years, that the number living in this interval at the end of the ninth year of the observation, is a mean proportional between the number living nine years before, and the living nine years after. The proof of this fact is contained in the English population returns, by means of a supplementary observation of the mortality in England and Wales during a period of seven years, 1818-24. The results of the observation for seven years, agree exactly with the results of the observation for eighteen years, the mean population at the different ages in each case, being assumed to be the number ascertained to be living in the middle of the year 1821, or in the middle of the respective periods of seven and eighteen years. The absolute mortality during the seven years, was 2 per cent. less at every age than the absolute mortality during the period of eighteen years. The relative mortality in the two cases is identical, as it ought to be if the materials of the two observations were complete; and as there is no reason to suspect the mean population for the period of seven years not to have been correctly assumed, there seems to be no room for doubting that the mean population for the longer period of eighteen years, has not also been correctly assumed.

The present observation would have been more complete, if the enumeration of the living, according to age, had been made at the end of the year 1821, which is the middle of the period of observation. The time of enumeration appears to have been fixed on no settled principles, and it seems to have been a mere accident that the time chosen was so near the time at which the enumeration ought to have been made, in order to render the observed number and ages of deaths for eighteen years of the greatest value. The return of births and deaths is made up to the last day of December in each year; and in order to have the means of instituting any accurate comparison between the population living at any time, and the births and deaths, the enumeration ought to have been made at the beginning or end, and not in the middle, of the year. In defence of this acknowledged error, we are told that the middle, of the year was chosen, because the days were longer! If the population had been enumerated at the end of the year 1821, the number living would have been about ¾ per cent. greater than the number given in the return. The correction necessary on this account, reduces the ap-

parent mortality of females at all ages, from 2.083 to 2.067.

The scale of relation connecting together the mortality at different ages in large towns, is of a totally distinct character from that applicable to the general population. The relative mortality of the two sexes is also widely different. In the country, the mortality under the age of five years, is only ten times as great as the mortality between the ages of ten and fifteen years; whilst in large towns, it is fifteen times as great. In the country, above the age of five years, the mortality of males exceeds by a very small amount the mortality of females; and between the ages of ten and fifty, the mortality of females even exceeds that of males. But in large towns at every interval of age, the mortality of males considerably exceeds that of females. For the whole of England and Wales, I have assumed that the registered deaths are to be increased 13.947 per cent. for males, and 13.894 per cent. for females, in order to obtain the true number of deaths. For large towns, I have assumed the necessary increase to be 20 per cent. for each sex; it having been always supposed that the deficiency is considerably greater in towns than in the country. If a lower degree of disparity had been adopted, the minimum mortality, or the mortality between ten and fifteen years of age, would have been less in large towns than in the whole territory. The population returns contain observations on six towns only, which are of the largest size, and which contain a large proportion of sailors and soldiers, of which no enumeration has been made. Having no materials for making a satisfactory estimate of the deficiency, I have made no correction of the apparent results; so that the mortality of the male sex in the six towns between the ages of fifteen and sixty years, is represented considerably higher than the fact. Instead of 3.39 for the mortality of males at all ages, the true number ought probably to be near 3.15.

TABLE, *exhibiting the Materials from which the Law of Mortality of the aggregate Population of England and Wales has been deduced.*

Between Ages.	Living on 28th May, 1821.				Dying in 18 years, 1813-30.			
	In England and Wales.		In Six Large Towns.		In England and Wales.		In Six large Towns.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
0 – 5	791,579	774,689	24,716	24,330	736,039	622,903	36,449	31,744
5—10	693,858	682,457	21,853	21,940	87,263	79,732	3,817	3,448
10—15	603,613	569,366	16,759	17,982	52,324	52,155	1,673	1,544
15—20	509,586	535,569	12,424	17,752	63,405	71,535	2,033	2,089
20—30	755,780	901,338	18,709	31,338	144,586	163,140	5,622	6,001
30—40	593,662	649,507	19,447	24,991	123,996	140,848	5,757	5,855
40—50	482,329	500,977	16,220	18,219	129,675	*129,939	5,880	5,430
50—60	342,204	352,160	10,152	11,913	142,843	132,918	5,545	5,317
60—70	231,509	249,184	5,770	7,439	*182,207	179,251	5,991	6,223
70—80	115,032	124,648	2,499	3,572	202,208	211,028	5,314	6,312
80—90	29,587	36,315	616	942	116,726	136,085	2,506	3,636
90—100	2,253	3,280	44	86	14,486	21,304	300	597
above 100	60	129	5	4	637	1,263	20	48
Ages specified	5,151,052	5,379,619	149,214	180,508	1,996,395	1,942,101	†80,907	78,244
Ages omitted	683,114	765,090	2,961	4,389	75,199	80,265	—	—
Total	5,834,166	6,144,709	152,175	184,897	2,071,594	2,022,366	77,954	74,883
Estimated omissions	160,000	—	—	—	288,930	281,000	15,591	14,977

* There is a small arithmetical error, amounting to 200, in each of these numbers, as given by Mr. Rickman.

† The number of deaths whose ages are specified are in excess, because of the deaths in the suburbs of some towns having been included.

TABLE, *exhibiting the Average Annual Deaths for every Hundred Persons living in each of Thirteen Gradations of Age, according to Nine distinct Observations.*

Between Ages.	England & Wales 18 Years.		England & Wales 7 Yrs., 1818-24.		Six Towns 18 Years.		Sweden, both Sexes.		Table of "Mean Mortality."	Belgium both Sexes, 1829.
	M.	F.	M.	F.	M.	F.	21 Years, 1755-75.	20 Years, 1776-95.		
0— 5	5.35	4.60	5.29	4.56	9.21	8.06	9.01	8.50	6.73	6.58
5— 10	.72	.67	.70	.65	1.09	.97	1.42	1 36	.99	.87
10— 15	.50	.52	.49	.53	.62	.53	.66	.61	.65	.54
15— 20	.72	.76	.69	.76	1.02	.73	.76	.70	.75	.66
20— 30	1.01	1.04	.96	1.01	1.88	1.18	.92	.89	.93	.91
30— 40	1.14	1.24	1.09	1.21	1.85	1.45	1.22	1.16	1.25	1.00
40— 50	1.49	1.49	1.44	1.48	2.26	1.84	1.74	1.61	1.68	1.36
50— 60	2.34	2.16	2.26	2.08	3 41	2.76	2.64	2.39	2.40	2.17
60— 70	4.53	4.12	4.40	4.02	6.48	5.17	4.81	4.93	4.83	3.85
70— 80	10.12	9.69	9.95	9.49	13.28	10.92	10.23	10.41	10.04	9.09
80— 90	22.71	21.46	22.11	21.27	25.40	23.84	20.78	19.74	20.18	17.88
90—100	37.01	37.19	36.50	36.78	42.57	42.88	39.41	35.13	39.85	30.47
Above 100	61.11	56.06	68.06	58.61	24.97	74 12	—	—	70.00	—
All Ages.	2.17	2.07	2.12	2.03	3.39	2.68	2.89	2.68	—	2.27

The apparent mortality of males in all England and Wales, has been diminished by .09 between 20 and 30, and by .06 between 30 and 60 years of age, on account of the unenumerated maritime and military population. In the six large towns a greater correction is necessary, but none has been applied.

It might be supposed probable that the mortality deduced for females between the ages of fifteen and fifty years, may be subject to error from the disposition of females to understate their ages. The error is apparently of very small amount. If the ages of all the females, dying as well as living, be understated to the amount of two years, the mortality at each of the three decennial intervals from twenty to fifty years will be five per cent. higher than the fact. But if the ages of the dying are correctiy given, and the ages of the living only are understated, then the apparent mortality between thirty and forty will be correct; whilst the mortality between twenty and thirty will be lower, and the mortality between forty and fifty higher than the truth. Adopting the intermediate supposition that the ages of the dying are understated to only one half the amount that the ages of the living are, the female mortality under the age of forty will be very nearly correct.

It has been already remarked, that the numbers representing the absolute mortality at each age in my present tables, are founded upon the assumption that the registered deaths are deficient twelve per cent. from the truth, and that Mr. Rickman has estimated this deficiency at eight per cent. The estimate of Mr. Rickman is not founded upon any fact, and leads to results contradictory of facts which he admits. My estimate is founded upon a probable fact, and leads to results in harmony with all other stated facts. Mr. Rickman agrees with me in supposing that the increase of the English population is entirely due to the excess of births over deaths, or that the immigration from Ireland compensates the emigration from England. Assuming this as a fact, the truth of my estimate and the error of Mr. Rickman's are easily demonstrable by means of the proportion stated to exist between the unregistered births and deaths.

In the population inquiry, questions were addressed to each clergyman requiring an estimate of the number of births and deaths in his parish unentered in the register. A portion of the clergy made such an estimate, another portion offered no estimate. The absolute number of "unentered" births and deaths of which there exists an estimate is evidently of very little value, because we are ignorant of the proportion of the total population from which this estimate was obtained. It may, however, fairly be presumed that the *proportion* of unentered births to unentered deaths would have been the same for the whole, as for this part of the population. This proportion is to be regarded as a valuable fact. For on the supposition that the increase of the population is due entirely to the excess of births over deaths, the difference between the un-

entered births and deaths is a known quantity, and the absolute number of unentered births or deaths is known when this proportion is known. Mr. Rickman's estimated deficiency in the deaths is, however, derived from the apparently groundless assumption, that the total deficiency in the deaths was just double the number of which an estimate was returned. Because the partial estimate amounted to four per cent. on the total, he has assumed that if all had made an estimate, the deficiency would have been eight per cent. He then shows, as a consequence of this assumed deficiency, that the unentered births were to the unentered deaths in the proportion of four to one. He entirely disregards the fact elsewhere stated, that the unentered births were to the unentered deaths as two to one, which proportion would have indicated a defect of twenty per cent. in the deaths, as I have shown in No. 614 of THE LANCET.

For the whole of England and Wales the partial estimate of the different clergymen indicates that the number of unentered births was just twice as great as the number of unentered deaths. If London be excluded, the proportion between the unentered births and deaths was that of three to one. This last proportion I have adopted as true for the whole of England and Wales, because it is applicable to nine-tenths of the total population, and because the estimate for London is not much to be relied upon. The determination of the absolute mortality at all ages being a question of great public interest, it may be useful to exhibit the chain of facts upon which my estimated deficiency in the deaths is founded. I have confined myself to the observations on the female sex, because the increase of the female population is capable of being more correctly determined than that of the male population.

The total number of registered births of females in England and Wales during the eighteen years 1813-30 was 3,129,368, and of deaths, 2,022,366, which yields an excess of births over deaths of 1,107,002, instead of 1,658,202, the true increase of the female population in that time. There remains, therefore, the number 551,200 to be accounted for by the excess of unentered births over unentered deaths.

The total number of "unentered" obtained from those parishes which made an estimate, amounted to 357,168 births and 170,930 deaths of both sexes. For London, the estimate was 40,498 births and 65,934 deaths. Consequently for all England and Wales, excluding London, the partial estimate was 316,670 births and 104,996 deaths; which numbers are very nearly in the proportion of *three to one.*

If, then, it be assumed that the true deficiency in the deaths of females for all England and Wales amounted to 275,600, then three times this number, or 826,800, will represent the corresponding deficiency in the births. The difference between these unentered births and deaths is 551,200, the increase of the population to be accounted for as stated above.

The true number of births of females during the eighteen years will then be 3,956,168, and the true number of deaths 2,297,966. The female population alive at the middle of the eighteen years, or at the end of the year 1821, was 6,198,200. Consequently the average annual deaths of females was 2.06 per cent., or one out of 48½. The average annual births of females was 3.55 per cent., or one out of 28. The deficiency in the births amounted to 21 per cent., and the deficiency in the deaths to 12 per cent. According to Mr. Rickman, the deficiency in the births was 19 per cent., and in the deaths 8 per cent. According to my estimate the proportion existing between the total births and deaths of females is that of 172 to 100: according to Mr. Rickman the proportion is that of 175 to 100.

The population returns of 1831 abound with contradictory statements made by Mr. Rickman, founded upon the obviously false hypothesis of the population having been "stationary," and that the annual births had been equal to the annual deaths for a long period of time. Mr. Rickman does not appear to have thought that there was any absurdity in supposing 175 to be equal to 100. At a late hour, and since the publication of the returns, he has been made sensible of his error. In the pages of a medical periodical he has recently bestowed a great deal of unnecessary pains on the demonstration of his own errors. He appears to claim praise for detecting errors which could never have been committed by one possessing any knowledge of the subject discussed. He is greatly mistaken if he supposes that any writer of repute has said a word to the effect that the "hypothesis of the population being stationary," was applicable to circumstances like those of the English population. One specimen of Mr. Rickman's conclusions will be sufficient to satisfy the reader as to their value. Because out of 100 deaths of females in England and Wales at all ages 32 occur below the age of five years, he has stated as a fact that out of 100 *born*, 32 die before they complete their fifth year. The true statement is, according to his own showing, that 32 die out of 175 born, which represents a mortality of 18½ instead of 32 per cent.

I have considered it unnecessary to construct a table rigorously representing at annual intervals the law of mortality which occurred in England during the period of observation. Such a table would be of very little value, because it would differ in an insignificant degree from a theoretical table

which I published more than three years ago. Moreover, there is reason to believe that this theoretical table being founded upon general principles, will be a better indication of future facts, than a table exactly representing one fact out of a great series of facts. The mortality of the female population of England is represented as near the truth as can be desired for any useful purpose, by my table of "Mean Mortality," when the limiting age of the period of "infancy" is taken at seven years. In the published table I have fixed this limit at eight years, which is the true limit for the male population of England. To adapt this table to the female population no alteration has been made except at ages under eight years. The results of this altered table agree very nearly in three important points with the results of the English observations for females. According to the table and according to the fact, the mortality between the ages of five and ten years is 20 per cent. greater than the mortality between the ages of ten and fifteen years. According to the table, there die annually 4.47 out of every 100 constantly living under the age of five years. According to the fact, when the registered deaths are assumed to be deficient $12\frac{1}{4}$ per cent., the mortality of females under the age of five years was 4.60 per cent. According to the table, out of 100 born 19.5 die before they complete their fifth year of age. According to the fact when the registered births are assumed to be deficient 21 per cent., out of 100 born, 19 die before they complete their fifth year. The near coincidence of these results is satisfactory evidence of the general consistency of the materials, and of the conclusions deduced from them. It may be useful to state that the "expectation" or mean duration of life, at birth is 43.70 years according to the table of Mean Mortality, when the limit of "infancy" is fixed at seven years. If the English female population had been stationary, or if the annual births had been equal to the annual deaths for a long period of time, there would have died annually at all ages during the eighteen years 1813-30, one out of every 43.70 living. But on account of the increase of population, the actual annual mortality was only one out of $48\frac{1}{2}$.

On the supposition that the registered deaths are deficient $12\frac{1}{4}$ per cent., the mortality of the English population between the ages of sixty and seventy, and between seventy and eighty years of age, agrees very nearly with that of the table of Mean Mortality. According to this table, 204 living between the ages of sixty and seventy are reduced by deaths in ten years to 100 living between the ages of seventy and eighty years. According to the fact stated in the returns of 1821, there were of both sexes 201 living between sixty and seventy for every 100 living between seventy and eighty years. If the population had been stationary between sixty and eighty years, the coincidence of these numbers would prove that the absolute mortality at this interval has been truly stated, and is represented by the Table of Mean Mortality. If the absolute mortality is correctly stated at any one interval, it is correct at every interval of age, because the scale of relation connecting together the mortality at different ages is indisputably established. That the population was stationary at the period in question, or that the living in 1821 between the ages of sixty and seventy proceeded from the same number of births as the living between seventy and eighty, appears to be highly probable. At least this was certainly the case in London, and there is no ground for supposing that the rest of England did not resemble London in this respect. Those living in 1821, between the ages of seventy and eighty years, were born in the ten years 1741-50, and those living between the ages of sixty and seventy were born in the ten years 1751-60. Now, according to the London Bills of Mortality, during the ten years 1730-39, the number of baptisms amounted to 170 thousand. In the ten years 1740-49 they amounted to 146 thousand; in the ten years 1750-59 they were 148 thousand; and in the two following decennial intervals the baptisms amounted to 160 and 173 thousand respectively. It may hence be inferred as highly probable that the English population in 1821 was decreasing between the ages of eighty and ninety years, stationary between sixty and eighty, and increasing under the age of sixty years.

The new theory of mortality is founded upon the discovery of three numbers, respectively presiding over three well-marked periods of human life—before, during, and after, the existence of the procreative power. To construct a theoretical table, the absolute mortality at any one age must be known, together with the position of the inferior and superior limits of the "procreative period." In every population, whatever may be the absolute mortality, the relative mortality at different ages is the same, when the position of these two limits is the same. In the Table of Mean Mortality I have fixed the superior limit at the age of fifty-five years, which happens to be the true limit in each of the nine independent observations above stated. In all these observations, and in every county of England, the mortality between fifty and sixty is to the mortality between forty and fifty years, in the proportion of three to two, as it is also in the Table of Mean Mortality. Notwithstanding this extensive coincidence, the position of this limit is not to be regarded as having more permanency than the position of the inferior limit. A variation of one year in the position of the superior limit involves a change of five per cent. in the rela-

tive mortality; the same variation in the position of the inferior limit involves a change of 32 per cent. in the relative mortality. In constructing the Table of Mean Mortality, I ventured, in opposition to all direct evidence on the subject, to put back the inferior limit one year, and thus effected a diminution of 32 per cent. in the relative mortality under the age of nine years. My prediction has been confirmed, and more than confirmed three years after its publication, by the present observation on the English population. According to all previous observations, the inferior limit, or the mean age of attaining the minimum mortality, was at nine years—the mortality between five and ten years being always twice as great as the mortality between ten and fifteen years of age (as it is now in the large towns of England), which agrees with theoretical tables wherein the inferior limit is fixed at nine years. In the table of "Mean Mortality," I assumed the inferior limit to be at the age of eight years, which is the limit now applicable to the total male population of England; the mortality between five and ten years being 50 per cent. greater than the mortality between ten and fifteen, according to fact and according to the table. But for the female population the limit is at the age of seven years, for the mortality between five and ten is only 20 per cent. greater than the mortality between ten and fifteen, according to fact and according to a table wherein the age of seven years is assumed as the limit. In Belgium the position of this limit is now at the age of eight years and a quarter for both sexes. The grounds of my accomplished prediction were the following:—From the ages of the living under fifteen years, and from the rate of increase in the births, indicated by the population returns of 1821, I became convinced of the fact, that the mortality under the age of ten years was less in an extraordinary degree than had ever been supposed to exist. I knew also that the diminution in the mortality during infancy was amply sufficient to account for the reduced mortality in England at all ages. Knowing then that the mortality was considerably diminished under the age of ten years, and not diminished above that age, I accounted for it in the only way consistent with the new theory. The truth of this theory has now been confirmed by the highest order of human evidence, for it has enabled me to predict the precise manner in which a new and extraordinary diminution of the relative mortality in infancy has been effected.

In every county of England the proportion of deaths occurring at annual intervals between the ages of one and six years, agrees with what I have stated to be the universal law of mortality. The deaths in any two consecutive years of age are always in the proportion of three to two, according to fact and according to theory, as may be perceived by any person without calculation. Under the age of one year, the theory is correctly applicable to the county of Cornwall only. In all other counties, the proportion of deaths under the age of one year is much greater than that indicated by the theory. Four years ago, in the preliminary observations to my "LIFE TABLES," I expressed an opinion that the theory would not represent the fact in all cases under the age of eight weeks. I believed then, as I believe now, that the high mortality under the age of one year will be found to consist in an excessively high mortality during the few weeks immediately succeeding birth.

As the subject which I am discussing naturally divides itself into two parts at the point now attained, I shall here arrest my remarks until the publication of another Number of THE LANCET will admit them to appear.

46, Regent Square, Nov. 7, 1835.

CASE OF

GANGRÆNA SENILIS,

IN WHICH THE POST-MORTEM EXAMINATION DISCLOSED A

COAGULUM OF FIBRINE ADHERENT TO THE AORTA.

To the Editor of THE LANCET.

SIR,—If you consider the outlines of the following case worthy of being recorded in your truly independant journal, I shall feel obliged by its insertion. It is, in my opinion, calculated, in some degree, to illustrate the pathology of a disease which is too frequently fatal.—I am, Sir, your obedient servant,

W. TAGERT,
Surgeon to Mercer's Hospital,
Dublin.

CASE.—Catherine Strahan, aged 66, of a delicate and feeble frame, was admitted a patient into *Mercer's Hospital*, on the 25th of September, 1835. She then suffered from distressing diarrhœa, and complained much of pain in the left leg and foot, accompanied by a constant sense of coldness. This coldness, and the pain of the extremity, with occasional diarrhœa, afflicted her about a month previous to her admission. The pain was so urgent as to interrupt her sleep. She attributed her sufferings to rheumatism, and kept the limb wrapped in flannel. She did not suffer from pains elsewhere, but her general health was broken. On admission, the leg and foot presented a natural appearance, and she stated, that when suffering from cold, the limb assumed a livid hue. The diarrhœa was relieved by the ordinary