

**Inquiry into some points of the sanatory state of Edinburgh; the rate of mortality of its inhabitants since 1780; their average duration of life; the difference in the rate of mortality among its different classes, and among the married and single; and its comparative eligibility as a place of residence, and for the education of children / [James Stark].**

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INTO SOME POINTS OF THE

SANATORY STATE

OF

EDINBURGH;

THE RATE OF MORTALITY OF ITS INHABITANTS SINCE 1780 ; THEIR  
AVERAGE DURATION OF LIFE ; THE DIFFERENCES IN THE  
RATE OF MORTALITY AMONG ITS DIFFERENT CLASSES,  
AND AMONG THE MARRIED AND SINGLE ; AND ITS  
COMPARATIVE ELIGIBILITY AS A PLACE OF  
RESIDENCE, AND FOR THE EDUCATION  
OF CHILDREN.


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PREVALENCE AND FATALITY OF SMALL-POX," &c. &c.

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ON THE  
SANATORY STATE OF EDINBURGH.

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EDINBURGH, from its favourable situation, its capabilities for efficient drainage, its free exposure to the purifying blasts, its excellent supply of water, and its stringent police regulations as to cleanliness, has ever been reckoned a peculiarly healthy town. Almost every writer has repeated this statement, since Arnot, in his "History of Edinburgh," claimed for it the proud distinction of being "the most healthful of any town of equal bulk in Great Britain." Without presuming to claim for it the same distinction, the object of this paper is to point out the actual state of health of the town, and see how far it still merits the encomiums lavished on it by its early historian.

Edinburgh is situated on three hills, which have a general direction from east to west. The central ridge, on which the most ancient part of the town is built, is steep and narrow, and rises from Holyrood Palace to the Castle, where it abruptly terminates in a perpendicular precipice of about 300 feet, its summit being 443 feet above the level of the sea. The southern hill, on which Newington, Lauriston, &c. are built, with a steep slope to the north, extends as a gently sloping plain to the south; while the northern hill, separated from the central ridge by the valley of the North Loch, declines on the north with a pretty rapid slope to the Water of Leith. In fact, Edinburgh has been very appropriately likened to a bird with outspread wings, looking to the



west. The body being represented by the central ridge, the head by the Castle, and the two wings by the northern and southern sloping hills.

These hills, with the exception of the Castle rock and Calton Hill, which are trap rocks, are composed of sandstones and shales of the coal formation, cut across here and there by dikes of greenstone. The sandstone is a compact and durable white building stone, and many of the houses of Edinburgh are chiefly built from the stones raised from the rock on which they are founded. A few excellent springs of water rise in the suburbs of the town, and supply so many of the poorer classes with that necessary element, and by additional borings might be so increased as to supply most of the public wells.

The drainage of the city follows the natural declivity of the ground from west to east. On the south side several small streams have from time immemorial conveyed to the sea the refuse of the whole of the old town, and part of that of the new. These streams with their contents are carried into a main covered sewer, which proceeds along the North Loch and down the North Back of the Canongate to the Water-gate, in the burgh of Canongate, into which sewer the surface water and soil of the High Street and Canongate also fall. Within a few years another main sewer has been formed, which drains the Cowgate. Its contents are carried along the South Back of the Canongate to the cross road to Dumbie-dykes, and are discharged into the large sewer, just completed, which runs through the meadow ground between Dumbie-dykes and Salisbury Crags.

A third great sewer of the old town receives the contents of the drains of a part of George Square, Nicolson Street, and other contiguous districts, and proceeding as a covered drain, finally joins the great sewer at the foot of Salisbury Crags. All these sewers finally deliver their contents into a wide open ditch at a place near the Clock Mill, about half a mile from Edinburgh, when the stream takes the name of the Foul Burn, and flows in open channels to the sea.

The Water of Leith becomes the great receptacle of the sewerage of a portion of the southern districts of the Old Town and of the western and northern districts of the New Town. From Bruntsfield Links and the Meadows on the south side of the city, a small stream, running through the lands of Dundryan and Lochrin, forces its way through the low grounds of Dalry into the Water of Leith. This stream receives the contents of the drains of the streets in that locality. The drainage of the western and northern parts of the new town proceeds in covered sewers,



which debouche at once into the Water of Leith at different parts of its course. The north-eastern parts of the new town are drained by a sewer which terminates in an open canal at the east end of London Street, flows as such through the garden grounds below Gayfield Square, after which it is covered over and falls into the Water of Leith above the harbour. The sewerage of the houses on the Calton Hill and adjoining streets is carried to Leith in ditches between the London Road and Leith Walk, most of which are now covered over.

The sewerage water from the whole of these sewers, with the exception of that in those from the western and northern parts of the New Town, which terminate at once in the Water of Leith, is used for the purposes of irrigation. Very nearly one thousand acres are thus irrigated, and the grass raised on the meadows is let annually at prices varying from L.25 to L.50 per acre.

From its high and exposed situation, Edinburgh is powerfully swept by the prevailing winds. If the slightest breeze blows, the city enjoys its full share of it, and it is very rare indeed that a perfect calm reigns. From its proximity to the sea, the winters are rarely severe, and the same cause tends to temper the immoderate heats of summer. Nevertheless, the alternations of temperature are occasionally very great, having been observed within the same day to extend from 30 to 40 degrees. The mean temperature of the year varies from 44 to 46 degrees. The lowest degree of temperature noted for many years past has been + 5 degrees Fahr.; the highest summer degree of temperature in the shade, 86 degrees. The east and north-east winds commence to blow with considerable regularity about the middle of March, and are the chief winds during the months of April and May. The west are, however, the most prevalent winds, and all our great storms and blasts come from the south-west. The dry season usually commences about the middle of May, and continues till the end of June. The rains, with great regularity, set in during the last week of June, or first week of July, and continue more or less uninterruptedly in heavy thunder showers, or partial but heavy falls during July and the first two weeks of August. These heavy showers are chiefly from the south-west. From the 12th or 15th of August till October, and sometimes till November, the weather is, generally speaking, dry, with refreshing or bracing mornings, cool evenings, and often oppressively hot days. November is, generally speaking, the most unpleasant month of the year; damp fogs, drizzling rain, or sleet, usually prevailing. Occasionally, however, the month is tolerably dry and pleasant. During December and January, the usual winter weather prevails,



—dry frosts, or occasional falls of snow which very rarely lies above a day or two; or, if milder, sleet or rain. Winter sometimes extends its reign through February. The weather, however, is often remarkably fine during that month, and the heats equal or even superior to those of April. The quantity of rain which falls annually varies from 20 to 26 inches.

In the immediate vicinity of Edinburgh there are no undrained marshes. The North Loch, formerly a lake extending between the hills on which the Old and New Towns are built, remained in a marshy state for nearly fifty years after the buildings of the New Town were commenced. In 1821, under an act of Parliament, the portion to the west of the Earthen Mound was drained, enclosed, and planted; and, in 1832-3, the ground to the west was similarly drained, planted, and enclosed. These grounds are now traversed by the Edinburgh and Glasgow Railway.

Hope Park, or “the Meadows,” a level piece of ground to the south-west of the town, of about fifty acres in extent, and formerly a lake, was first drained, planted, and enclosed in 1722; and as, in the course of years, the drains got foul and the ditches choked up, it was thoroughly drained by the town-council in 1842, when the open stagnant ditches were covered over.

The level grounds on the east of Edinburgh, stretching towards the sea, those on the west, &c., which are irrigated with the sewer water, are all thorough-drained. A great outcry was raised some years ago as to these meadows being the cause of the epidemic typhus fever which then prevailed. Their probable influence on the health of the inhabitants will be alluded to afterwards.

Speaking in a general way, the inhabitants of Edinburgh may be divided into four classes. The lowest of these, consisting of the labourers, porters, carters, scavengers, paupers, &c., may be said to be confined to the Old Town, including the High Street, Canongate, Cowgate, Grassmarket, West Port, Potterrow, Crosscauseway, Pleasance, and all the narrow closes, lanes, and courts therewith connected. Of this class, each family usually occupies one apartment, but, in not a few instances, two or more families inhabit the same room. The greatest want, both of the conveniences and even the necessities of life, exist among the low Irish. A heap of straw is all they have for a bed; of furniture or domestic utensils they have scarce any, and the state of filth and vermin amid which they live is truly pitiable. Such houses have no supply of water, the inhabitants being dependent on the public wells for this necessary element.

The next class, that of artisans, small shop-keepers, &c., inhabit the better tenements of the Old Town, and the lower or



bye streets of the New Town. Each family usually occupies two rooms, occasionally, however, three or four, in which case one is frequently let to a lodger. These rooms are in general tolerably well furnished. A water-cistern and soil-pipe is either furnished to each suite of apartments occupied by the same family, or the same are common to all the families living on the same floor. Water-closets, however, are unknown to this class.

The middle classes live in flats which enter from a common stair, or directly from the street, and consist of from six to eight or ten apartments, or in small self-contained houses in the second-rate streets or outskirts of the town. These are in almost every case provided with water-cistern, soil-pipe, and water-closet, and are altogether comfortable and healthy abodes.

The upper classes inhabit self-contained houses of two, three, or four floors with attics and sunk floor, or they occupy the lower floors of tenements whose upper floors entering from a common stair are let out in flats. These houses are provided with every convenience which wealth can command.

Although the New Town began to be built about the middle of the eighteenth century, it may be stated generally that till about the year 1800 the inhabitants of Edinburgh were chiefly confined to the Old Town, which, however, had extended over a considerable portion of the southern gently sloping plain, and included some open squares and pleasure grounds. From this period, however, the town rapidly extended northward, southward, and westward, so as in thirty years to cover a space of ground more than eight times the size of the town in 1800. If, then, crowding into narrow dwellings be recognised as one of the causes of unhealthiness, we ought to find the health of the city improving gradually from about the year 1780, from which period the improvements would begin to be felt.

Edinburgh has been celebrated for its excellent supply of water, though of late years that supply has been very deficient, as much on account of the more varied uses to which it is now put than it was thirty years ago, as on account of the increasing population. Before 1820 water-closets were not common excepting in the newer built houses of the New Town. The night soil was removed in carts, and formed by its sale a valuable source of revenue to the police board. About 1824, after the new supplies of water were brought from Crawley, water-closets began to be fitted up in every house, and have now become so general as greatly to diminish the value of the police manures, and proportionally increase that of the sewerage water for irrigation.

Perhaps there is no town of Great Britain where the scavenging is carried to a greater state of perfection than in Edin-



burgh. Every street, close, alley, or thoroughfare is swept daily and the refuse carried away. The consequence is, that the streets are kept in a state of cleanliness scarcely ever witnessed in any other town. This of course is not done without great expense, but the sale of the ashes and manure to the farmers leaves little of the burden to fall on the inhabitants. Thus though the cleansing expenses in Edinburgh amount to about L.12,000, about L.10,000 of this is recovered by the sale of the manure collected.

In making investigations into the state of health of a town and ascertaining its rate of mortality, the first essential is to procure accurate returns of the living population. The first actual enumeration of the number of the inhabitants appears to have been made in 1755, at the desire of Dr Webster, when it appeared that there were in the Old Town 31,122, in Canongate parish, 4,500, in St Cuthbert's, 12,168, which, with 2000 for the inhabitants of the castle, hospitals, prison, &c., makes a total of 49,790. In 1755, Mr Arnot, finding from the road survey that there were 13,806 families in Edinburgh and Leith, and being convinced from the healthiness of Edinburgh that the number of 6 to a family was not too large, multiplied this number by six and added 1400 for the inhabitants of the castle, prisons, hospitals, &c. This yielded a total of 83,236 inhabitants for Edinburgh and Leith, but as Leith must be deducted, the total for Edinburgh, according to Mr Arnot's calculation, would be 73,236 inhabitants. This is evidently much too high. The number of families multiplied by five would be much nearer the truth, and if from the sum total thus procured we deduct 10,000 for Leith and add 1400 for the inmates of the castle, prisons, &c. we shall have 60,430 as the number of inhabitants of Edinburgh in 1775.

In 1791 Sir John Sinclair made an estimate of the population of Edinburgh for his Statistical Account of Scotland. The ministers and elders of six of the city parishes, together with those of St Cuthbert's, North and South Leith, made an actual enumeration of the number of persons in their respective parishes. From these data the number of persons in the remaining parishes was calculated, and gave the numbers in Edinburgh alone as 71,045. The first government census was taken in 1800, and it is much to be regretted that, instead of following the natural division of Edinburgh and Leith, the inhabitants of these two places have always been classed together, and thus rendered it a matter of considerable difficulty to ascertain the true number of inhabitants in Edinburgh. To an ordinary observer it may appear that there could be no difficulty in abstracting the parishes of North and South Leith from the total population of Edinburgh and Leith, but the difficulty is caused by this, that part of St Cuthbert's pa-



rish lies within the burgh of Leith, while no inconsiderable portion of the parish of South Leith lies within the burgh of Edinburgh. Yet the burgh of Edinburgh is quite separate from the burgh of Leith. There is no natural amalgamation of the two burghs by connection of buildings. The two burghs are naturally as distinctly separate as if they were miles from each other. Gardens, nursery-grounds, fields, cemeteries and irrigated meadows separate the one burgh from the other.

It has thus been necessary to correct the government census of Edinburgh up to the very last census of the population in 1841, and to add the estimated amount of inmates of the castle. Much anxious care has been taken to render this as accurate as is now possible; and the following are the corrected estimated numbers of the population from 1755 to 1841. This correction was rendered absolutely necessary, as the mortality tables have reference to the parliamentary burgh and not to the parish divisions.

*Population of Edinburgh.*

Year 1755,	Number of population,	49,796
1780,	63,745	
1791,	71,045	
1800,	69,288	
1811,	84,624	
1821,	114,235	
1831,	139,123	
1841,	140,241	

From the above table it is apparent that the population doubled in 30 years—from 1800 to 1831. If these numbers be correct, it will also be apparent, that, instead of an increase, there was a falling off in the number of the inhabitants between 1791 and 1800. This many will no doubt deem to be very improbable, seeing the inhabitants have doubled their numbers since 1800, and were on the increase since 1755. My own conviction, however, is, that Edinburgh continued on the increase till about the year 1790 or 1791, when, from some cause which has not been explained, it fell off till about the year 1803, when it again began to rise. The annual number of deaths strongly corroborates this view, and thus unexpectedly authenticates the accuracy of Sir John Sinclair's valuable statistical researches.

It is necessary, however, to remark, that the last parliamentary census appears to be the most incorrect. At the time when the census was taken, on a very moderate calculation, 2000 inhabitants of Edinburgh must have been absent from town, very many houses in the west end of the town being shut up, whose inhabitants were consequently omitted to be enumerated. This cause of



vitiation of the parliamentary census did not exist to the same extent in 1831, for very few families thought then of moving to the country till the month of August. A great and beneficial change, however, has in this respect crept in of late years, by many families removing to country quarters the beginning of June.

As a faulty population return makes the mortality of a city appear much greater than it really is, it were much to be desired that some of the public bodies of the city would, for the credit of their town, take speedy means to procure a correct return of the population of the parliamentary burgh of Edinburgh; which boundary will, I trust, form the limits of every subsequent parliamentary census of Edinburgh, instead of confounding its inhabitants with those of Leith, as has always been done up to this day.

The first point of interest relative to the living population of Edinburgh, is the comparison of their relative proportions at different ages with those of Scotland or England generally, or of a few of the larger English towns in particular. The following table (Table I.) will illustrate some points of interest on this head.

TABLE I.—Population 1841; exhibiting the proportion of living at different ages to the total population.

Places,	Total Population.	Population under 5 years.		Tot. population under 15 years.		Population between 15 and 60.		Population above 60 years.	
		No.	Prop. per 1000.	No.	Prop. per 1000.	No.	Prop. per 1000.	No.	Prop. per 1000.
England and Wales	15,906,741	2,099,152	131	5,723,746	359	9,039,623	580	1,143,372	71
England alone, .	14,995,138	1,977,577	131	5,388,990	359	8,541,283	580	1,064,865	71
Middlesex, .	1,576,636	183,741	116	481,997	305	1,001,345	636	93,295	59
London, .	1,875,494	221,869	118	577,449	307	1,185,488	635	112,557	60
Liverpool, .	223,003	28,942	129	72,113	323	141,569	647	9,321	30
Manchester, .	192,403	24,907	129	65,242	338	118,038	615	9,139	47
Birmingham, .	138,125	19,167	138	49,332	357	81,956	593	6,937	50
Bristol, .	64,279	7,363	114	19,684	306	40,147	625	4,448	69
Scotland, .	2,620,184	342,785	130	953,186	363	1,474,718	568	192,280	69
Edinburgh, county, .	225,454	26,538	117	74,582	330	136,584	607	14,288	63
Edinburgh city, .	140,241	15,327	109	43,907	313	87,500	625	8,834	62
Glasgow, .	282,343	35,372	125	93,527	331	177,241	627	11,575	42

The numbers of the population of the English towns in the above table do not correspond with the Government census of 1841, but were obtained from the documents in the possession of the Registrar-General of England, through the kindness of William Farr, Esq. The population above enumerated inhabit the several districts included in the registrar's returns of mortality—and thus afford means of comparison with the Registrar-General's reports, otherwise unattainable.

The above table shows the population of the named places, arranged in four classes according to their age—and exhibits the



proportion which the living at each age bear to the general population. If the places were arranged in the order of greatest proportion of individuals at each age in proportion to the total population they would severally stand in the following order:—

Children under 5 years.		Total Children under 15 years		Adults, 15 to 60 years.		Aged, above 60 years.	
Places.	Prop. per 1000.	Places.	Prop. per 1000.	Places.	Prop. per 1000.	Places.	Prop. per 1000.
Birmingham,	138	Scotland,	363	Liverpool,	647	England & Wales	71
England & Wales	131	England & Wales	359	Middlesex,	636	England (alone),	71
England (alone),	131	England (alone),	359	London,	633	Scotland,	69
Scotland,	130	Birmingham,	357	Glasgow,	627	Bristol,	69
Liverpool,	129	Manchester,	338	Edinburgh City,	625	Edinb. County,	63
Manchester,	129	Glasgow,	331	Bristol,	625	Edinburgh City,	62
Glasgow,	125	Edinb. County,	330	Manchester,	615	London,	60
London,	118	Liverpool,	323	Edinb. County,	607	Middlesex,	59
Edinb. County,	117	Edinburgh City,	313	Birmingham,	593	Birmingham,	50
Middlesex,	116	London,	307	England & Wales	590	Manchester,	47
Bristol,	114	Bristol,	306	England (alone),	580	Glasgow,	42
Edinburgh City	109	Middlesex,	305	Scotland,	568	Liverpool,	30

Many interesting conclusions might be deduced from these tables. Supposing we had no other means of ascertaining the facts, the proportion of aged persons, or persons who live beyond the age of sixty years, affords the truest approximation to the actual sanatory condition of the town or district. In all manufacturing towns there exists a greater proportion of children and of adults than in a non-manufacturing town,—of children, because the parties marry early,—of adults, because the neighbouring rural districts are partially drained to supply the demand for labourers,—and in an increasing population there is frequently an excess of persons between the ages of 15 and 60. As a general rule, rural districts exhibit the largest proportion of children and the greatest proportion of aged, because the causes of mortality among children are less than in towns; more children are therefore reared, more attain an advanced age.

A still less objectionable plan of ascertaining from population returns alone the comparative healthiness of a town or country, and one which allows the truth to be still nearer approached, is to strike off altogether the children below 15 years, and ascertain the proportions which the aged (those above 60) bear to the whole population above 15 years of age. When this is done, the following result is procured:—



TABLE II.—Showing the proportions of adults and aged to the whole population above 15 years of age.

Places.	Total population above 15 years.	Between 15 & 60 yrs.		Above 60 years.	
		Population.	Prop. per 1000.	Population.	Prop. per 1000.
England and Wales,	10,182,995	9,039,623	878	1,143,372	122
Middlesex, .	1,094,640	1,001,345	914	93,295	86
London, .	1,298,045	1,185,488	913	112,557	87
Liverpool, .	150,890	141,569	939	9,321	61
Manchester, .	127,177	118,038	928	9,139	72
Birmingham, .	88,893	81,956	922	6,937	78
Bristol, .	44,596	40,147	901	4,448	99
Scotland, .	1,666,998	1,474,718	884	192,280	116
Edinburgh county,	158,872	136,584	905	14,288	95
Edinburgh city,	96,334	87,500	908	8,834	92
Glasgow, .	188,816	177,241	938	11,575	62

From this table it is apparent that, if the above mentioned places were arranged according as they contained the greatest proportion of aged individuals, or, in other words, according to their order of comparative healthiness as evidenced by longevity—they would stand in the following order:—

	Aged persons per 1000 of population above 15 years of age.
Healthiest and 1. England and Wales, containing .	122
2. Scotland, .	116
3. Bristol, .	99
4. Edinburgh county, .	95
5. Edinburgh city, .	92
6. London, .	87
7. Middlesex, .	86
8. Birmingham, .	78
9. Manchester .	72
10. Glasgow, .	62
Unhealthiest 11. Liverpool, .	61

Taking a general view, then, of all the circumstances, in so far as any conclusions can be deduced from simple population returns, it appears that Edinburgh holds a very favourable position,—being more highly favoured than any town of equal size in England.

The next object of inquiry is, what is the actual condition of Edinburgh in a sanatory point of view? What is the average annual amount of mortality among its inhabitants? Has it increased or decreased of late years?

With no small expense of time and labour I have gone personally over all the records of burials in the city and suburbs since 1780, and offer the following table as the result of these labours. In order to render the table available for comparison with the English registers of death, the still-births are excluded.



TABLE III.—Mortality of Edinburgh from 1780, and proportion of deaths to the population.

Year.	Deaths.	Popula.	Proportion.	Year.	Deaths.	Popula.	Proportion.
1780	1730	63,745		1814	2032	93,507	1 death in 40.01
1781	1708			1815	2021		
1782	2096			1816	2544		
1783	1798			1817	2347		
1784	1980			1818	2584		
1785	1800			1819	2818		
1786	2087			Mean	2337	114,235	
1787	1759			1820	2713		
1788	2032			1821	2881		
1789	1998	65,205	1 death in 34.37	1822	2821	123,013	1 death in 38.16
Mean	1897			1823	3377		
1790	1923			1824	2957		
1791	2527			1825	3705		
1792	1941			1826	3575		
1793	2097			1827	3347		
1794	1850			1828	3696		
1795	1785			1829	3164		
1796	1718			Mean	3223	139,123	1 death in 34.45
1797	1614	70,000	1 death in 36.55	1830	3510		
1798	1781			1831	3664		
1799	1919			1832	5262		
Mean	1915			1833	4312		
1800	1532			1834	3657		
1801	1666			1835	3543		
1802	1658			1836	3968		
1803	2133			1837	5009		
1804	1925			1838	4176		
1805	1919	69,288	1 death in 39.50	1839	3365		
1806	1910			Mean	4046	140,241	1 death in 36.22
1807	2044			1840	3688		
1808	2487			1841	3507		
1809	2042			1842	3854		
Mean	1931			1843	4541		
1810	2186			1844	3964		
1811	2236			1845	3688		
1812	2397			Mean	3873		
1813	2206						

From this table it appears that (sinking fractional parts) from 1780 to 1789 one person died annually out of every 34 living. From 1790 to 1799 one died annually out of every 36 living; so that in proportion as Edinburgh was better supplied with water, and spread over the buildings of the newer parts of the town, the health of the city improved. From 1800 to 1809 there died annually only 1 out of every 39 inhabitants; and from 1810 to 1819 only 1 out of every 40 living. Thus it is seen that, in proportion as the town improvements went on, the mortality of the inhabitants diminished. The next decennial period, from 1820 to 1829, shews, however, a retrograde movement, the mortality in-



creasing to 1 out of every 38 inhabitants annually ; and was still greater during the consecutive decennial period 1830 to 1839, during which period 1 died annually out of every 34 living. It is, however, to be remembered that during the last-mentioned decennial period two epidemics—the Asiatic cholera, and the epidemic influenza, increased the mortality during the years they prevailed to the extent of about 1500 annually. During the current decennial period the mortality has been high, amounting to 1 death out of every 36 living ; showing that since 1820 causes of mortality are at work not then in existence, and are, if anything, on the increase.

Before passing to other topics, it is worth while to inquire shortly whether any circumstances occurred about the year 1821, which could serve to account for the increasing proportion of deaths since that period. As the mortality began to increase about that period, and has been on the increase to the present time, it must depend on a cause or causes which came then into operation, and is rather increasing than diminishing. This must be apparent from the fact, that notwithstanding the sanatory improvements since 1821, the health of the town, instead of improving, has been retrograding ; in fact, the sanatory measures have been counteracted by some other increasing evil.

Since 1818 the lower classes of Edinburgh have undergone a gradual but increasing physical and moral deterioration. Having witnessed the change myself, I have no hesitation in ascribing by far the greatest proportion of the increased mortality to this cause, and this supposition will be shown to receive strong corroboration from the fact afterwards to be mentioned in detail, that the excess of mortality is confined to the lower classes.

The low Irish emigrants who are now settled in great numbers in Edinburgh, and in fact constitute nine-tenths of our paupers, were the original and immediate cause of the deterioration of the lower classes. Previous to 1818 very few Irish were in Edinburgh ; but during that year the Union Canal, which connects Edinburgh with Glasgow through its junction with the Forth and Clyde Canal, was begun, and the demand for labourers brought over the first great importation of Irish to the city. The building mania being also at that time, and till 1825 or 1826, at its height, induced numerous Irish families to settle annually in Edinburgh, till their numbers increased so as to drive the native labourer out of the market.

The first settlers inhabited the lowest descriptions of houses. Old byres, stables, and out-houses, never previously considered habitable, were used by them as places of abode, perhaps from the greater facilities such places afforded for rearing a pig, which many of them continued to do in their new abodes. In propor-



tion as these Irish increased, the Scottish artisans and labourers were driven from their neighbourhood, as they found it impossible to live with any comfort in the midst of the filth, vermin, quarrelling and fighting which constantly attended the abodes inhabited by these immigrants. The consequence has been, that the greater proportion of the lowest description of houses in the Cowgate and adjoining closes, and West Port, have become filled with Irish, to the almost complete exclusion of the native Scot.

It is among this class that want of personal cleanliness, destitution, and disease prevail to the greatest extent. Provided with little, in some cases with no furniture, and few domestic utensils, they have nothing to form a comfortable home. Their spare time and money are spent in low taverns and public houses; consequently intemperance and all its attendant train of ills prevails to no small extent among them. These Irish settlements may therefore be regarded as marking an important epoch in the history of Edinburgh—as marking the period when the deterioration of the lower classes commenced—a deterioration in manners, morals, and health.

It is important to observe that this cause has kept exact pace with the increase in the mortality. The numbers of this miserable lowest class have been increasing since 1818. But then it is to be remarked, that it was not till 1825 that the great failures here took place from over speculation, when numbers were thrown out of employment, and the wages of all were reduced; and it is instructive to note that it was this year (1825), that the mortality suddenly rose from 2957 to 3705, never afterwards materially to fall again. Now trade, building, everything has languished in Edinburgh since that period, while the destitution, misery, and numbers of these lower classes have increased; nor was it till last year, when the mortality fell very low, that the demand for railway labourers could be said to put these lowest classes in as good a position as they held in 1824, at which period they were far fewer, and of course had less influence on the general mortality of the city.

I am far from conceiving that the above cause explains the whole of the present excess of mortality over that of the decennial period 1810 to 1819. Other accessory causes will be alluded to afterwards, but this being, in my apprehension, the chief one, deserves special notice here.

Some, who have only superficially studied the subject, will be apt to imagine, that as the rapid increase in the population of Edinburgh up to 1825 manifestly depended, to a great extent, on the numbers who immigrated to it, the mere loss of this influx of healthy strangers would suffice to account in no small degree for the now greater mortality. Immigrants are usually supposed to



consist of young men from 15 to 25 years of age, drawn to the town in consequence of the demand for them; and those who look at the subject in a superficial manner are apt to imagine that such an influx ought to diminish the proportional mortality, as the entrants are at the most healthy period of life.

This is a fallacy which a few facts will easily dissipate. Edinburgh was at its period of greatest increase in the year 1821, when the government census of the population was taken;—increasing at the rate of 2961 annually, or 3·16 per cent. In the year 1841, when the last census was taken, Edinburgh was nearly at a stand still as to increase, only adding for the ten previous years at the rate of about 112 annually, or 0·07 per cent., a scarcely calculable fraction. Notwithstanding this, the proportion of children under 15 years of age in 1821 exceeded that of the children of same age in 1841 by no less than 116 in every 1000 of the population; while the proportion of adults in 1821 fell below the proportion of adults in 1841 by no less than 96 out of every 1000 of the population. The following instructive table shows the absolute numbers, and the calculated proportions of the population at different ages for each of these years.

TABLE IV.

Year.	Total population.	Population under 5 years.		Population under 15 years.		Population between 15 and 60 years.		Population above 60 years.	
		No.	Proportion per 1000.	No.	Proportion per 1000.	No.	Proportion per 1000.	No.	Proportion per 1000.
1821, ...	138,235	18·009	130	59·313	429	73·018	529	5·904	42
1841, ...	140,241	15·327	109	43·907	313	87·500	625	8·834	62

The slightest attention to the subject will satisfy every one that the above-mentioned result ought to follow, when large numbers of young adults immigrate to a town. These, from prospering in the world, soon get married, and the annually increasing number of births soon tells on the proportion of children in the population.

In endeavouring to form a correct idea of the healthiness of Edinburgh, it is of importance to compare its mortality at different ages with other towns. With this view the following table was drawn up, exhibiting a three years' average of the annual number of deaths—and the years 1840–41 and 42 were selected,—as the mean of these years enables us, without complicated calculations, to compare the number of deaths with the population as ascertained by the census of 1841. It unfortunately happened that I could not procure the particulars of Glasgow for 1840; nor of Edinburgh for 1842, without, in the latter case, undergoing an amount of labour for which I had no time.



TABLE V.—Table of deaths at different ages, and their proportion to the total deaths. (Average of three years, 1840–41 and 42.)

Places.	Total deaths	Deaths under 1 year.		Total deaths under 5 yrs.		Total deaths under 15 yrs.		Deaths between 15 & 60		Deaths above 60.	
		No.	Prop. per 1000	No.	Prop. per 1000	No.	Prop. per 1000	No.	Prop. per 1000	No.	Prop. per 1000
England & Wales	349,662	76,140	217	137,569	364	165,523	473	103,894	297	80,245	229
London	45,753	9,491	207	15,495	338	21,576	471	14,747	322	9,430	206
Manchester	5,978	1,501	251	2,985	499	3,374	564	1,815	305	779	130
Liverpool	7,691	1,871	243	4,024	523	4,536	583	2,288	304	867	112
Bristol	1,963	368	187	758	386	932	474	641	327	390	198
Glasgow, (2 yrs., 1841–2)	8,122	1,673	205	3,861	475	4,581	564	2,493	306	1,048	129
Edinburgh, (3 yrs., 1839–41)	3,520	581	165	1,183	336	1,457	413	1,343	382	720	204
Birmingham	3,670	909	247	1,753	477	2,005	546	1,081	294	583	159

This table furnishes much curious and valuable information, and indeed from it alone a tolerably correct estimate may be formed of the comparative healthiness or unhealthiness of each place therein named. Thus, if arranged in the order in which fewest deaths in proportion to the total deaths occur among children under 1, under 5, and under 15,—that is to say, in the order of comparative healthiness for children,—they will arrange themselves in the following order :

Order of least mortality among children under 1 year.		Order of least mortality among children of all ages under 5 years.		Order of least mortality among children of all ages under 15 years.	
Places.	Prop. per 1000 deaths.	Places.	Prop. per 1000 deaths.	Places.	Prop. per 1000 deaths.
Edinburgh	165	Edinburgh	336	Edinburgh	413
Bristol	187	London	338	London	471
Glasgow	205	England & Wales	364	England & Wales	473
London	207	Bristol	386	Bristol	474
England & Wales	217	Glasgow	475	Birmingham	546
Liverpool	243	Birmingham	477	Glasgow	564
Birmingham	247	Manchester	499	Manchester	564
Manchester	251	Liverpool	523	Liverpool	583

These facts, then, exhibit in a striking light the superior salubrity of Edinburgh as a place of residence for children, seeing that at all ages under 15 the proportion of deaths is much less than in any other of the places mentioned, even exceeding that of England and Wales, which of course includes the country districts, in which the mortality among children is always much less than in towns.

Now it is exceedingly curious to observe that the proportion of



adult deaths to the total mortality would arrange these places in almost exactly the reverse position from that in which the proportion of children's deaths arranged them. This is quite in conformity with what was above stated in reference to the relative proportion of adults and children to the total population.

If again arranged in the order in which they would stand, according to the greatest proportion of persons who attain the age of 60 years and upwards, or, in other words, according to the comparative longevity of the population, they would stand thus.

Proportion per 1000 of persons who die above 60 years of age.

1. England and Wales, proportion per 1000,	229
2. London,	206
3. Edinburgh,	204
4. Bristol,	198
5. Birmingham,	159
6. Manchester,	130
7. Glasgow,	129
8. Liverpool,	112

Thus it is seen that, viewed either according to the small proportion of deaths among children, or the great proportion who attain old age, Edinburgh holds a very high position, in a sanatory point of view, among the large towns of Great Britain.

From these facts, then, may be deduced the axiom, that other things being equal, *the less the proportion of deaths among children under 15, and the greater the proportion of deaths above 60, the greater will be the healthiness of the situation.*

In order to complete the review of the mortality of Edinburgh with a few of the large towns of England, it remains to be shown in what proportion the deaths at different ages stand to the population at the same ages. It has been shown above that there is good reason to believe that the last parliamentary census of the population of Edinburgh fell considerably short of the reality; allowance, therefore, ought to be made for this source of error. In the following table, however, the exact population of the parliamentary burgh of Edinburgh, according to the census of 1841, is taken as the foundation of the calculations, according to the subjoined scale.

Population of Edinburgh, 1841.

City of Edinburgh, comprehending the ancient and extended royalties,	56,336
Canongate Parish,	8,932
Part of St Cuthbert's Parish,	70,722
Part of South Leith Parish,	3,229
Castle of Edinburgh,	1,022
Total,	140,241

The following table, then, is drawn up for the purpose of exhibiting the comparative mortality of several large towns with Edinburgh, and the proportions which the deaths at different ages bear to the population at the same ages.



TABLE VI.—Deaths at different ages; and proportion to population at same ages.  
Population 1841. Deaths average of 1840-41-42.

Places.	Total.			Under 5 years.			Total under 15 years.			Between 15 and 60 years.			Above 60 years.		
	Deaths.	Population.	Proportion.	Deaths.	Population.	Proportion.	Deaths.	Population.	Proportion.	Deaths.	Population.	Proportion.	Deaths.	Population.	Proportion.
England & Wales,	349,662	15,906,741	1 in 45.4	137,569	2,099,152	1 in 15.2	165,523	5,723,746	1 in 34.5	103,894	9,039,623	1 in 87.0	80,245	1,143,372	1 in 14.2
London,	45,753	1,875,494	1 in 40.9	15,495	221,809	1 in 14.3	21,576	577,449	1 in 26.3	14,747	1,185,488	1 in 80.3	9,430	112,557	1 in 11.9
Birmingham,	3,670	138,125	1 in 37.6	1,753	19,167	1 in 10.9	2,005	49,332	1 in 24.6	1,081	81,956	1 in 75.8	583	6,937	1 in 11.9
Manchester,	5,978	192,403	1 in 32.3	2,985	24,907	1 in 8.3	3,374	65,242	1 in 16.3	1,815	118,038	1 in 65.0	779	9,139	1 in 11.7
Liverpool,	7,691	223,003	1 in 28.9	4,024	28,942	1 in 7.1	4,536	72,113	1 in 15.8	2,288	141,569	1 in 61.9	867	9,321	1 in 10.7
Bristol,	1,963	64,279	1 in 32.7	758	7,363	1 in 9.7	932	19,684	1 in 21.1	641	40,147	1 in 62.6	390	4,448	1 in 11.4
Edinburgh,	3,520	140,241	1 in 39.8	1,183	15,327	1 in 12.9	1,457	43,907	1 in 30.1	1,343	87,500	1 in 65.1	720	8,834	1 in 12.2
Glasgow,	8,112	282,343	1 in 34.6	3,861	35,372	1 in 9.1	4,581	93,527	1 in 20.4	2,493	177,241	1 in 71.0	1,048	11,575	1 in 11.0



From the above table it appears, that, if the places therein named were arranged according to the smallness of the mortality as compared with the population, or, in other words, in the order of comparative healthiness, they would stand in the following order.

England and Wales, losing 1 annually out of every	45.4
London, . . . . .	40.9
Edinburgh, . . . . .	39.8
Birmingham, . . . . .	37.6
Glasgow, . . . . .	34.6
Bristol, . . . . .	32.7
Manchester, . . . . .	32.3
Liverpool, . . . . .	28.9

This list might easily have been extended to any length, but those towns were selected for comparison with Edinburgh, as their large size renders them fitter objects of comparison than smaller town. To show, however, that mere size of town has not so much to do with its healthiness, the following proportional mortality in the following English towns may be given, keeping to the same three years' average as in the above table.

Worcester loses annually 1 out of every	39.6 of its population.
Norwich, . . . . .	39.0
Leeds, . . . . .	37.5
Nottingham, . . . . .	36.7
York, . . . . .	36.7
Hull, . . . . .	35.5
Gloucester, . . . . .	35.1
Wolverhampton, . . . . .	34.1
Preston, . . . . .	33.6
Chester, . . . . .	32.6
Merthyr Tydvil, . . . . .	28.4

Thus we see that, on taking an average of the same years for so many towns, Edinburgh occupies a very high position in the scale of healthiness, few English towns coming up to it in this respect.

When, however, we proceed to analyse the contents of the above table, we shall find that Edinburgh exceeds almost all towns in Great Britain in the essential elements of healthiness, as exhibited by a comparison of the mortality tables with the population at different ages.

It has been laid down above as an axiom, that the fewer the proportional number of deaths among children under 15, and the greater the proportional number of deaths above 60, the greater will be the healthiness of the locality. To apply this axiom to the above table, it must be modified. Thus the fewer the deaths of children under 15 in proportion to the population at the same age, and the fewer the deaths of aged about 60 in proportion to the living at same age, the greater will be the healthiness of the situation.

*First, the proportional deaths among children.*—In the above table children are considered under two ages, under 5 and 15.



If arranged according to the number of deaths among children under 5 as compared with the living at the same ages, we find the towns arrange themselves in the following order.

1. London, losing 1 out of every	14.3 living.
2. Edinburgh, . . . . .	12.9
3. Birmingham, . . . . .	10.9
4. Bristol, . . . . .	9.7
5. Glasgow, . . . . .	9.1
6. Manchester, . . . . .	8.3
7. Liverpool, . . . . .	7.1

But the mortality among children between the ages of 5 and 15 is so much higher in London than it is in Edinburgh, that if we compare the total number of deaths among children under 15 years of age with the total living at the same age, we shall find that Edinburgh takes its position at the head of the list, distancing immeasurably all the other towns in the above table. Thus of the living under 15 years there is lost by death annually in

Edinburgh, 1 out of every	30.1 living.
London, . . . . .	26.3
Birmingham, . . . . .	24.6
Bristol, . . . . .	21.1
Glasgow, . . . . .	20.4
Manchester, . . . . .	16.3
Liverpool, . . . . .	15.8

In other words, Edinburgh loses annually of children under 15, no less than one-third fewer than Glasgow, and one-half fewer than Liverpool. As a place of residence for children, therefore, Edinburgh, in point of salubrity, excels almost every town of Great Britain.

*Secondly, the proportional deaths among the aged.*—The aged, like children, seem to be highly susceptible of the influence of external agencies. This was the reason why the above axiom was proposed as the test by which the true sanatory condition of a town might be judged of; because if it be found that the deaths among children, who are most of all susceptible to external agencies, are few, there must be some vital error in the statistics if it does not show, that the total deaths bear much the same proportion. Having found that Edinburgh was peculiarly healthy for the young, let us see how it stands with regard to the aged. If the towns in the above table be arranged in the order of salubrity for the aged, they will stand thus:—

1. Edinburgh losing by death 1 annually out of every	12.2 living above 60.
2. London, . . . . .	11.9
3. Birmingham, . . . . .	11.9
4. Manchester, . . . . .	11.7
5. Bristol, . . . . .	11.4
6. Glasgow, . . . . .	11.0
7. Liverpool, . . . . .	10.7

Thus it is seen, that, whether we compare the deaths among



children or among the aged to the living at the same ages, almost the very same result is arrived at. In fact, the slight interchange of places between Bristol, Manchester, and Glasgow, rather proves than disproves the rule, seeing it may depend on slight inaccuracies in the statistics of mortality, or in the census of the population.

As deaths among children are proportionally much fewer in Edinburgh than in the other towns mentioned in the above table, we ought to find a proportionally greater number of deaths among adults. This may to many seem a paradoxical conclusion; but the slightest reflection must satisfy every one that such ought to be the case. As a third more children in proportion to the living survive the age of 15 years in Edinburgh than in Glasgow, and one-half more survive that age than in Liverpool, it follows as a natural consequence that there are just so many more in Edinburgh who must die at some period of life after their fifteenth year. Now this is what actually occurs; for when we arrange the above named towns in the order of least mortality among adults in proportion to the adults living, instead of finding Edinburgh at the head of the column, we find that other and more unhealthy towns have taken its place. Thus of those between the ages of 15 and 60 years,

1. London loses 1 annually out of every	80.3 living.
2. Birmingham,	75.8
3. Glasgow,	71.0
4. Edinburgh,	65.1
5. Manchester,	65.0
6. Bristol,	62.6
7. Liverpool,	61.9

Instead, therefore, of wondering that Edinburgh is so far down the column, the wonder is that it is so high up. This fact, then, by no means proves Edinburgh to be an unhealthy town for adults, for as in proportion to the births a greater proportion are reared and pass their fifteenth year, a greater proportion must necessarily die between the ages of 15 and 60 than in a town where the mortality is higher in early life. This circumstance will afterwards be shown to receive strong corroboration from the proportions who die at different ages among the different classes of society.

I am far, however, from believing that this will serve to account altogether for the fact of Edinburgh showing a comparative greater mortality among adults than London. It is a general rule, that if the deaths among children and the aged are low, so ought also the deaths among adults to be; and whenever this is not the case it ought to be held as an anomalous occurrence whose causes deserve investigation. In the case of Edinburgh, though I believe that a small proportion of the greater mortality among adults may be accounted for on the above supposition, I am not satisfied that



it will account for the whole, but, in the present state of our knowledge, it is better to take the facts with the above explanation, and trust to future observation for the correction of the error, if it be one.

It may certainly happen that though a town be in itself highly salubrious, and this salubrity be demonstrated by the small proportion of deaths among children, the adult population, from their peculiar habits, (as of intemperance, for instance,) may be cut off in as great a proportion as in a very unhealthy town. It becomes, therefore, a matter of high importance to ascertain whether the increased mortality affects all classes alike, or is limited to the lowest class of the inhabitants.

With the view of ascertaining this point, the deaths were arranged into four classes: 1st. Gentry and professional men; 2d. Merchants, master tradesmen, and clerks; 3d. Artisans, domestic servants, and soldiers; 4th. Labourers, porters, and paupers. As very many, however, of the third class become paupers as they advance in life, it was found that a considerable vitiation of results was obtained by separating these two classes, so that though the tables were originally prepared keeping these two classes separate, it was found more convenient to regard them as one class.

The following table, therefore, exhibits the proportions which the results at the under-mentioned five periods of life bear to the total deaths in each class.

TABLE VII.

Class.	Proportion per 1000 deaths under 1 year.	Proportion per 1000 deaths under 5 years.	Proportion per 1000 deaths under 15 yrs.	Proportion per 1000 deaths betw 15 & 60 yrs.	Proportion per 1000 deaths above 60 years.
1. Gentry and } professional, }	72	140	204	383	413
2. Merchant, &c.	127	263	326	400	273
3. Labourers, } artisans, &c. }	241	427	483	357	160

The above table renders it at once apparent that the greatest proportional mortality in Edinburgh occurs among the poorer classes, and that at every age the chances of life are greatly in favour of the first class. This table also strikingly illustrates the truth of the axiom formerly alluded to, that the less the proportion of deaths among children under 15 years of age, and the greater the proportion of deaths above 60, the greater is the healthiness of a locality or of a class. Thus of children under 1 year, the highest class in Edinburgh loses 72 only out of the 1000 deaths in that class. The merchant class, at the rate of 127 out



of the 1000 deaths. And the artisan and labouring class, in the enormous proportion of 241 out of 1000 deaths at all ages; that is to say, that the merchant class loses annually very nearly double the proportion of children under 1 year which the gentry and professional class lose, while the artisan and labouring class loses annually four times the proportion of children under 1 year lost by the first class, and double that lost by the merchant class.

The same fact is exhibited at 5 years of age. At that age the first class loses annually in the proportion 140 out of every 1000 deaths at all ages; the second class in the proportion of 263; and the third class in the proportion of 427.

When the total deaths under 15 years are reckoned, it is seen that the highest class loses in the proportion of 204 out of the 1000 deaths.

the second class,	do.	do.	326
the lowest class,	do.	do.	483

Thus it is apparent, that while among the first class there dies less than half the proportion of children under 15 years, as compared with the deaths among the third class, these deaths are more equally distributed over the fifteen years of life, and do not cluster around the first year of-existence, as they do in the lowest class.

This is just what we might expect. Of the lowest classes, the strong alone survive the first year or years of existence; all the delicate are cut off, so that, in consequence of this, and of there being fewer left alive, the proportional number of deaths diminishes as life advances. Of the highest class, again, so many more are reared—so many delicate children get over the first year of life—that more are spared to die at a more advanced period of existence. In fact, the table shows that many more of the third class die during the first year of life than of the first class during the first fifteen years of existence.

As the natural consequence of this increased mortality of the lowest classes during childhood, they exhibit a less proportional mortality during the adult period of life, *i. e.* from 15 to 60 years of age. This is such a self-evident proportion, that it can require no extended proof. If of 1000 births in the third or lowest class, one-half are cut off before they attain their 15th year, while, in the first class, only one-fourth have died during the same period, there is left living, above 15 years of age, one-fourth more of the first class to die at a more advanced age. Consequently, if compared with the total mortality, the deaths among adults will appear to be more numerous among the first class than among the third class during that period of life. This is exactly what was actually noticed; for, while in the first class, 383 out of the 1000



deaths occurred between the ages of 15 and 60, only 357 died between the same ages among the third or lowest class.

This fact, then, is illustrative of what was formerly stated in reference to a really healthy town, exhibiting a greater proportional mortality between the ages of 15 and 16 than an unhealthy town. As more of the third class die early in life, a less proportion is left to die at more advanced ages, and these few would seem to have had their constitutions more hardened in consequence of what they have come through. This explanation, too, accounts for the fact of the lowest class exhibiting the greatest number of individual cases of extreme old age. Let those, therefore, who endeavour to harden their children, by exposing them half-clad in all weathers, remember at what expense of life this is done *to the survivor*. When done with prudence no harm may result; but who can doubt that its injudicious application is the fruitful source of the hope of many a family being cut off?

Though such are the conclusions to which a comparison of the adult deaths with the total mortality lead, the subject may be viewed in another light, which exhibits more clearly the actual laws of mortality among the three classes of society. For this purpose two plans may be followed, either to compare the deaths with the living in each class, or to exclude altogether the consideration of the deaths under 15 years, and compare the deaths of the adults with those of the aged.

The difficulties connected with the first mode were found to be insurmountable, as the parliamentary census of the population does not distinguish between master and servant in the same profession or trade. The latter plan was therefore adopted as the only means left of affording an approximation to the truth, and with the following result.

TABLE VIII.

Table showing the Proportions of Adults and Aged in the Different Classes to the total Deaths above 15 years of Age.

	Proportion per 1000 between 15 and 60 years.	Proportion per 1000 above 60 years.
First, gentry and professional,	481	519
Second, merchant,	594	406
Third, artisan and labourer,	696	304

This table furnishes a tolerably exact view of the comparative mortality which prevails among the three classes of society above 15 years of age. Thus we see that of 1000 of the first class above 15 years of age, 481 die between the ages of 15 and 60 years, leaving 519 to be cut off at an advanced period of life. Of 1000 of the second class above 15 years of age, 594 die between the ages of 15 and 60, leaving 406 to die at a more ripe



age. Of 1000 of the third class, however, above 15 years of age, no fewer than 696 die between the ages of 15 and 60, leaving only 304 to die at periods above 60 years of age.

That this is the true mode of viewing the relative mortality among the three classes at adult and aged life, seems proved from the fact, that the last column of this table perfectly corresponds in its results with the last column of Table VII. Both of these demonstrate that a far greater proportion of the first class die above 60 years of age than of any other class, the smallest proportion being in the third class. Thus the last column of Table VII. shows, that of the first class between a third and a half survive their 60th year, 413 out of every 1000 dying above 60 years of age. Of the second class, more than a fourth survive their 60th year, 273 out of every 1000 persons dying above 60 years of age; while of the third class, such has been the fearful mortality at earlier periods of life, that less than a sixth survive their 60th year, only 160 out of every 1000 of that class dying above 60 years of age.

Here, then, is a wide field for the philanthropist. Here is shown, by unquestionable data, the necessity of active measures being early taken to arrest such a fearful waste of human life, and all its attendant miseries—widows and helpless orphans thrown destitute on the charity of a cold and heartless world.

The difference in the ratio of mortality of the several classes is equally evidenced by calculating their mean age at death. Thus of the

First class, the mean age at death is	47.22 years.
Second class, do.	36.53 ...
Third class, do.	25.88 ...

The period of life, however, at which the exact half of each of these classes is cut off is,

First class, half die before the	51½ year of life.
Second class, do.	33 ... ..
Third class, do.	17½ ... ..

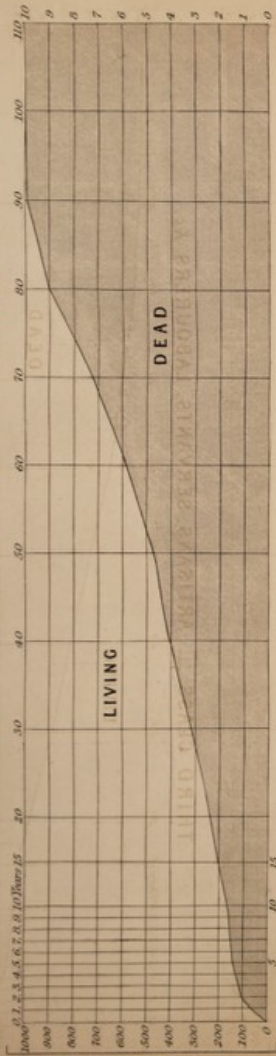
These and many other particulars are seen at a glance in the accompanying diagrams of the curves of mortality among the different classes of society in Edinburgh; and in the following table, from which the diagrams were prepared. In these is shown the relative numbers living and dead at every age out of a generation of 1000 persons of each class. The space on the under side of the curve represents the dead, the upper the living. The vertical lines indicate the ages of life from 1 to 110; the horizontal lines, the generation of 1000 persons. At any selected age, therefore, the numbers living and dead are easily distinguished by observing where these two series of lines are cut by the curve of mortality.



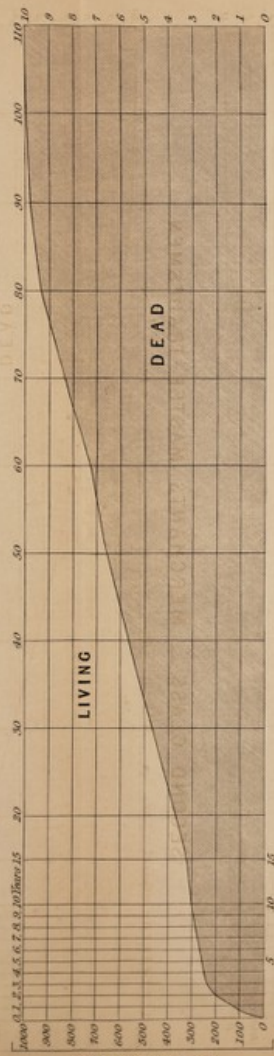
# DIAGRAMS OF THE CURVES OF MORTALITY IN EDINBURGH.

Showing the numbers Dead and Living at every age in a Generation of 1000 individuals in each of the Three Classes of Society, and also in the Whole Population.

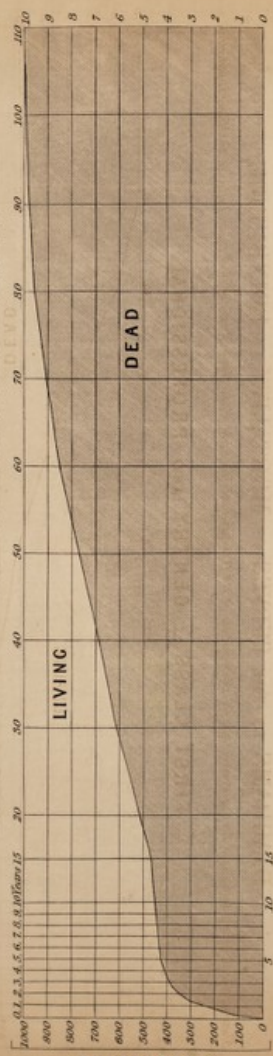
FIRST CLASS — GENTRY AND PROFESSIONAL.



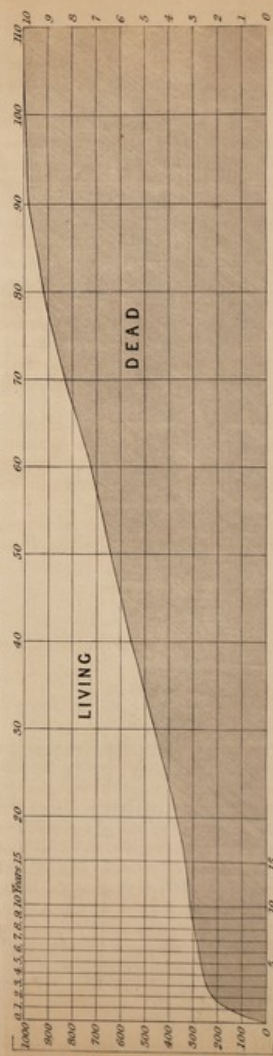
SECOND CLASS — MERCHANTS, MASTER-TRADESMEN.



THIRD CLASS — ARTISANS, SERVANTS, LABOURERS &c.



THE WHOLE POPULATION.





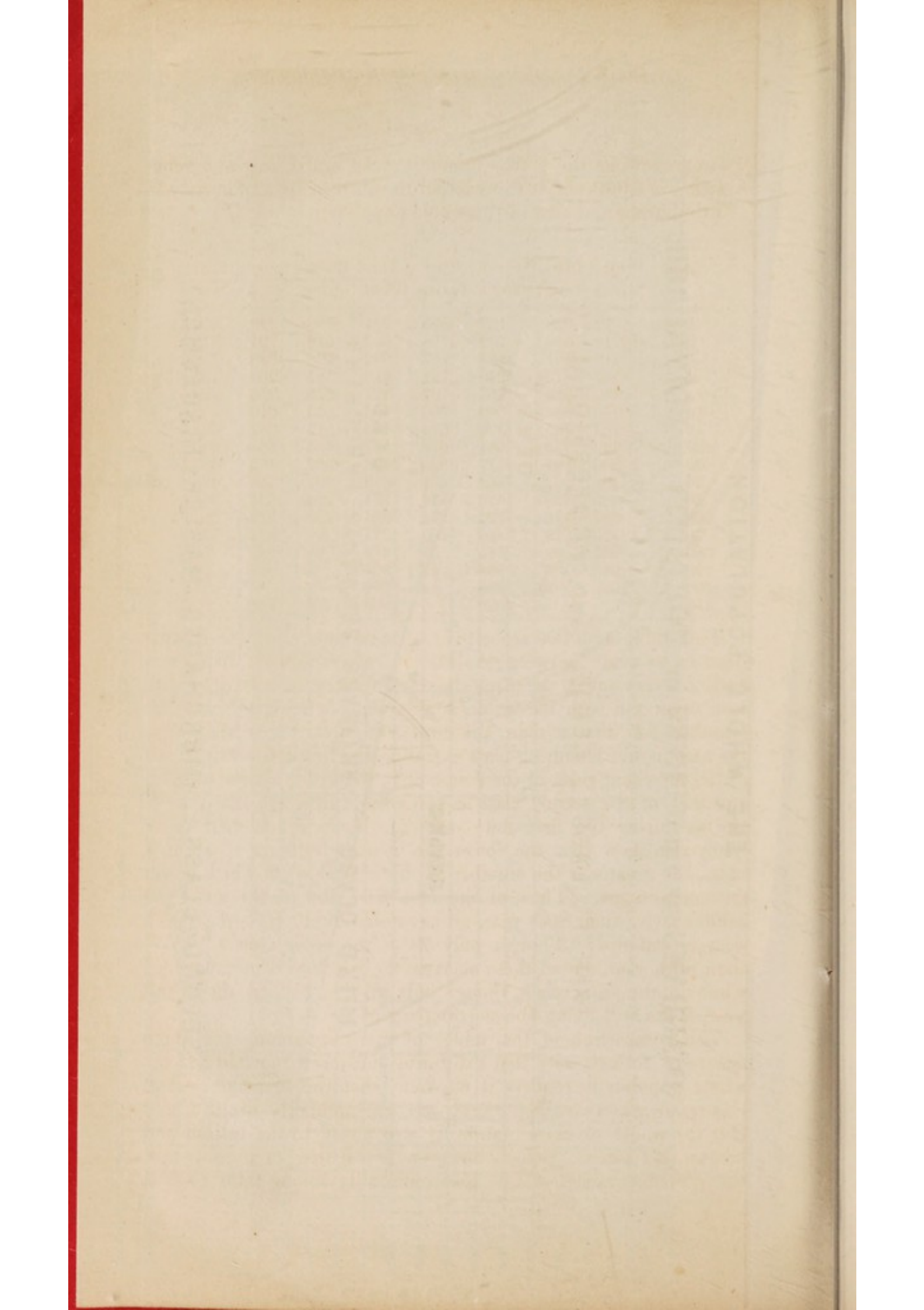




TABLE IX.

TABLE showing the actual numbers dead and living in a generation of 1000 persons in each of the three classes of society in Edinburgh, and also in the whole population.

Age.	First Class.		Second Class.		Third Class.		The whole population.	
	Dead.	Living.	Dead.	Living.	Dead.	Living.	Dead.	Living.
1 year.	72	928	127	873	241	759	146	854
2 ...	110	890	202	798	352	648	221	779
3 ...	119	881	233	767	392	608	248	752
4 ...	127	873	249	751	413	587	263	737
5 ...	140	860	263	737	427	573	276	724
10 ...	166	834	300	700	465	535	310	690
15 ...	204	796	326	674	483	517	337	663
20 ...	242	758	381	619	517	483	380	620
30 ...	306	694	477	523	608	392	463	537
40 ...	408	592	569	431	693	307	558	442
50 ...	480	520	656	344	771	229	635	365
60 ...	587	413	726	274	844	156	719	281
70 ...	723	277	840	160	911	89	824	176
80 ...	901	99	941	59	974	26	938	62
90 ...	991	9	988	12	995	5	991	9
100 ...	1000	0	999	1	998	2	999	1
110 ...			1000	0	1000	0	1000	0

This table and the accompanying diagrams allow the comparison to be made between the relative proportions of living and dead at every age in the three classes of society, as compared with each other and with the whole population. They exhibit the astounding fact, that as many die during the first year of life among the artisan and labouring class as during the first four years of life of the merchant class, or the first twenty years of the highest class; and that of the second class as many die during the first year of life as during the first four years of life in the highest class. They also show that the lower the average duration of life in a class, the greater is the number of individual cases which attain extreme old age. Thus, of the first class, though 99 out of the 1000 survive their 80th year, all have died by the time the 100th year is attained. Though only 59 of the second class survive their 80th year, one of these survives the 100th year of existence; while in the third class, though only 26 live beyond their 80th year, 2 are still living above 100 years of age.

The comparison of the tables of mortality among the three classes of society, with that exhibiting the mean mortality of the whole population, renders it apparent that the first and second classes of society in Edinburgh are pre-eminently healthy, and that the whole excess of mortality is confined to the artisan and labouring classes. Before, however, proceeding to inquire into the probable causes of this great mortality among these classes,



it still remains to notice the influence of marriage on the duration or expectancy of life.

In every country where tables have been kept of the ages at death of the married and single, it has been found that the mean age at death of the married exceeds by several years that of the single. Edinburgh is no exception to this rule, and the following are the results of the calculations from the data in my possession.

The mean age at death of all classes, whether married or single, was 29.54 years—that of the males being 27.06 years, that of the females, 31.98 years; thus showing a difference in favour of female life to the extent of nearly 5 years. The actual age, however, at which the exact half of the population was cut off, was 34 years.

In comparing the ages of the married and single, the ages of the single were computed from the age of 22 years; that of the married, from the age of 16 in the female, and 17 in the male, the lowest age at which any married person died. The calculations give as the

Mean age at death of the married,	57.54 years.
Do. single,	42.18 years.

showing a difference in favour of the married to the extent of about 15 years.

The difference was still greater between the mean ages of the married and single males, being for the married males, 56.69 years, and, for the single males, only 38.22 years.

The difference between the mean ages of the married and single females was not so great, being, for the married females, 58.20 years, and, for the single females, 46.81 years, or a difference of about 11 years only. As on the average of the whole population, the mean duration of female life was found to be the greatest; so in married life, the mean age of the female exceeded that of the male by about one year.

Looking at the great discrepancy between the mean ages of the married and single males, as compared with that of the females, it can scarcely be doubted that some error has crept into the returns or entries on the registers relative to the persons being married or unmarried. Every effort has been made for the last year to get this amended so far as practicable, and the condition of life of almost every person has been regularly and carefully entered, without, however, affecting the general result.

Having thus hastily glanced at a few of the many interesting results deducible from the facts which have been collected, it still remains to notice shortly the probable causes of the great mortality among the lower classes especially, and the means by which that mortality may be abated.



These causes may be arranged under seven heads,

1. Accumulations of filth within and around the dwellings.
2. Want of drainage or sewerage; or, where sewers are present, their unwholesome state, from the presence of fetid black mud closing up the sewers and cesspools.
3. Closeness and want of proper ventilation within the houses.
4. Crowding of families into the same confined chambers.
5. Want of a proper supply of water.
6. Prevailing habits of intemperance, mainly produced and kept up by the want of all comforts at home.
7. Retaining the corpses of the dead in the apartment occupied by the living.

In addition to these, it is necessary to recall the attention to what was above stated, relative to the probable cause of the increased mortality since 1821. It was there attempted to be shown that this increased mortality was probably dependent on the increasing physical and moral degradation of the lower classes, produced by the numerous settlements of low Irish among the native inhabitants. Reference may therefore be had to these statements, in order to complete the series of causes giving rise to the increased mortality.

To each of the above heads, therefore, the attention will shortly be directed.

*1st, Accumulations of filth within and around the dwellings of the poor* in all cases tend to increase the mortality among them. It may be remarked, however, that, in consequence of the admirable situation of Edinburgh, the amount of its scavenging force, and its stringent police regulations, there are not many places where accumulations of filth are allowed to occur external to the dwellings, excepting always in those numerous closes and alleys where pigs, cows, horses, or asses are kept, and dunghills are allowed to be formed. It is otherwise, however, within the dwellings inhabited by many of the lowest class, and no one who has not visited these abodes could believe the state of filth and want of all comfort amidst which some of them live. In some of these dwellings, every spare corner or uninhabited apartment becomes the receptacle for ashes and nuisance of all kinds, which the wretched beings are either too lazy, or want the means to convey to the street. This state of matters is, in so far as my own observation extends, chiefly confined to the low Irish, and, in addition, I have met with more than one instance of pigs or a donkey inhabiting the apartment which formed the sole dwelling of one or more families. Wherever this class have taken up their abodes, house property has become most materially lessened in value,—in fact, is scarcely worth holding, as the expenses attending the periodical cleaning away the accumulated filth, and restoring the doors, shutters,



and partitions which have been torn down for firewood, more than consumes the low and ill-paid rent. As an instance of this deterioration in the value of property may be mentioned what came under my own notice relative to one tenement. Up to the year 1828 the annual rental, which was regularly paid, amounted to L.31, 10s., but in 1845 the same tenement, though in habitable order, was sold for L.20 sterling, the proprietor being glad to get rid of it to save an annual loss of several pounds.

The mode in which these accumulations of filth act in increasing the mortality, is by vitiating the air which is breathed by filling it with noxious effluvia; and though not actually producing disease, still, by weakening the constitution, rendering it predisposed to assume whatever form of disease may be prevalent at the time.

2. *The want of proper drainage and sewerage* in many parts of the town tends also to swell the bills of mortality. The admirable situation of Edinburgh adapts it for the most perfect system of drainage and sewerage. In many parts, however, of the Old Town, there are even yet no sewers; all the soilage water is thrown out on the streets or closes, and finds its way into the sewers as it best can, by means of the surface drains. In consequence of this, most of the narrow closes of the Old Town are kept in a constantly wet state, and, from the putrefaction of the soilage water, exhale at all times noxious effluvia. It is precisely in these localities that typhus fever and all other epidemic diseases are found to rage with the greatest severity. In fact, in almost all the narrow closes of the Canongate, in many of those running between the High Street and Cowgate, and still more especially in certain blind closes and courts at the head of the Cowgate, Grassmarket, and West Port, and in certain courts and tenements at Stockbridge,—in all these places typhus fever may be truly said to be endemic. It is never wholly absent from them, and whenever it is at all prevalent, falls with especial severity on the wretched inhabitants of these localities, in epidemic seasons sometimes attacking every one in these localities between the ages of 20 and 60. Being an infectious disease, however, after being once originated, it does not limit its attacks to the lowest classes, but spreads among those who from accident or other causes are brought into contact with these individuals. It is therefore a matter of importance to every inhabitant of the city, that such places should be repeatedly and thoroughly washed and cleansed, in order that these fetid exhalations may not engender, or predispose the inhabitants to take, those fatal diseases, which, once originated, spread among all classes.

But though such be the state of the poorer classes in reference to the vitiation of the air which they breathe, and its baneful ef-



fects on them, it is not to be inferred that the air breathed by the higher classes is wholly exempt from a like vitiation. It was shown above, that the merchant class lose nearly twice more children during the first five years of life than the highest class, and it is very hard to believe that this is solely caused by the children of the upper ranks being better fed, clothed, and attended to. In several instances in which particular unhealthiness was remarked to prevail in a family which had been previously healthy, this unhealthiness has been traced to a more probable cause. The moment the house was entered, one of two smells in general prevailed; either that nauseous odour which proceeds from a foul drain, or the equally disagreeable one from a badly constructed water-closet or soil-pipe. Now these two causes of unhealthiness are much more prevalent than is usually imagined, and their baneful effects on the general health are greater than could at first sight be believed.

As my attention has been directed to this subject for some time, considerable trouble was taken to procure information on these points, and a few of many instances may be adduced by way of illustration.

More than one of the members of a family in ——— Street were attacked with typhus fever. During the warm weather it was a very easy matter to nose the foul odours from the drains as the house was approached.

Typhus fever cut off the head of a family in ——— Row. On many occasions when passing close to the railings in front of the house, the strong odour distinctly declared the presence of choked drains or foul cess-pool.

In ——— Street a lady sunk some weeks after child-birth, and the emanations from the drains were felt exceedingly disagreeable as the house was approached.

More than one of a family in ——— Place were attacked with typhus fever. The odour of the drains was disagreeably fetid even in September.

A family in ——— Place, ever since they removed to the house they now occupy, have had their servants laid up in succession. Two were seized with fever, one died, while sore throats, erysipelas, and general ill health have prevailed among them. The emanations from the drains were so strong that they put one in mind of the smell arising from rats decaying below the floor after having been poisoned.

A family previously healthy while living in an upper flat, moved to a main-door house consisting of street and sunk floors. Scarcely a single member of the family has enjoyed a day's health since. One disease succeeded another in rapid succession, and the children only recovered on being sent to the country. The



odour of the emanations from the drains is quite sensible over this house.

The very same happened this year to a family in — Place, and though very few months have elapsed since the family removed there, the children have already assumed a pale and sickly look, and have lost their appetite for food. The drains are felt to be disagreeably fetid as soon as the house is entered.

These few facts, then, may suffice to show the effect which emanations from foul sewers or cess-pools occasion. Still as it may be doubted whether the emanations from the drains caused the effects above alluded to, a very few instances which have come under my own notice may be adduced to show the influence of removal from the foul emanations in restoring the lost health.

A family residing in a house in — Street, in which a strong fetid odour arose from the soil-pipe, had constantly some of its members on the sick-list. They removed to what was usually considered a more unhealthy locality, but to a house in which neither soil-pipes nor sewers existed, and they have scarcely ever since required the presence of a medical practitioner.

Three other families in — Place and — Street, inhabiting houses similarly fitted up, were induced to remove to houses which wanted the convenience of a soil-pipe, when, without the aid of medicine, they recovered that health they had lost while residing in the houses which were constantly more or less pervaded with the fetid odour arising from the soil-pipe.

A family residing in a street and ground floor in — Street lost their health from the fetid emanations from the drains. The children, previously healthy, became pale, cachectic, with loss of appetite and strength, and were affected with glandular swellings. As the cause was but too apparent, it required little persuasion to induce them to remove to a more healthy habitation, where they have completely recovered their pristine vigour and strength, and all the glandular swellings have disappeared.

One circumstance connected with this subject ought not to be passed over in silence. The first time the epidemic cholera attacked the inhabitants of this city, it was found to prevail especially in those localities which were in the most filthy state as to cleanliness, external and internal. On its second visit, however, about three years thereafter, it was a most remarkable circumstance that all the fatal cases,—indeed almost all the cases—occurred in two parts of the tenements only, viz. the lowest or ground floor, and the highest or attic floor. The whole of the intermediate floors, three, four, or five in number, were passed over by that formidable disease. This fact appearing at first sight inexplicable, I sought to discover the reason why the disease should make such a selection, and satisfied myself that it could be ac-



counted for on rational principles. The fetid odours, dampness, and want of cleanliness on the lowest or ground floors were sufficient to account for the preference the disease exhibited for the inhabitants of these places; and it was not a little remarkable that although the intermediate floors were comparatively free from the same disagreeable effluvia, the highest floors or attics were nearly as stifling as the ground-floor, in some instances worse; the low roof, with its small skylight windows, and more confined space, seeming to have prevented the heated vitiated air of the lower floors from escaping. This vitiated air, breathed in a more concentrated form by the inhabitants of these floors, must have tended to lower the tone of their systems, and render them more obnoxious to the prevailing epidemic.

Seeing the dangers arising from these fetid effluvia from drains, &c., inquiry was made as to the cause of their escaping through the sinks and water-closets, and vitiating the air of the house. It was ascertained that in almost every case this arose from the soil-pipes being insufficiently constructed, not being provided with proper knees (or cesspools as they are termed,) or from no care being taken to unite them properly with the sewers into which they open, from the house sewer being perforated with rat burrows, being filled with a greater or lesser quantity of black putrescent mud, and being seldom or never trapped. In almost every case, too, the house drain opens into a cesspool in front of the house, in which all the more solid matters collect and undergo putrefaction. The house sewer or drain, however, being large and square, permits a greater or lesser quantity of the same mud to collect in its interior, and the fetid emanations arising therefrom find their way into the house through the rat burrows or the walls and junctions of the sewer itself, and through the floor as well as along the soil-pipes.

From my own observation, I have little hesitation in attributing the greater mortality among the mercantile class, as compared with that among the highest class, chiefly to their being more exposed to these fetid emanations from the sewers. As the great body of this class live in floors, these emanations escaping through or along the soil-pipes and water-closets, vitiate the whole air of the dwelling, and cannot fail to act prejudicially. Indeed, in almost every such floor, no sooner is the door opened, than the odour of the emanations from the sewers through the water-closets or soil-pipes may be distinctly felt. This alone, without seeking for any more hidden cause, is unquestionably sufficient to account for the greater amount of sickness and death among the merchants, master tradesmen, and clerks, than among the gentry and professional men. The highest class, to a great extent, escape this evil. The houses inhabited by them are in general more



carefully finished. The large open staircase in the centre of the house, extending from its top to its bottom, furnishes a constant supply of fresh air, and the apartments inhabited by that class are further removed from the sources of impurity than in houses laid out in floors.

As a general rule, cesspools should be abolished. They are receptacles of filth, which are attended with many evils, but no counterbalancing good. That they keep out rats is the chief argument used by builders for their employment, but a proper trap on the sewer would do the same thing, and not be attended with the same danger to health. Such traps might be cheaply constructed of slate, as has been tried in many sewers in London and elsewhere. But traps are bad things on any sewer, as they tend to increase the deposition of solid matters, excepting at the mouths of those grated openings at the corners of streets where the surface drainage enters the sewer.

In every case the square box drain which runs along the ground floor of the house should be filled up, and the tubular sewer of Mr William Dyce Guthrie be substituted. No stream of water which can be commanded in any private dwelling is sufficient to wash away the black putrescent mud which rapidly collects in these box drains. In fact, they require to be opened to their full extent in order to cleanse them, and the expense and annoyance which this causes prevent its being done so often as is required.

This lodgement of solid matters never occurs with the tubular sewers, provided the pipe be of sufficient capacity. Let the stream of soilage water be ever so small, it runs along that portion where deposit could alone occur, and carries all solid matters at once into the main street sewer. Mr Guthrie recommends never to lay down a pipe of larger diameter than can be filled completely (or flushed) with water, so as to clear it out by its hydraulic pressure. This, however, is a dangerous rule, whose fallacy has been already proved here in the only sewer laid down under the direct superintendence of that gentleman. The two and one-half inch pipe acted well so long as it was regularly flushed once a-week or so, but since this has been neglected it has become so obstructed that a pressure of even ten feet of water failed to remove the obstruction. Besides, as house sewers are constructed to carry off the drainage of the back area as well as of the soil-pipes, no hydraulic pressure above a few inches in height could be obtained without plugging all the lower apertures into the sewer. Provided, however, the pipe be of sufficient capacity flushing with water is never required, the ordinary soilage water sufficing to carry every particle of solid matter direct into the street sewer. This is the experience of Mr Kirkwood, plumber, Thistle Street Lane,



who has taken the lead here in this matter, and has fitted up several houses with tubular sewers during the two past years. He has used leaden, cast iron, and earthenware pipes glazed in the interior, to which last he gives the decided preference, the smooth interior favouring the washing away of all solid matters, and the pipe not corroding as do both leaden and iron pipes. He recommends no pipe to be used of less diameter than three and one-half inches,—four being the preferable diameter for ordinary tenements of three to six floors. These he furnishes at about eleven pence per foot of plain pipe.

No emanations can escape from these tubular sewers, no rats lodge about or destroy them, no deposit take place in their interior; so that, if provided with a proper double knee, or cess-pool as it is termed, at its junction with the soil-pipe, the present evils arising from the employment of the old square box drains may be completely avoided. These tubular sewers ought to be carried at once into the main street sewer, and the old box drain and its cess-pool thoroughly filled up.

Mr William Stark, builder and architect here, has, I believe, the merit of having recommended the use of, and laid down the first tubular sewer in Edinburgh. The whole drainage and soilage of a large tenement of six flats in the High Street\* was in 1826 carried obliquely across the floor of the ground flat in cast iron pipes of six inches in diameter. They are forty feet in length, and have a fall of only half a foot, and run direct into the street sewer. They have never been flushed with water, have never become obstructed during the twenty years they have been in use, and appear to be as clear as the day on which they were laid. This fact, then, ought to satisfy every one that, provided a proper sized pipe be used, no care whatever is required in the use of the tubular sewer. Were periodical flushings required for such sewers, that alone would prove a bar to their general introduction, but Mr Kirkwood's two years' practical experience, along with the above fact, and there may be many others here of which I am not aware, suffices to show that tubular sewers of proper size have no drawback whatever.

Seeing, then, that such is the superiority of the tubular sewer, when of proper size, over the common box drain, its value in a sanatory point of view is inestimable, and it cannot be doubted that, if generally introduced, it would, in a very few years, save to each family the cost of its construction in doctor's fees and medicines alone. The inhabitants would thus enjoy a greater amount of health and freedom from disease, the average duration of life would be prolonged, and fewer deaths occur in proportion to the population.

\* Messrs Stark and Company's Printing Office.



This part of the subject ought not to be passed over without directing the attention of the Commissioners of Police to the untrapped state of all the sewer mouths at the corners of streets, &c. where the grated openings receive the surface drainage. In the warm weather especially, the fetid emanations which escape from these open mouths in every direction taint and vitiate the surrounding air, and thus prove an additional source of ill health and of mortality to the inhabitants. This nuisance only requires to be pointed out to be removed.

It will be recollected that the mortality of Edinburgh has been on the increase since about the year 1821; and though the principal cause of this increase has been pointed out, it is worth while to inquire whether the state of the sewers has had any thing to do with it.

It was stated above, that, previous to the introduction of the new supply of Crawley water, about the year 1824, only the more recently built houses were fitted up with water-closets and soil pipes. Previous to that time by far the greatest proportion of the night soil was removed in carts, along with the ashes, and sold as manure. But from that date water-closets began to be introduced to the older built houses, and are now to be found in almost every respectable dwelling in Edinburgh. From the insufficient mode in which the greater proportion of these conveniences\* are erected, it is very much to be doubted whether they have not done more harm than good in a sanatory point of view. The emanations from the sewers before this additional source of impurity was added were neither so great nor so disgustingly fetid as now, and it is not a little strange, that, just in proportion as the sewer water was thus rendered more impure, was the increase in the mortality,—the one has kept exact pace with the other.

Here, then, are two distinct causes for the increase of the mortality of Edinburgh since 1821, the demoralization of the lower classes produced by the settlements of the low Irish, and the increasing virulence of the emanations from the sewers since the general introduction of water-closets. Any increase of mortality from this last cause might have been entirely avoided had the requisite care been taken to prevent those emanations escaping from the sewers. But seeing that the proprietors and builders of houses have in general fitted up the necessary conveniences in the cheapest way, and by the lowest estimates, the inhabitants have to blame themselves alone for the sufferings which such parsimony entails.

3. *The closeness and want of ventilation in the chambers of the poor; and*

\* Mr Kirkwood, plumber, has invented an excellent form of water-closet, which more effectually obviates the objections to the old ones than any I have yet examined. It might indeed be fitted up in every bed-room without discovering its presence by any foul odours.



4. *The crowding of families into the same apartment*, tend much to increase the mortality among the lower classes. The Old Town of Edinburgh, to which the greater portion of the lower classes are confined, possesses one peculiarity scarcely noticed in English towns. Having been a walled town, the houses, to save room, were built of a great height, averaging from five to seven floors or stories, (one tenement still exists ten stories in height), and in many cases so close to each other that a cart could not pass between the houses on opposite sides of the same close. This narrow space for ventilation is in numerous instances still further contracted by the upper stories projecting over the ground floors, so that persons on opposite sides of the same close could easily shake hands with each other. As almost every room in such tenements is occupied by a whole family, it often happens from 150 to 200 persons enter from the same staircase, and were it not that very many of these houses have become uninhabitable, and are tumbling into decay, the average number of square feet to each inhabitant of these districts would be less than in most towns. As it is, however, the number of square feet to each inhabitant of the lower parts of the Old Town varies from 78 to 140 feet; while in the New Town, where the higher classes reside, it varies from 333 to 360 square feet for each inhabitant.

Previous to 1818 even the lowest class in Edinburgh paid tolerable attention to cleanliness, and there were comparatively few families who did not rent two apartments. Since the Irish settled in numbers among us, the lowest class have become almost as demoralized, and have sunk to nearly as low a level as them. Still it is chiefly among the Irish that the want of cleanliness, the want of almost every article of domestic furniture, and the crowding of families into the same apartments prevail. Spending almost all the money they receive on ardent spirits and food, this class have nothing to spare for fuel, comfortable clothing, or furniture, consequently every crevice which could admit a draft of air is closed up, and the closeness and stench of the apartment are alike insufferable to any one not accustomed to it. When attending this class as dispensary physician, I became fully alive to the pernicious influence of these causes on the health of the inmates. The health of the parents was usually indifferent, and several weeks' labour was annually lost from ill health. Scrofulous affections and skin diseases were prevalent among the children. All were peculiarly liable to be seized with every passing epidemic; the attacks were more severe, convalescence more protracted, and the mortality greater than among children in more comfortable dwellings.

5. *The want of a proper supply of water* rendered all these causes of mortality still more irremediable, putting it out of the



power of most of the lower classes to purify their dwellings or wash their clothes as often as they ought to be.

Previous to the town making over their rights to the joint stock water company, who got their bill passed through parliament in 1818, the supply of water was so much beyond the wants of the inhabitants, there being many private pump wells, that for many hours, day and night, a large stream of surplus water was allowed to run down the High Street,—a thing almost unequalled in any European city. With the new supplies from Crawley, water-closets were generally introduced, and the private pump wells began to be disused. Leith, also, which was formerly supplied from Lochend, was furnished with water from the Crawley pipes. The natural consequence of this was, that, instead of Edinburgh being better supplied with water, very few years elapsed before every one felt that the supply was more deficient than ever. Soon the surplus stream ceased to flow down the High Street; and in order still further to economise water for those who paid for it, the public wells from which the poorer classes derived their only supply were deprived of their second and third service pipes, and were restricted to one nozzle. The serious loss of time incurred in waiting their turn at the one service pipe of the public wells, and the small quantity of water procured after all, was felt by the poorer classes to be such an intolerable tax that the landlord of every tenement of the least respectability was obliged to introduce a cistern with service pipe to supply each house, each floor, or the whole tenement. It might be supposed that this measure, good in itself, would have completely remedied what was complained of; but in practice it has not been found to have had this effect, seeing that the supply to these houses is limited to a few hours daily, or every other day during spring and summer. As their cisterns are small, and several families are often served from one cistern, their miserable supply of water is scarcely sufficient for the bare wants of life, and personal cleanliness.

That I may not be supposed to be making any mistatement as to the quantity of water actually brought into Edinburgh, I shall refer to the statement of Mr Jardine, the engineer of the Water Company, as taken from his evidence before the House of Commons in 1842, when the present Water Company obtained their new bill.

Mr Jardine states, that “the average supply by the present works is 190 cubic feet per minute,” or “about 1,641,600 imperial gallons per day,” “not giving above ten gallons to each individual of the population.” The mode in which this average is made up is this:



Crawley spring,	50 cubic feet per minute.
Swanston and Comiston springs,	30
Burn water,	10
Compensation pond water,	100
Total,	190 cubic feet per minute.

By the passing of the late act of 1842, the Company was bound to introduce, within six months after the passing of the act, 130 cubic feet per minute of burn water, taken from above its entrance into the compensation pond, to supply the impure stagnant water which was formerly taken from the pond itself. This would increase the supply to 210 cubic feet per minute, or to 302,400 cubic feet per day. This multiplied by 6.23, the number of gallons in a cubic foot, gives 1,883,952 imperial gallons as the average supply of water to Edinburgh and Leith daily. As the improved drainage on the farms of Swanston and Comiston have, however, greatly diminished the supplies from these springs, it is very questionable whether even now above 190 cubic feet of water per minute are delivered in Edinburgh. Even this, however, is much above the average of summer. From the same evidence we learn, that in the dry summer of 1842, the supply was diminished to 90 cubic feet per minute, or about 5 imperial gallons to each inhabitant, supposing always that the inhabitants received the whole of it.

Take the average, then, as stated by Mr Jardine, and we shall find, that the poor ten gallons which he states the Company supply to each individual in Edinburgh and Leith falls far below the actual supply to each individual of the population.

From the evidence of Mr John Fyfe, surveyor to the Water Company, it appears that the receipts drawn for water in 1842 amounted to L.16,000; but as the amount levied on houses varies according to the rise or fall of the rental, L.15,000 is much nearer the average annual receipts. Of this sum no less than L.2915 were drawn from water supplied to manufactories, breweries, tanneries, shipping, &c., leaving only four-fifths of the water-rates to be levied from the inhabitants of houses, in Edinburgh and Leith. Now, if the water-rates bear any proportion to the quantity of water supplied, then the inhabitants receive only 4-5ths of the quantity brought into Edinburgh. Thus if the supply were at the rate of 200 cubic feet per minute, which there is every reason to believe is the utmost that is supplied, the inhabitants of Edinburgh and Leith would receive only 160 feet of this quantity, the manufactories, breweries, tanneries, shipping, &c. receiving the remaining 40 cubic feet. In other words, though the supply of water daily transmitted through the pipes should amount to 1,794,240 imperial gallons, yet the inhabitants of Edinburgh and Leith would only receive



4-5ths of this, or 1,435,392 imperial gallons daily. This quantity distributed among 168,000 persons gives the very insufficient supply of  $8\frac{1}{2}$  gallons daily to each inhabitant.

Seeing such is the very deficient supply of water to Edinburgh, the late decision of Parliament in reference to the Water Companies is to be regretted, and it is desirable that such measures were adopted as would procure a constant supply of wholesome water for the inhabitants.

It is seen above that the supply of water to the inhabitants of Edinburgh is deficient; it remains to be shown that this deficient supply does not reach the classes which require it most.

It was stated above that most of the lowest classes of houses were unfurnished with water, and that the inhabitants thereof were dependent for their supplies on the public wells. Mr Robert Paterson, police surveyor, in his evidence before the Parliamentary Committees in 1842, stated, that of 26,752 houses in Edinburgh, no fewer than 10,000 under L.4 of annual rent were dependent on the public wells for their supplies of water. (Pp. 55 and 59). In other words, two-fifths of the families in Edinburgh were dependent on the public wells for their supplies of water. As these houses are chiefly situated in the steep closes or lanes, courts, and alleys on each side of the Canongate, High Street, Cowgate, Grassmarket, and West Port, it so happens that few or none of these closes are provided with water. There are thus no means of cleansing these places by means of a flow of water, and a certain proportion of the foul water thrown out is, from the want of a more copious flow, left to evaporate, to the prejudice of the health of all around. The distance of many of these houses from a public well, the time consumed in waiting there till their turn arrives when they may fill their pitchers from the contracted single nozzle, all act in preventing the lower classes making free use of water even for the purposes of personal cleanliness. Such a state of matters acts most prejudicially on the habits and morals of the lower classes; and seeing that no less than two-fifths of our fellow citizens are in a manner deprived of the use of this healthful element, it is to be hoped the attention of the legislature will be directed to the subject, and means be adopted for furnishing a copious supply to the poorest of the inhabitants. It is somewhat astonishing that advantage has not been taken of the supplies of water which could be so easily procured by borings of no great depth in almost any part of Edinburgh. Such is the nature of the strata on which Edinburgh is situated, that there is every reason to believe that sufficient water might easily be procured by boring, to supply most of the public wells. In sinking cellars in George Street, the water rose so copiously, that the work was forced to be abandoned, and the opening thoroughly closed over; and in the



recent operations at the Edinburgh and Leith Railway tunnel, the flow of water was the cause of several persons losing their lives. It is rumoured, that, in digging the foundation of the building for the baths for the working classes, a spring was opened, so copious, that it is expected it will be sufficient to supply that establishment with water. This source of supply ought, therefore, not to be overlooked, seeing that by it alone, the whole of the houses of the poorer classes, not now provided with water, might be supplied at less expense than by any other plan.

6. *The prevailing habits of intemperance among the lowest classes, mainly produced and kept up by the want of all comforts at home*, though it tends to increase the mortality, need not be enlarged on here. If a man after a hard day's labour find no comfort or attractions at home, scarcely any furniture, but foul odours and all impurities, he is but too apt to retire to the tavern and drown his discomforts and his senses together in drink. His partner, too, often follows his example; a disregard of human life is engendered; and, as a necessary consequence, the children, but especially the infants, are neglected by their besotted parents, and die in those frightful numbers noticed above. Strange as it may appear, the want of a better supply of water tends to keep up habits of dissipation. In many low taverns and spirit cellars, water is given gratis to those who purchase liquor; and as the distance from the public wells is often considerable, and the trouble and loss of time attendant thereon great, many of the poorer classes purchase drink in order to procure a pitcher of water.

7. *Retaining the bodies of the dead in the apartment occupied by the living* tends to increase the mortality, especially during the prevalence of any epidemic disease. From the difficulty of raising funds for the burial, and from the fear of premature interment, the corpse is often retained till putrefaction has advanced so far as to render its presence noxious to the living. Of the crowd of visitors who visit the relatives of the deceased at this time, it is not at all unusual to find several afterwards seized with the disease of which the deceased died. This, in fact, is one mode by which contagious diseases spread beyond the locality in which they apparently originated. Mr Edwin Chadwick, Secretary to the Poor Law Commission, has so amply enlarged on this subject, and suggested remedies for its removal or alleviation, that I cannot do better than refer to his excellent "Supplementary Report on the results of a special inquiry into the practice of Interments in Towns." His recommendation of having a building in each parish, to which the corpses might be removed till interred, is worthy of consideration. It would tend to keep up the awe which the sight of a dead body ought always to create. It would tend to prevent that recklessness to human life which over fami-



liarity with mortal remains is apt to foster. It would tend to prevent the spread of contagious diseases, as the speedy removal of the body would allow the house to be whitewashed and fumigated, and other means be taken for preventing the further spread of the malady.

Many will be apt to imagine that one great cause of unhealthiness in Edinburgh has been overlooked—that is, the effluvia from the irrigated meadows in its neighbourhood.

When first it was ascertained that the mortality of Edinburgh, as compared with its population, had been increasing since about the year 1821, the first impression was, that the fact could easily be accounted for on the supposition that the mortality kept pace with the increase in the number of acres of irrigated meadow. The more closely the subject was investigated the more convincingly did it appear that the irrigated meadows exerted no appreciable influence on the health of the inhabitants; and that a foul cess-pool, a stagnant collection of putrid water, or an accumulation of filth, caused a greater amount of traceable sickness than the emanations from hundreds of acres of irrigated meadow lands.

The mode which was adopted to prove this fact, was first to ascertain, what are the usual classes of diseases which marshy grounds induce in the neighbourhood, and then determine whether these diseases were more common in the neighbourhood of the irrigated meadows than elsewhere. It was ascertained that in the few marshy districts around Edinburgh, the diseases which were peculiar to such situations were remittent fevers—the remittent fever of infants, and the bilious remittent fever of adults. In a few cases the fevers assumed the intermitting type, or form of ague, and it frequently happened that the common typhus exhibited somewhat of the remittent type when it attacked persons inhabiting such localities. The question, therefore, was

“Are remittent or intermitting fevers more common in those parts of Edinburgh exposed to the assumed malaria from these irrigated meadows, than they are in situations remote from their influence?”

It was, in the first place, found that cases of remittent fever are by no means common in Edinburgh; while ague is nearly unknown. In the second place, it was ascertained that the cases of true infantile remittent fever which do occur are principally confined to particular localities: to the neighbourhood of the Canal, to that of the Water of Leith, to that of Canonmills Pond, &c. Hence cases of this form of fever are endemic to Gilmour Place, Fountain Bridge, and adjoining streets, Water of Leith village, Stockbridge, India Place, Saunders Street, Brandon Street, Canonmills village, Warriston Crescent, &c. and also, before the Meadows (or Hope Park) were thoroughly drained, and their



stagnant and putrid ditches filled up, cases used annually to occur in Buccleuch Street and Place, Hope Park End, part of George Square, &c. These are the situations in which the infantile remittents are most prevalent, and not those bordering on or surrounded by the irrigated meadows. Thus the inhabitants of the village of Restalrig—a village completely surrounded by the irrigated meadows, are even less obnoxious to these fevers or indeed to any fever (typhus not excepted) than those residing in the higher parts of Edinburgh. In the third place, every resident in a marshy and unhealthy situation presents a sallow sickly expression, the children are sickly-looking, and want the florid complexion typifying full health. Nothing of this was noticed in the districts most exposed to the exhalations from the irrigated meadows; the inhabitants at all ages presented the appearance of florid health, and the great ages attained by many proved that no influence hurtful to health had been exerted on them. In a few situations, however, the inhabitants on the borders of some of these irrigated meadows presented a sickly aspect, but the condition of their houses as to dampness, want of ventilation, collection of filth in the stagnant open drains immediately around them, more than accounted for this, without requiring us to impute their bad health to the assumed malaria from the distant meadow.

One conclusion, then, alone admitted of being drawn from the facts collected, and that was, that the irrigation of meadows with the sewer water from a town does not appear in this climate to engender malaria, nor act in any appreciably hurtful manner on the health of the human beings inhabiting their neighbourhood.

It was of no small importance in the present day that this conclusion should be founded on solid facts, seeing that it has been proposed to apply the whole sewer water of towns for the purposes of irrigation. Edinburgh being one of those few towns which have extensive irrigated meadows in its vicinity, it was extremely desirable that it should be ascertained beyond the reach of dispute, whether the emanations from these meadows acted prejudicially on the health of the inhabitants. If so, the fact could not be too soon or too extensively made known, in order to prevent other towns suffering also; but if not, it was equally important that the fact should be made public, that other towns may, by the sale of their sewage water, be put in possession of funds for carrying out sanatory improvements.

In addition to the facts above mentioned, one other may be alluded to, as sufficient of itself to prove, that in so far as the general health of the inhabitants of Edinburgh is concerned, no harm results from the presence of these irrigated meadows. If the general health of the town were deteriorated in consequence of the inhabitants breathing the assumed impure or vitiated air



arising from these meadows, we ought to find that the mean age at death of all classes was lower than in towns which were not surrounded with irrigated meadows. This, however, is not the case. The mean age at death of all the classes in Edinburgh is fully as high as, and will stand comparison with that of the same class in almost any other town; and, as it has been shown above, that London is the healthiest town in England, the mean age at death of its classes may be compared with those of Edinburgh, for the purpose of illustrating this fact. In London, the mean age at death among the operatives is 22 years; in Edinburgh, even including the paupers, &c., it is nearly 26. In London, the mean age at death of the highest class is 44 years; in Edinburgh, it is 47. These facts speak for themselves.

Gas being universally used in Edinburgh in place of candles or lamps, and introduced into almost every room of every class excepting the very lowest, it might have been expected, that, had the vitiation of the air which it causes, produced any baneful effects, it would have been manifested on the inhabitants. As no hurtful effects have been traced to this cause, and as it has been shown above that children, who are most easily affected by impure air, are subject to a less mortality in Edinburgh than in other towns, it may safely be concluded that the general introduction of gas to the apartments of the houses in Edinburgh does not tend to increase the mortality.

It only remains to notice in a few words the *eligibility of Edinburgh as a place of residence, and as a place for the education of children*. The above tables satisfactorily prove two essential facts; *first*, that Edinburgh is a very healthy city; and, *secondly*, that the whole excess of mortality is confined to the lowest of the population. If visitants, therefore, consult their health, they will find very few towns, indeed, which can compare with Edinburgh as a place of residence. Situate in the midst of a romantic neighbourhood, having within a few minutes' walk hills, from which the noblest views may be obtained, being within a very moderate distance from the finest sea-shore for bathing, and with shaded or open, public or retired walks, which lead to every point of interest in its neighbourhood, Edinburgh possesses advantages scarcely surpassed by any other city in the empire. When to these are added the cheapness of provisions and fuel, the abundant daily supply of fresh fish, vegetables, and fruits, the moderate rent of the large, airy, and substantial houses, and the superior literary and scientific society which may be enjoyed, some idea may be formed of the eligibility of Edinburgh as a place of residence.

*The eligibility of Edinburgh as a place for the education of children* may be summed up in a few words. To parents resid-



ing in the country, at a distance from proper schools, Edinburgh holds out inducements scarcely to be met with elsewhere. The first question which every parent naturally asks is, "Is the place which I have selected for my child's education a healthy one?" If he fixes on Edinburgh he has the satisfaction of knowing that scarcely any town in Great Britain can vie with it in this respect; for while London, the healthiest of the English large towns, loses annually 1 out of every 26 children under 15 years of age, Edinburgh is so much more healthy for children that it loses only 1 out of every 30 annually. By choosing Edinburgh, therefore, he knows that he is sending his child to a place where it will run less risk of being cut off in early age, than in almost any other locality in Britain, and where opportunities of education are ample and varied.

Having settled the matter of healthiness, the next inquiry which the parent naturally makes is relative to the advantages possessed by Edinburgh in an educational point of view; and in this respect also the northern metropolis possesses peculiar advantages. In no city of the British empire, we believe, has the theory of education been more deeply studied, or the practical details of it more efficiently carried into operation; indeed education may be said to be the staple commodity of Edinburgh, on which no inconsiderable portion of the inhabitants depend for their support; and, if such an expression were allowable, the city might be designated as a "great manufactory of cultivated mind." The mercantile principle, so far as it can be applied to the cultivation of the youthful intellect, has thus been brought into active operation, and the extensive field presented by a population of 140,000 inhabitants, has continued to invite from other quarters a succession of the most accomplished and successful labourers. The practical educationists of Edinburgh, either for professional attainments or artistic skill, may safely bear a comparison with those of any other city in Europe.

The fame of Edinburgh as a place of education is not of modern date. As the capital of an independent kingdom, and the resort of the native nobility and gentry, it acquired this character at an early period; and the establishment of the University and the High School by James VI. is a memorable proof of the interest then felt by the citizens even in the higher departments of knowledge. The same feeling has continued to influence them in all subsequent time, and accordingly the means of education have been professionally extended in compliance with the increasing demands of the community. In addition to the support afforded by the Magistrates and Town Council of the City, the spirit of enterprise has always been active. The most improved methods of instruction have been promptly introduced, and the most ample



encouragement has been given by the inhabitants to every real improvement.

The educational establishments comprise those for all stages from infancy to manhood, from the infant school to the university. For the information of strangers it is perhaps necessary to state, that all the Edinburgh schools, properly so called, are DAY-SCHOOLS, which are open for a certain number of hours daily—generally from 9 A. M. till 3 P. M. The majority of the pupils reside with their parents or friends; those from a distance are accommodated in boarding houses. Besides many private or adventure schools for the education of the children of the higher classes, may be mentioned the Circus Place School, a private seminary for elementary instruction, attended by upwards of three hundred children of both sexes, from 6 to 13 years of age, and there are other establishments of the same nature in different quarters of the city.

In addition to numerous boarding establishments for the education of young ladies, Edinburgh is perhaps singular in presenting three Institutions exclusively devoted to this object. These may be more properly denominated ladies' gymnasia, or colleges, inasmuch as they are intended to continue or supplement the education which has been obtained elsewhere. The course of instruction embraces everything which goes to form a finished education, including music, drawing, modern languages (French, Italian, German), with lectures on ancient and modern history and literature, chemistry, natural philosophy, geology, botany, and other branches of natural history.

The establishments for the education of boys are numerous and varied, suited to every profession, class, and rank of society. The most important of these are the High School and the Edinburgh Academy; the former on the east, the latter on the north side of the city. The internal arrangements of both, though differing somewhat in detail, are on the whole nearly similar. They are presided over by a rector, assisted by four masters for classics, with separate masters for writing, mathematics, French, German, and gymnastics. In the Edinburgh Academy there is a separate master for the English language and literature. The boys are formed into classes yearly on the 1st October, successively under each of the masters, by whom their classical education is conducted for four years, till they are qualified for entering the higher or rector's class. From the commencement of the fifth year the pupils of the High School are under the charge of the rector alone, who thus continues in one class at least two sets of pupils at different stages of advancement. In the Edinburgh Academy the rector's pupils are divided into three classes, in each of which he has the advantage of the assistance of the master by whom the



class was reared. The High School is under the direction and patronage of the Town Council of the City ; the Edinburgh Academy under the management of fifteen directors, selected from a numerous body of subscribers, which includes in its number many of the citizens most distinguished for their rank, talents, and literary attainments. Besides these seminaries whose prominence has entitled them to particular notice, there are schools for more general and commercial education, well deserving of support ; and also many private boarding establishments both in the city and suburbs. Among other educational establishments it is perhaps necessary to mention especially the Scottish Naval and Military Academy, an institution which has been in operation for many years for the education of the future defenders of our country, and which has been conducted with great judgment and effect.

It now only remains to mention the University, an institution which for the last 150 years at least has maintained an important position among the learned seminaries of Europe, and in the sciences, both of matter and of mind, has contributed not a little to extend the boundaries of human knowledge. To a list of names in all departments of science which few other establishments of the same nature in Europe can equal, and none can surpass, it offers to the student perfect liberty of choice in all the departments of human knowledge, without the necessity of conforming to any particular creed, or adopting any peculiar dress. The appointments to the chairs in the university are chiefly in the hands of the Magistrates and Town-Council of the City ; and, to use the words of one of its principal ornaments, Principal Robertson, in a speech made at laying the foundation-stone of the present buildings,—“ With what integrity and discernment persons have been chosen to preside in each of these departments, the characters of my learned colleagues afford the most satisfying evidence. From confidence in their abilities, and assiduity in discharging the duties of their respective offices, the University of Edinburgh has become a seat of education not only to youth in every part of the British dominions, but, to the honour of our country, students have been attracted to it from almost every nation in Europe, and every state of America.”

21, *Heriot Row.*



