1883.

BOROUGH OF CARDIFF.

REPORT

ON THE

Sanitary Condition of Cardiff,

FOR THE YEAR 1882,

BY

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TO THE

CARDIFF URBAN SANITARY AUTHORITY.

Cardiff, March, 1883.

GENTLEMEN,

I beg to bring before your notice my report on the Sanitary condition of your District during the past year.

In consequence of my attention having been called to the prevalence of Zymotic Diseases, and the desire expressed by Dr. Ballard, Medical Inspector of the Local Government Board, that I should make a searching inquiry into the several causes exercising a direct or collateral influence thereon; I propose, in this Report, to enter into details respecting these matters. The ever varying character of the District, due to the unprecedented rapidity of increase of population, and consequent necessity of providing house accommodation, renders this an opportune occasion, although some of these details may have been referred to from time to time in previous reports.

The District now comprises an area of 7,374 acres, exclusive of that portion covered by water. The first special matter requiring consideration, as exercising a direct influence on the public health, is the Geological conformation of the superficial strata of the District. These strata have been formed by the varying beds of the rivers Taff and Ely; also, to some extent, by the Rumney, at the eastern boundary of the District, and by the tides of the Bristol Channel on

the South. We therefore find that on the West, South, and East a marine clay deposit occupies a considerable area. At the Basin of the East Bute Docks, and probably all along the high water mark on the South East, the clay averages a depth of 45 feet; the thickness decreasing as it recedes from the Channel inland to near Pengam farm house, that locality where Splot House farm formerly stood, and a short distance from the top of the Bute Docks, where it joins a silty gravel, or forms a thin stratum above it.

On the South West and Western portion of the District there is a very large deposit of marine clay, extending all along the boundary until it is intersected by the South Wales Railway. It occupies the whole of the surface between the rivers Ely and Rumney bounded by the Bristol Channel, as well as a small portion North of it, and forms the populous part of Canton, as far North as Sophia Gardens and Wellington Street. This clay is of a very plastic nature and is quite impervious to water.

The stratum which joins the clay along the boundary referred to, and which extends inland for some distance, following the whole line from the river Ely on the West in a Southerly direction to the Cardiff Docks, and afterwards in a South-Easterly direction to within a short distance of the Rumney River, is composed of a mixture of silt, clay, and gravel—a material as nearly impervious to water as the marine clay itself.

A large portion of the surface stratum of Canton, North of the South Wales Railway, consists of this silty gravel. The remaining portion, although much less extensive, is nevertheless capable of holding water, except here and there, where beds of porous gravel situated at the North-East of Canton, and extending backwards to Llandaff, exist. These same strata occupy a large area in the Northern portion of the District, from the Weddal, Tydraw, and Cemetery on the North-East, to Roath Castle on the South; and from Maindy on the West, to Roath Mill on the East; as well as numerous beds of smaller dimensions intersecting the more porous gravel, and the upland clayey marl stratum.

It is to the Geological conformation of this portion of the District I would especially call your attention, as it embraces the localities where the numerous new streets have been chiefly formed, and necessarily where a great portion of your population reside. The low West lands in Roath, which formerly were part of the Old Common, *e.g.*, Plasnewydd, Tyn-y-coed, &c., has this class of subsoil.

A gravel subsoil of a more open character joins the silty gravel deposit, and, like it, extends from almost one end of the District to

the other. This stratum, however, is far from being of an uniform nature, and is more or less intersected by beds of silty gravel and clayey marl. It occupies the portion lying between the silty gravel on the South, including the North portion of the old town, the North of Canton, and the South-Eastern inhabited portion of Roath, Splotlands, Adamsdown, &c.

The surface stratum in the hilly parts of the district at Penylan, as well as some smaller plots, on what was formerly the Crwys Farm, Park Place, and one extending from Plasnewydd to the Drill Hall, is composed of a clayey ferruginous marl. The latter plots named agree very nearly in composition with the clayey marl of Penarth, being calcareous in its nature.

The subsoil is usually very plastic and retentive, so that little water can percolate into the sub-strata. It will therefore be apparent that the outlying portions of the District on the South, East, and West have a subsoil so close and retentive that the only exit for water is surface drainage. Moreover, these districts are very low, much of the clay lands being under (tidal) high water level, while those on the silty gravel are but a few feet higher.

The foggy vapours which overhang these low levels in the winter, in addition to the miasmatic and damp atmosphere, generated by the continual evaporation of water from the surface, exercise an important influence, not only directly on those diseases usually referred to, but also collaterally upon those groups headed Constitutional, *e.g.*, Phthisis, Tuberculosis, &c.

METEOROLOGY.

Annexed in tabulated forms are recorded the Meteorological observations for each month made during the year 1882. From these it will be seen that the year throughout was marked by an extraordinary prevalence of moisture. Thus out of 365 days there were 226 on which a measurable amount of rain (·01 inch) fell in the 24 hours. These did not include other days when there was a lesser amount of rain. It may also be observed that the season was generally very unsettled, with strong gales at frequent intervals.

The temperature of the air, as compared with the preceding 41 years, was much above the average of each month, until the beginning of June, then it fell below, continuing low until October, when the temperature again rose high, and continued so until the end of the year. It is remarkable that the thermometer registered a temperature at or below 32° only on 18 days.

METEOROLOGY.

MONTH.	BAROMETER.			THERMOMETER.						HYGROMETERS.		DEATH RATE PER 1000 INHABITANTS.	
	Highest.	Lowest.	Mean of Month.	Maximum.	Minimum.	Mean of Max.	Mean of Min.	Mean of Month.	No. of days at or below 32 deg.	Mean of Dry Bulb.	Mean of Wet Bulb.	All Causes.	Seven Chief Zymotic Diseases
January	18th...30·903 in.	3rd...29·273 in.	30·295 in.	6th, 52°·0	22nd, 29·0	45·8	38·5	42·1	4	41·6	40·6	22·6	3·3
February... ...	20th...30·814 „	26th...28·981 „	30·194 „	21st, 57°·0	4th, 30·5	48·2	39·1	43·6	2	42·1	41·1	18·3	2 0
March	16th...30·612 „	1st...29·020 „	30·005 „	15th, 56·9	22nd, 31·5	52·7	40·0	46·3	2	45·7	43·6	21·4	2·6
April	8th...30·286 „	28th ..29·137 „	29·736 „	8th, 61·5	20th, 31·3	55·7	41·8	48·7	1	48·	46·	17·3	2·3
May	17th...30·411 „	25th ..29·343 „	29·990 „	31st, 69·1	15th, 39·5	62·	43·	52·5	...	54·	50·5	16·8	1·8
June	17th...30·510 „	9th...29·469 „	29·891 „	30th, 72·4	17th, 41·3	63·	49 4	56·2	...	56·9	53·9	13·1	·8
July	27th...30·375 „	7th...29·290 „	29·802 „	29th, 74°·	27th, 46·9	66·5	53·7	60·1	...	64·6	56·9	18·3	3·5
August	4th.. 30·282 „	29th...29·347 „	29·896 „	12th, 76·3	28th, 46·7	66·8	53·6	60·2	...	68·	57·2	20·1	6·4
September ...	7th...30·347 „	27th...29·248 „	29·837 „	1st, 66·1	13th, 37·2	61·1	47·6	54·3	...	55·6	52·3	19·4	3·0
October	5th...30·475 „	24th...29·117 „	29·987 „	1st, 64·4	26th, 33·2	55·4	45·2	50·3	...	49·8	48·5	22·6	3·0
November ...	30th ..30·118 „	9th...29·260 „	29·716 „	5th, 59·8	18th, 28·1	49·1	39·2	44·1	2	43·2	41·5	22·1	4·1
December ...	20th...30·246 „	4th...29·123 „	29·618 „	31st, 53·7	11th, 20·2	43·8	36·8	40·3	7	39·9	39·2	23·8	4·0

The rainfall of the year 1882, as observed by Mr. W. Adams, C.E. F.G.S., at his residence, Cambridge House, Park Place, Cardiff, is shown by the subjoined table :—

Latitude, N., 51 deg., 9 min., 10 sec.
Longitude, W., 3 deg., 9 min., 55 sec.
Diameter of Receiver of Gauge, 5 inches.
Height above ground, 1 foot.
Height above sea-level, 43 feet.

Month.	Total Depth.	Greatest fall in 24 hours.	Date.	Days on which ·01 inch or more fell.
January	3·19	0·82	2nd	13
February	2 56	0·60	28th	15
March	2·26	0·32	1st	19
April	5·68	0·60	12th	20
May	2·72	0·59	22nd	13
June...	4·28	0·82	5th	20
July	5·77	0·84	6th	24
August	6·75	1.14	22nd	16
September ...	3·94	0·79	28th	17
October	8·33	1·64	23rd	23
November ..	6·26	0·90	7th	21
December ...	4·86	0·73	31st	25
	56·60			226

The following table illustrates the rainfall for the year 1882, and six previous years :—

Month.	1876	1877	1878	1879	1880	1881	1882
	Inches	Inches	Inches	Inches	Inches	Inches	Inches
January ...	1·91	5·77	1·73	4·71	·87	·92	3·19
February ...	5·33	2·79	3 07	5·95	3·88	4·81	2·56
March ...	3·92	2·66	1·25	1·14	1·90	3·88	2·26
April ...	2·70	2·90	4·10	2·64	1·98	1·44	5·68
May ...	0·23	2·47	4·32	2·85	1·45	2·62	2·72
June ...	1·91	1·48	3·68	6·48	2·38	3·59	4·28
July ...	1·24	4·94	2·01	4·00	6·64	2·62	5·77
August ...	6·06	5·70	10·82	8·12	·77	6·94	6·75
September .	7·08	3·25	3·21	4·85	3·67	2·09	3·94
October ...	3·84	4·89	5·76	1·51	4·94	3·23	8·33
November...	5·27	6·54	3·06	0·43	3·67	4·98	6·26
December ...	7·13	3·40	2·70	2·11	6·70	4·50	4·86
	46·62	46·79	45·71	44·79	38·85	41·62	56·60

The following is a monthly summary :—

JANUARY was exceedingly mild and damp, and the prevalent winds were E.S.E. The temperature of the air was much above the average, the thermometer reaching its highest point on the 6th, when it registered 52° in the shade, and its lowest 29° on the 22nd. The mean of the month was 42·1°, and there were only four days when the temperature was at or below 32°. The barometer was very unsteady ; its highest reading was 30·903 in. on the 18th, its lowest 29·273 in. on the 3rd, showing a range between the highest and lowest points of 1·630 in. The mean of the month was 30·295 in. The mean of hygrometric dry bulb was 41·6, of wet bulb 40·6. The total depth of rainfall was 3·19 in., extending over a period of 13 days.

FEBRUARY was a wet month, with prevailing winds more or less Westerly. The highest temperature was 57° on the 21st, the lowest 30·5° on the 4th, the mean of the month being 43·6°. There were only two days when the temperature was at or below 32°. The barometer was again unsteady ; its highest reading was 30·814 in. on the 20th, and its lowest 28·981 in., giving a range of 1·833 in., whilst the mean barometric reading of the month was 30·194 in. The mean of hygrometric dry bulb was 42·1, of wet bulb 41·1. The total rainfall was 2·56 in., falling on 15 days.

MARCH was remarkably mild and genial. N.W. winds prevailed throughout the whole of the month. The maximum temperature was 56·9° on the 15th, the minimum 31·5° on the 22nd, the mean of the month being 46·3°. There were two days when the temperature was at or below 32°. The barometer oscillated very much, its highest reading being 30·612 in. on the 16th, and its lowest 29·020 in. on the 1st, showing a range of 1·592 in., whilst the mean of the month was 30·005 in. The mean of hygrometric dry bulb readings was 45·7, of wet bulb 43·6. The total rainfall was 2·56 in., extending over 19 days. The following is the monthly mean temperature of the Quarter recorded at Cardiff as compared with that at Greenwich :—

MONTH.	CARDIFF.	GREENWICH.
January	42·1°	40·4°
February	43·6°	41·8°
March	46·3°	46·0°
Mean of Quarter ...	43·0°	42·7°

From these figures it will be seen that the mean temperature of January and February in Cardiff was much in excess of Greenwich.

April was mild and wet, with a preponderance of S.E. winds. The maximum temperature was 61·5° on the 8th. The minimum 31·3° on the 20th; the mean of the month being 48·7°. On one day only the temperature was at or below 32°. The barometer was low and changeable; the highest reading was 30·286in. on the 8th, the lowest reading 29·137in. on the 28th. The range was 1·149in., and the mean of the month 29·736in. The mean of hygrometric dry bulb was 48·0; of wet bulb 46·0. The total rainfall was 5·68in., extending over 20 days.

May was wet and dry alternately, with the exception, however, of one interval of 10 days when no rain fell. The winds were chiefly from the South. The maximum temperature, 69·1°, occurred on the 31st; the minimum, 39·5°, on the 15th; the mean of the month being 52·5°. The barometer continued unsteady, its highest reading, 30·411in., on the 17th, its lowest, 29·343in., on the 25th. The range was 1·068in., and the mean of the month 29·990in. The mean of hygrometric dry bulb was 54·0; of wet bulb 50·5. The total rainfall measured 2·72in., extending over 13 days.

June was exceedingly cold and wet for the season, with a preponderance of S.W. winds, which at times attained a force approaching a gale. The maximum temperature was 72·4°, on the 30th; the minimum 41·3°, on the 17th; whilst the mean of the month was 56·2°. The barometer was again unsteady; its highest reading was 30·510 in., on the 17th; its lowest 29·469in., on the 9th. The range was 1·041in., and the mean of the monthly readings was 29·891in. The mean of hygrometric dry bulb was 56·9; of wet bulb 53·9. The total rainfall was 4·28in., extending over 20 days.

The following is the monthly mean temperature of the Quarter recorded at Cardiff, compared with Greenwich :—

MONTH.	CARDIFF.	GREENWICH.
April	48·7°	47·9°
May	52·5°	54·5°
June.....	56·2°	56·5°
Mean of Quarter ...	52·3°	53 0°

The temperature in Cardiff during the months of May and June was below that of Greenwich.

JULY was cold and wet; S.W. winds prevailed at times with great force. The maximum temperature was 74° on the 29th; the minimum 46·9° on the 27th; the mean of the mouth 60·1°. The barometer was low and continued unsteady; the highest reading, 30·375in., ou the 27th; the lowest, 29·290in., on the 7th; giving a range of 1·085in. The mean of the month was 29·802in. Of hygrometric dry bulb readings the mean was 64·6; of wet bulb 56·9. The total rainfall was 5·77in., and there were 24 wet days.

AUGUST was fine and dry in the earlier part of the month, with strong N.W. winds, approaching a gale at times. The maximum temperature, 76·3°, on the 12th; the minimum, 46·7°, on the 28th; the mean of the month being 60·2°. The barometer was low and unsteady, its highest reading, 30·282in., was on the 4th; lowest, 29·347in., on the 29th; the range 1·135in., and the meau of the month 29·896in. The mean of hygrometric dry bulb 68·0; of wet bulb 57·2. The total rainfall was 6·75in., extending over 16 days.

SEPTEMBER was warm during the first few days, and afterwards cold with much rain, N. winds predominating. The maximum temperature was 66·1° on the 1st, the minimum 37·2° on the 13th, and the mean of the month 54·3°. The barometer was low, with frequent oscillations; its highest reading was 30·347 in. on the 7th, the lowest 29·248 in. on the 27th. The range was 1·099 in., and the mean of the month 29·837 in. The mean of the hygrometric dry bulb readings was 55·6, of wet bulb 52·3. The total rainfall measured 3·94 in., falling on 17 days. The following is the monthly mean temperature of the Quarter recorded at Cardiff, as compared with Greenwich:—

MONTH.	CARDIFF.	GREENWICH.
July	60·1°	60·4°
August	60·2°	59·6°
September	54·3°	54·3°
Mean of Quarter ...	58·2°	58·1°

The mean temperature of the Quarter was below the average of many years.

OCTOBER was warm in the early part of the month, but became cold afterwards, with N.E. winds and frequent gales. The maximum temperature was 64·4° on the 1st, the minimum 33·2° on the 26th, the mean of the month being 50·3°. The atmospheric pressure was above the average the first few days, but in the middle and latter end of the month this decreased. The highest barometric reading was 30·475 in. on the 5th, the lowest 29·117 in. on the 24th, the range 1·358 in., and the mean of the month 29·987 in. The mean of hygrometric dry bulb was 49·8, of wet bulb 48·5. The rainfall was excessive, being 8·33 in., extending over 23 days.

NOVEMBER was unusually mild and wet. N.W. winds extensively prevailed, and frequent heavy gales. The maximum temperature was 59·8° on the 5th, the minimum 28·1° on the 18th, the mean of the month being 44·1°. There were two days when the temperature was at or below 32°. The barometer was low, and oscillated considerably; its highest reading was 30·118 in. on the 30th, the lowest 29·260 in. on the 9th, the range being ·858 in., and the mean of the month 29·716 in. The mean of hygrometric dry bulb was 43·2, of wet bulb 41·5. The total rainfall was 6·26 in., extending over 21 days.

DECEMBER was very wet and foggy, with violent winds blowing in ever varying directions. The maximum temperature was 53·7° on the 31st, the minimum 20·2° on the 11th, the mean of the month being 40·3°, and there were seven days when the temperature was at or below 32°. The barometer was again low and unsteady; its highest reading was 30·246in. on the 20th; lowest 29·123in.; the range 1·123in.; the mean of the month 29·618in. The mean of hygrometric dry bulb 39·9; of wet bulb 39·2. The total rainfall was 4·86in., extending over 25 days.

The following is the monthly mean temperature of the Quarter recorded at Cardiff as compared with Greenwich :—

MONTH.	CARDIFF.	GREENWICH.
October	50·3°	50·8°
November	44·1°	43·5°
December	40·3°	40·1°
Mean of Quarter ...	44·9°	44·8°

THE DRAINAGE.

Closely associated with the Geology and natural configuration of this District in its relationship to public health is its system of drainage. Since I last directed your attention to this subject several portions of the system have been reconstructed, and others added. It is therefore desirable I should again describe it as a whole; from the circumstance that in the early part of the present year I was requested to enquire into and report upon the prevalence of autumnal diarrhœa, with a view to ascertain the specific conditions under which it existed abnormally in any locality, together with the excitant or predisposing causes. In carrying out these instructions my attention was frequently called to the presence in various places of noxious sewer exhalations, and in these localities excessive mortality prevailed. The subject was still more interesting from the fact that many of the remarks I have to make on the diarrhœal epidemic apply with equal force to other infectious diseases. In describing your system of drainage I shall confine myself as far as practicable to the main trunks, alluding to lateral branches relieving adjacent streets only where absolutely necessary for the purposes of this Report.

CARDIFF SEWERAGE.

Central Sub-District.

The Sewerage of this sub-district commences at an outfall on the East Moors, near the Tharsis Copper Works, with a Sewer 10 feet in diameter, having an inclination of 1 in 1,320, extending to near the east end of Tyndall Street, where it reduces in size, first to eight feet in diameter, and afterwards to six feet. At the east end of Tyndall Street, close to the Rhymney Railway Bridge, *Sewer No.* 1 branches off in a northerly direction, under the Great Western Railway, through Davis Street to Fitzalan Place, at which point it is crossed by the new Sewer which now intercepts it. Sewer No. 1, in size, is 4ft. by 2ft. 9in., with an inclination of 1 in 620.

Sewer No. 2 passes through Tyndall Street, Herbert Street, Bute Street, Custom House Street, under the Glamorganshire Canal, through St. Mary Street, High Street, and Angel Street. This Sewer from its commencement has a gradient varying from 1 in 1,320 to 1 in 528, and also varies in size from 4ft. by 2ft. 9in. at its commencement to 3ft. by 2ft. at its termination.

Sewer No. 3, with a size of 3ft. by 2ft., runs from Davis Street, through Victoria Street, Adam Street, Bute Terrace, David Street, and Charles Street, joining the main Sewer in Crockherbtown, with a gradient varying from 1 in 1,133 to 1 in 700.

Sewer No. 4 commences by a junction with Sewer No. 2 in Bute Street, at the end of Herbert Street, and proceeds through a portion of Wharf Street to opposite the end of Hope Street, where it turns Southwards through the back lane, and under the Junction Canal in front of St. Mary's Church; through Gladstone Street, Bute Lane, Mount Stuart Square, Evelyn Street, Dudley Street, and Eleanor Street, down to Penarth Terrace. This sewer varies in size from 3ft. 9in. by 2ft. 6in. to 3ft. by 2ft., and is laid at an inclination of from 1 in 1,500 to 1 in 1,100. A portion of Bute Town, between Adelaide Street, James Street, West Bute Street, as far as Loudoun Square on the North, and Stuart Street on the South, is drained by a separate outfall system near the Packet Harbour. Originally the only outlet of this portion of the sewers was by a 2ft. iron pipe from the old stone sewer in Stuart Street leading to the foot of the Packet Slip, which is joined about half way down the slope by a 12-inch pipe from the Bute Street drain. In 1879-80 a new outfall from this portion of the sewers was constructed, 3ft. 3in. in diameter, leading from Stuart Street, at the end of George Street, into the gut to Mr. Gunn's Dry Dock. The main sewer of this portion of the District is that in Bute Street, varying in size from 4ft. by 3ft. 6in. to 3ft. 3in. by 2ft. at its apex opposite Loudoun Square. At Patrick Street this sewer is now connected to the main trunk running through Bute Lane, &c., and by an arrangement of sluices a portion of the sewage in the Bute Lane Sewer can in times of flood be sent through the Patrick Street Sewer to Bute Street, and the new outfall at Stuart Street.

The northern portion of the district is now drained by *Sewer No.* 5 in the following manner. Commencing at the 10ft. main outfall near the Bute Gas Works, the new intercepting sewer constructed in 1879-80 extends to Sanquhar Street, through Gwendoline Street, under the Great Western Railway, through Cycle Street, a portion of Constellation Street, Moira Place, and Fitzalan Road, to the end of Fitzalan Place; thence on through the remaining portion of Fitzalan Road and Gaol Lane to Newport Road, near the Rhymney Railway Bridge, where it enters the sewer from Crockherbtown, Queen's Street, and Duke Street, and joins *Sewer No.* 2 at the end of Angel Street. These sewers vary in size from 4ft. 6in. diameter to 3ft. by 2ft., and are laid at inclinations varying from 1 in 1,377 to 1 in 320. A branch from this line of sewers, 3ft. 3in. in diameter, is laid from Moira Terrace into Adam Street, and joins *Sewer No.* 3 at

the corner of Victoria Street, and which in times of flood overflows into this branch, and through to *Sewer No.* 5.

Sewer No. 6 commences by a junction with *Sewer No.* 5 in Fitzalan Road, and extends in a Northerly direction through Fitzalan Place, West Grove, Gordon Road, under the Rhymney Railway through Upper George Street, Cathays Terrace, and Crwys Road, to the end of Allen's Bank Road, near the Barracks. This sewer varies in size from 3ft. 9in. by 2ft. 6in. to 3ft. by 2ft., and is laid at gradients varying from 1 in 1,156 to 1 in 66.

Sewer No. 7, the size of which is 3ft. 3in. by 2ft., extends from *Sewer No.* 5, in Crockherbtown, through Windsor Place, Park Lane, Cathays Road, and North Road, Blackweir, and is laid at inclinations varying from 1 in 675 to 1 in 127.

The Sewers in this district are flushed in the following manner :— The whole of the Main Sewers in Bute Town are flushed by an arrangement at Penarth Terrace, where, at times of extraordinary high tides, the sea water can be used in volumes for flushing the whole of the Sewer No. 4, and also the Sewers in Stuart Street, James Street, and George Street. Secondly, from the Reservoir in Loudoun Square, supplied with water from the water mains, which is utilised as often as may be necessary for flushing any of the Sewers situate within the part bounded by Canal Parade, Loudoun Square, Bute Street, and North Church Street; also the Sewer in Bute Street, back to Stuart Street. Hannah Street Sewer is flushed by water from Mr. Hodge's Docks; there is also a 9in. pipe from Mr. Tamplin's Dock, running through the south side of Loudoun Square to the Sewer in Bute Lane. Most of the Sewers within the area bounded by Tyndall Street, Herbert Street, Bute Street, Custom House Street, the Road to the Great Western Railway Station, Havelock Street, Westgate Street, Angel Street, Duke Street, Queen Street, Crockherbtown, Newport Road, Fitzalan Place, Fitzalan Road, Moira Place, Constellation Street, Cycle Street, and Gwendoline Street are flushed with water supplied by a culvert from Cardiff Castle Moat, and by a sluice in the Canal Tunnel, passing under Crockherbtown; water can, if necessary, also be obtained for flushing purposes from the Canal. The water obtained from these sources can be turned through any of the principal, and most of the lateral Sewers within this area.

The Sewer from Blackweir to Crockherbtown is flushed by a stream of water running from the Taff Vale Railway and entering the Sewer opposite the Old Militia Barracks. The new Sewers on

Lord Bute's land, between Miskin Street, Salisbury Road, and Senghenydd Road, are flushed from a flushing tank at the Northern end of Senghenydd Road, which is also supplied with water from the water mains.

All other Sewers in this district are flushed by means of a hose pipe and water from the water main.

The Eastern Sub-District.

The Sewerage of this district commences at the outfall Reservoir on the Splott Moors by *Sewer No.* 1, 3ft. 6in. in diameter, extending Northwards across the Moors, through Adeline Street, under the Great Western Railway, through Clifton Street (where it reduces to 3ft. by 2ft.), Clive Street, Milton Street, to Clive Place at the flushing tank.

Sewer No. 2 commences at Clifton Street by a junction with Main Sewer No. 1, and extends through Pearl Street to Green Gardens.

Sewer No. 3 commences by a junction with Main Sewer No. 1 in Clifton Street, and extends Eastwards through the length of Broadway into the Main Trunk Sewers, which have as good gradients as the difficulties of the natural configuration of the district will admit. The lateral Sewers from adjacent streets discharge themselves into No. 3. Main Sewer No. 1 in this portion of the district is flushed from a flushing tank in Milton Street, which in wet weather is supplied with water by a pipe drain laid through the grounds of Roath Castle to the stream at Castle Road, near the end of Merthyr Road. In dry weather, when this stream does not yield a sufficient supply for the purposes, then the tank can be filled with water from the water mains. All the other Sewers in this portion of the district are flushed by means of a hose pipe with water direct from the water mains.

The western portion of the District, North of the Great Western Railway, and situate between Castle Road on the West, and Cycle Street, System Street, Orbit Street, Longcross Place, Wordsworth Street, and Clive Place, on the East, is drained into the Sewers of the central district running through Constellation Street, Meteor Street, Glossop Road and Castle Road.

The Sewers of Clive Street, Milton Street, Shakespeare Street, Vere Street, and Oxford Street are flushed from the tank in Milton Street, as well as those of System Street, Planet Street, Comet Street, and Eclipse Street. The Sewers in the latter three streets have

recently been reconstructed, and discharge into the Sewer in Meteor Street. These Sewers are sufficiently large to admit of personal inspection, and are flushed from a tank at the Northern end of System Street, which is supplied with water from the water mains. The remaining Sewers in this neighbourhood are flushed by means of a hose pipe with water direct from the water mains.

The Western Sub-District.

This district, a large portion of which was, previous to the amalgamation of Canton district with Cardiff, without a proper system of drainage, is now Sewered in a most efficient manner. The Main Trunk Sewers may be described as follows. The original outfall Sewer, constructed by the Trustees of Lord Windsor, commences near the mouth of the river Taff, and extends in a North-Westerly direction through Amherst-street and Knole Street to Bromsgrove Street. At this point Main Trunk Sewer No. 1 commences. This Sewer, which is 4 feet in diameter, extends in a Northerly direction across the Moors, passing in its course under the Penarth Road and the Great Western Railway, to Tudor Street, and has a gradient of 1 in 1,700.

Sewer No. 2 commences by a junction with Sewer No. 1 in Tudor Street, and is 4 feet in diameter, and extends in a Northerly direction across the Moors, parallel to the Great Western Railway, until it reaches the boundary of Canton Common, then across the Common into Leckwith Road, opposite the end of Wellington Street, and through Leckwith Road to the Canton Cross, its inclination being 1 in 1,500.

Sewer No. 3, which is a continuation of Sewer No. 2, is 3ft. 9in. by 2ft. 6in., and extends in a Westerly direction along Ely Road to opposite the Clive Arms, and is laid at an inclination of 1 in 1,300.

Sewer No. 4 is a continuation of Sewer No. 1, and extends from Tudor Street through Clare Street, Neville Street, and Cowbridge Road, to the end of Wyndham Crescent. This Sewer, which is 4 feet in diameter, has gradients varying from 1 in 1,700 to 1 in 1,900.

Sewer No. 5, which commences at the end of Sewer No. 4, is 3ft. 3in. by 2ft., and extends through Wyndham Crescent, Romilly Crescent, Conway Road, and Mortimer Road, to the end of Cathedral Road, and is laid at gradients varying from 1 in 450 to 1 in 200.

Sewer No. 6 commences by a junction with Sewer No. 2, and extends through Edward Street, a portion of Cowbridge Road, and the lower portion of Severn Road; this Sewer is 3ft. 3in. by 2ft. in size, and is laid at gradients varying from 1 in 730 to 1 in 243. All the lateral Sewers are laid at sharp gradients and discharge into these Main Trunk Sewers.

In this district the only special means of flushing which have been provided are three inlets from the River Taff to blank ends of Sewers, two in Fitzaman embankment and one in Mark Street. There is, however, at all times sufficient sub-soil water entering the Sewers in this district to keep them thoroughly flushed, except at some of the blank ends, which are flushed by means of a hose pipe with water direct from the water mains.

The efficiency of the complete system of sewerage for sanitary purposes depends upon the extent and regularity of the flushing. Practically, those means which I have described in this report can only be considered as supplementary to the natural or storm water in consequence of the present public water supply being insufficient in quantity at the times when it is most needed to afford anything like ample volume for flushing purposes. It stands to reason that during the dry summer months, when storm water is at its minimum and at times entirely wanting, a much larger quantity of flushing water is required, whilst it so happens at this period that the public water supply is straitened to meet household and general municipal purposes. I have made further remarks upon this point under the head of Water Supply.

HOUSE DRAINAGE.

The fact that the majority of the Main Sewers of Cardiff are laid down in the streets longitudinally with the fronts of the houses (except in the case of detached houses) necessitates that the house drains proceed from the Sewer in the street under the floors of the houses to the back, where they branch off in various directions to the different water closets, sinks, &c., they connect, and it is therefore of the greatest importance that that portion of the drain especially lying under the house floor should be laid with the greatest possible care, so as to make it perfectly air-tight as well as water-tight. Formerly no extra precaution was taken in the construction of this portion of the drain, but stringent regulations are now in force that every drain so laid under the floor of any house shall be bedded and surrounded

in concrete. It is a question, however, whether puddling would not be better. This is intended as an additional precaution against the escape of Sewer gases from badly constructed drains under house floors. Where any house erected has a front garden, it is required that under this garden a ventilating syphon shall be connected with the drain, by which means the passage of sewer gas from the main drain to any part of the house is intercepted, and where a w.c. is constructed inside any house it is also required that the soil pipe immediately beneath the w.c. syphon shall be ventilated by a 4in. pipe carried above the roof of the house. Thus the shaft at the ventilating syphon acts as an inlet to the drain for fresh air, and the long ventilating pipe from the w.c. drain, fitted at the top with a ventilating cowl, acts as an outlet,—there is therefore a constant current of fresh air passing through all portions of the drains underneath or about the house.

Many of the older houses in the Borough have baths, scullery sinks, lavatories, &c., directly connected with the house drains, but in new houses this is not permitted ; every such bath, lavatory, or scullery sink must be constructed in such a manner as to discharge itself into the open air on to a trapped grid before entering the drain.

The stench trap, which for many years was almost without exception the only kind of trap used in house drains in Cardiff, is, to say the least of it, a very dangerous one. I refer to that known as the D trap (being made of cast iron in the form of a letter D). When in thorough working order, the amount of water seal is so small, being only about one-eighth of an inch, that at times, when the sewers are working under the slightest pressure, it is not sufficient to keep back the sewer gases. The one I have now before me (and in all probability thousands have been made from the same pattern) has a clear space of one-tenth of an inch between what would be the water level of the trap when in operation, and the dipper, which should be below the water level. This is almost useless, for while it has the semblance of a trap, there is actually no trap at all, there being a clear space for the constant escape of sewer gas.

There are other objections to this kind of trap. Taking a 4in., which is mostly used, and which has only about sufficient space for four fingers of an ordinary sized hand to pass through tho discharge, it is very readily choked. The top of the trap on all sides has a flange about $\frac{1}{2}$ an inch wide, which is to let into a rebate in the sink stone and cemented down, this being the only means of holding it in position.

When the grid becomes partially filled with sediment, the water cannot run off, in which case the first operation of the wife of the tenant, or servant girl, as the case may be, is to clean out the trap with the hand, when, almost invariably, the dipper of the grid is laid hold of, the grid wrested from position and thrown aside, and the water and filth on the surface immediately disappears down the drain with a rush. The trap, however, being removed, the sewer gas pours out in volume, and in any place where fever occurs, or where complaints are made of bad smells arising from the drains, the stench traps are almost invariably found to be out of order. The traps not unfrequently are found yards away, and have often disappeared altogether. When traps are thus removed from position, it is easy to imagine, since the drains are open to the atmosphere, that a constant current of sewer gas is being evolved into the houses, giving rise, as it often does, to serious injury to health.

The trap which has to be used now in all cases of new drains is far more effective, and is known as the Stoneware Syphon Trap. This can be recommended for its simplicity and economy in construction, and its cleanliness and freedom from liability to get out of order in working.

Though not by any means a modern invention, this kind of trap appears to have been totally unknown to the majority of Cardiff builders until its use was insisted upon, and great difficulty has been experienced in prevailing upon the builders of the town to adopt it. Where these traps are used, however, especially in combination with the ventilating pipe and ventilating syphon before described, it will undoubtedly conduce to a healthier atmosphere around and about our dwellings.

WATER SUPPLY.

The quality of the water drawn from shallow wells—a few of which still exist in the Borough—is constantly receiving attention, and as soon as the condition of the water is such as to lead me to conclude that injury to health may result to persons drinking it, I submit the analyses to your Board, and ask for power to get the wells closed permanently. In consequence of such application, ten wells were closed by magisterial order during the year. No instance has come to my knowledge which revealed any new deleterious ingredients in the waters submitted for analysis, hence I refrain from making any comments, further than to state that there was undeniable contamination from sewage sources, although oxidation of the organic constituents had taken place to a considerable degree. The ingredients present in all the waters condemned as unfit for use

showed, conclusively, that much soakage from drains, &c., found its way into the wells, thus rendering the use of the water dangerous to the health of persons drinking it.

Public Water Supply.

In my last Report reference was made to the various sources under consideration by your Board, from which a desirable public supply might be obtained, and the great necessity for more water pointed out. I have, in sequel, commented upon the spread of infectious disease by the germs floating in the air becoming revivified and introduced into the system, as well as upon the evils resulting from stagnant sewage deposited in drains for want of flushing water. During the hot summer months, when diarrhœa prevails, it is imperative that the sediment from sewage in the sewers should be removed, and as this can only be done by frequent flushing with large volumes of water, no remedy can be obtained until a further supply of water is procured. When a good supply of water shall have been obtained for drinking and household uses—and the want of such is becoming more and more pressing every day—then the existing reservoir at Llanishen and the present public supply can be turned to good account for sanitary use.

There can be no doubt expressed respecting the adaptability of the Taff Vawr or the Aber water for drinking and domestic use, nor can too much be said in favour of the gain which will result to the inhabitants by the substitution of so soft and desirable a water in the place of the present supply, which is admittedly hard. In accordance with the desire of Mr. Bateman, samples of the Llanishen and Ely waters were treated experimentally with lime, with a view to determine whether Clarke's process could be satisfactorily carried out, but the result—as foreshadowed by the many previous analyses done by Mr. Thomas, at my suggestion—showed that considerable permanent hardness remained after treatment. This will be seen from the following figures in parts per 100,000 :—

	Llanishen Water.		Ely Public Water Supply.
Total hardness	19·8	...	32·3
Hardness remaining after treatment with lime-water	10·1	...	12·2
Total solid matter	25·0	...	38·0

Under these circumstances the present water supply can only be regarded as temporary in its employment for drinking and domestic use, and viewing the question—serious as it is—from a sanitary

standpoint, I look forward, with considerable anxiety, to the period which must of necessity intervene before any new works can be completed.

THE FOOD SUPPLY.

The constant supervision of the meat market has been well maintained, and I am enabled to state that, upon the whole, the supply has been very satisfactory, as only 1,334 lbs. of food have been found unfit for consumption and ordered to be destroyed.

THE DWELLINGS OF THE WORKING CLASSES.

The daily reports of your Inspectors of Lodging Houses have shown that a considerable improvement has taken place in the internal condition of the houses of the working classes ; overcrowding has considerably decreased, so that it was rarely necessary to take any action against the occupiers in this respect.

POPULATION.

The estimated population of the district in the middle of the year 1882 is as follows :—

The sub-district of	Cardiff	49,406
,, ,,	Roath	24,963
,, ,,	Canton	14,234
Total		88,603

This estimate is based on the census of 1881, in accordance with the mean annual increment maintained during the previous ten years.

THE MARRIAGES.

The marriages during the year 1882 were as follows :—

Church of England	238
Chapels	230
Synagogue	
Registrar's Office	359
Total	827

Being at the rate of 9·3 per 1,000 inhabitants per annum.

THE BIRTHS.

The births registered during the year were 3,399; showing an excess of 254 over the previous year. The birth rate of the district was 38·3 per 1,000 inhabitants, that of the Kingdom being 33·7. It must, however, be borne in mind that the birth rate of Cardiff is calculated on a total population, and includes the estimated number of seamen (7,000 constantly in the Port), whose families reside elsewhere, and who do not contribute to the birth rate. If we deduct the 7,000 from the total population and calculate accordingly, the birth rate in Cardiff would be 41·9 per 1,000.

The births were registered as under :—

	Cardiff.	Roath.	Canton.	Total.
Quarter ending March ...	471	252	169	892
„ „ June	379	256	189	824
„ „ September...	430	272	146	848
„ „ December ...	421	238	176	835
	1,701	1,018	680	3,399

Of these 3,399, 1,714 were males, and 1,685 females.

THE DEATHS.

The total deaths registered in the Urban Sanitary District of Cardiff during the year were 1,724, 922 being males and 802 females.

The deaths were distributed throughout the district as follows :—

	Cardiff.	Roath.	Canton.	Total.
Winter Quarter ending March ...	272	106	72	450
Spring „ „ June ...	206	89	58	353
Summer „ „ September ...	244	93	68	405
Autumn „ „ December ...	264	150	102	516
... ...	986	438	300	1,724

The death rate was 19·457 per 1,000 inhabitants.

The death rate of the Urban Sanitary District of Cardiff in 1882, as compared with the 28 large towns, the 134 districts, and 57 sub-districts, comprising chief towns; the remaining districts and sub-districts comprising chiefly small towns and country parishes, is as under :—

	Quarter Ending.				Death Rate for Year.
	March.	June.	Sept.	Dec.	
Cardiff	20·4	15·8	18·1	22·9	19·4
28 large towns...	24·6	20·9	20·6	22·9	22·2
134 districts and 57 sub-districts, comprising chief towns	23·2	20·2	19·5	21·7	21·2
The remaining districts and sub-districts, comprising chiefly small towns and country parishes	19·1	17·2	15·2	17·5	17·3
Average death rate of the whole Kingdom	21·6	19·0	17·7	20·0	19·6

This table shows that the general death rate of the district, although in excess of the death rate of small towns and rural parishes, is slightly under the average of the Kingdom, and considerably below that of the 28 large towns weekly reported on by the Registrar-General, or that of the 137 districts and 57 sub-districts comprising chief towns.

Table showing Weekly Returns of Total Deaths registered in Cardiff; in the 28 large Towns; the death rates from all causes in each, distinguishing when Cardiff is in excess or otherwise; and the weekly death-rate of the seven chief zymotic diseases during the present year. I also give the weekly estimated population, based in

accordance with the last census, and the annual increment of the deeennial period 1871 and 1881 :—

Week ending.	Population of Cardiff.	Total Deaths.		Death Rate.				Zymotic Death Rate.	
		Cardiff.	28 Lge. Towns	Cardiff	28 Lge. Towns	Over.	Under	Cardiff	28 Lge. Towns
1882.									
January 7	87,431	42	4080	24·9	25·2		0·3	2·3	3·7
„ 14	87,480	38	3783	22·5	23·3		0·8	5·3	3·6
„ 21	87,529	34	3659	20·1	22·6		2·5	2·9	3·3
„ 28	87,578	39	4018	23·0	24·8		1·8	2·9	3·7
February 4	87,627	28	4042	16·6	24·9		8·3	1·7	3·7
„ 11	87,676	35	4832	20·7	29·8		9·1	2·3	2·4
„ 18	87,725	34	4275	20·1	26·4		6·3	1·7	3·9
„ 25	87,774	27	4118	15·9	25·4		9·5	2·3	4·0
March 4	87,823	34	3971	20·1	24·5		4·4	2·3	3·9
„ 11	87,872	42	3891	24·8	24·0	0·8		2·3	3·6
„ 18	87,921	42	3699	24·8	22·8	2·0		4·6	3·6
„ 25	87,970	27	3842	15·9	23·7		7·8	1·1	3·9
April 1	88,019	30	3767	17·7	23·2		5·5	4·2	3 9
„ 8	88,068	31	3620	18·3	22·3		4·0	1·1	3·6
„ 15	88,117	32	3956	18·8	24·4		5·6	1·7	3·7
„ 22	88,166	31	3677	18·2	22·7		4·5	1·7	3·5
„ 29	88,215	23	3513	13·5	21·7		8·2	2·9	3·8
May 6	88,264	32	3551	18·8	21·9		3·1	1·7	3·4
„ 13	88,313	28	3438	16·4	21·2		4·8	2·9	3·4
„ 20	88,362	26	3400	15·3	20·9		5·6	1·7	3·2
„ 27	88,411	29	3488	16·9	21·5		4·6	1·1	3·5
June 3	88,460	26	3237	15·2	19·9		4·7		3·1
„ 10	88,509	24	3204	14·1	19·7		5·6	1·1	3·2
„ 17	88,558	19	3079	11·1	19·0		7·9	1·7	2·9
„ 24	88,607	21	3097	12·3	19·1		6·8	0·5	2·8
July 1	88,656	31	2936	18·1	18·1			3·5	2·9
„ 8	88,705	32	2984	18·7	18·4	0·3		0·5	2·9
„ 15	88,754	29	3121	16·9	19·2		2·3	2·9	3·3
„ 22	88,803	32	3090	18·7	19·0		0·3	2·3	3·5
„ 29	88,852	22	3176	12·8	19·6		6·8	2·3	3·9
August 5	88,901	25	3267	14·6	20·1		5·5	2·9	4·3
„ 12	88,950	35	3425	20·4	21·1		0·7	4·6	4·6
„ 19	88,999	43	3800	25·1	23·4	1·7		9·9	6·1
„ 26	89,048	35	3680	20·4	22·7		2·3	8·1	6·5
September 2	89,097	27	3688	15·7	22·7		7·0	4·6	5·8
„ 9	89,146	34	3222	19·8	19·9		0·1	4·0	4·2
„ 16	89,195	25	3249	14·5	20·0		5·5	2·3	3·9
„ 23	89,244	35	3374	20·3	20·8		0·5	0·5	3·4
„ 30	89,293	31	3344	18·0	20·6		2·6	4·0	3·3
October 7	89,342	26	3228	15·1	19·9		4·8	1·1	3·0
„ 14	89,391	42	3522	24·4	21·7	2·7		1·1	3·0
„ 21	89,440	47	3308	27·3	20·4	6·9		5·2	3·3
„ 28	89,489	41	3477	23·8	21·4	1·4		4·6	3·3
November 4	89,538	29	3451	16·8	21·3		4·5	4·0	3·0
„ 11	89,587	47	3522	27·2	21·7	5·5		1·1	3·0
„ 18	89,636	38	3668	22·0	22·6		0·6	7·5	2·9
„ 25	89,685	39	3919	22·6	24·2		1·6	4·0	3·1
December 2	89,734	45	3615	26·0	22·3	3·7		4·6	2·6
„ 9	89,783	32	3794	18·5	23·4		4·9	2·8	2·9
„ 16	89,832	46	4370	26·6	26·9		0·3	4·6	2·9
„ 23	89,881	41	4480	23·7	27·6		3·9	4·0	2·9
„ 30	89,930	42	4036	24·3	24·9		0·6	4·0	2·5

The deaths at age were:

Under the age of one year	489
One year and under five years	261
Five years and under fifteen years ...	112
Fifteen years and under twenty-five years	102
Twenty-five years and under sixty years	488
Sixty and upwards	272
	1724

The proportion of deaths under the age of one year is 144 per 1,000 births. This contrasts very favourably with either the Kingdom or the 28 large towns selected by the Registrar General in his weekly reports, the proportionate rates being as under:—

	The Kingdom.	The Large Towns.	Cardiff.
Quarter ending March ...	146	156	106 per 1000
„ „ June	124	142	86 „
„ „ Sept.	145	172	194 „
„ „ Dec.	150	190	190 „
Average of Year	151	165	144

The following is a classification of the registered causes of death during the year:—

Zymotic Diseases	354
Constitutional ditto...	294
Local ditto	712
Developmental	249
Violent	115
	1724

In the Appendix will be found a table giving a classification of diseases, causes of death in each class, age at death, and proportionate death rate in this district in 1882 as compared with the average of the Kingdom extending over a period of 30 years.

In accordance with the instructions of the Local Government Board two tables have been compiled in forms prescribed by that authority. Table A gives the deaths during the year, classified under special headings; the age at which these deaths occurred—distinguishing

such as took place in Institutions from those distributed throughout the district; with the births, and population. Table B details the new cases of sickness coming under the observation of the Officer of Health. In these forms are included a certain number described as "the seven chief zymotic diseases," from the circumstance that these are the most fatal, and that this fatality is aggravated by defective sanitary arrangements.

These diseases are Small Pox, Measles, Scarlatina, Diphtheria, Whooping Cough, and Diarrhœa—the latter being very fatal in 1882. The unusual prevalence of this epidemic necessitated an enquiry into its history and nature, with a view of ascertaining whether any excitant or predisposing causes existed which might have contributed to this excessive mortality. The result has been detailed in that portion of my report which has reference to this disease; but in carrying out the object in view much of the information obtained applies with equal force to the prevalence of all infectious diseases. I have, therefore, been induced to enter somewhat more fully than usual into the subject, especially as the etiology of contagion is now receiving the attention which it deserves, and in consequence much light has been thrown on the laws bearing on the origin and prevalence of epidemic or contagious diseases. The present time is opportune for bringing before your notice the remarkable strides the science of Hygiene has recently made in recognising the origin and spread of infectious disease; and with this knowledge more effective means can be adopted to control or destroy them. Until recently all that was known of epidemic disease was that it prevailed, from time to time, over large districts or more limited areas, and that its effects were intensified by the existence of predisposing or excitant causes. These causes were overcrowded and filthy dwellings, defective drains, offensive cesspools, or bad water. At the same time it was known that there were districts wherein these causes existed in an aggravated form, and yet no infectious disease occurred. On the other hand, there were localities where perfect sanitary arrangements existed, nevertheless, infectious disease did occasionally manifest its presence. The only explanation given for the spreading of such diseases was, that infection prevailed in the atmosphere, but the consequences were severely felt when causes such as I have described were present. To remedy these evils much was accomplished, but it was done empirically, and, as a consequence, frequently fell short of all that would have been adopted had a more correct knowledge of contagia been attained. I may illustrate this by my experience of epidemic disease in this district. In 1849 epidemic Cholera extensively prevailed in Cardiff, resulting in 350 deaths from this disease,

the estimated population at that time being 16,693. All the precautions which could be taken, in accordance with the then known principles of Hygiene, were strictly carried out. Among the means adopted, a Hospital was erected in the Ten Acre Field, and into this hospital I caused the sick to be removed; nevertheless, after this removal, other members of the family succumbed to the disease.

During the progress of this epidemic, many theories were promulgated. One of these was that the air was infected, and that this was due to certain germs floating in the atmosphere, derived from the excreta of the sick. The germs thus evolved communicated the disease to those exposed to the contagium.

In 1854 Cholera in epidemic form again broke out in the town, when all the improved means resulting from the experience of the past were adopted; but instead of removing the sick from an infected house, arrangements were made and a place obtained to accommodate the healthy, who were at once removed from an infected house as soon as a new case occurred, a staff of nurses being engaged to attend on the sick. As the result of these precautions, no second case occurred in the same family. After a searching enquiry into the circumstances of every case coming under my observation, I could detect no single instance in which the disease was communicated by those who had been removed from an infected house. Each individual case, as regards its symptoms, was as severe in the second as in the first visitation, and ran its course as rapidly. Although the population largely increased, (22,461), the deaths were, nevertheless, reduced to 175.

Within the last few years, the attention of eminent scientists has been given to the germ theory. In this country Dr. William Budd, of Bristol, laboured with great zeal in this direction. He was followed by Dr. Spencer Wells, Mr. Lister, and other medical men. On the Continent, Professor Schwann worked in the same field; and the researches of M. Pasteur into the nature of an epidemic which had prevailed among silk worms in France threw great light on the subject. After him, Tyndall, by carefully conducted experiments, demonstrated that the atmosphere at all times contained organic germs, which varied in their essential characters. Some by means of microscopical examination were found to be parasitic; others were so minute that their specific nature could not be detected; but no doubt existed that these germs were organisms, that each germ was perfect in its individuality, and as amenable to laws governing organic matter as the most perfectly developed subject in the vegetable or animal kingdom.

Dr. Budd's researches tended materially to demonstrate that every infectious disease has a specific cause, and is due to a specific germ. Thus the germ of small-pox will produce small-pox and no other disease; the germ of scarlatina will not produce measles, and the like reasoning applies with equal force to all diseases. These germs cannot originate spontaneously, but are propagated by continuity of succession, showing great activity of development and multiplication whenever they are received into media possessing elements favouring their growth. From this reasoning he infers authoritatively that a crowded, filthy dwelling, or a defective sewer, or an offensive cesspool, or a bad condition of water cannot originate an infectious disease, but when an infectious germ is introduced into any one of these media, they become powerful agents in propagating any special infectious disease.

According to Mr. John Simon, a remarkable exemption from epidemic disease is recorded in one of the 627 registration districts in England. In the ten years extending from 1851 to 1860 inclusive no contagium of measles, scarlatina, or small-pox had arisen spontaneously in the Scilly Isles. This immunity was not due to any special sanitary merits, for it had an average amount of other evidence of unhealthiness.

Doubtless the reason of its escape was its insular position, and that no germ of infection had been introduced into the isles during the period referred to.

I may, therefore, state as a conclusion that every infectious disease has a specific germ for its origin or propagation, and its action is intensified by the special circumstances to which I have alluded. I may add also, that these germs of disease are introduced into the system by the air we breathe, the food we eat, and the water we drink, or the contagium may be communicated by inoculation, or by contact in cases of parasitic diseases of the skin.

Annexed are tables detailing the localities and streets in which deaths from the seven chief zymotic diseases occurred:

CARDIFF DISTRICT.

North Side.

Names of Streets.	S. Pox.	Measles	Scarlatina.	Diphtheria.	W. Cough.	Fever.	Diarrhœa	Total.
Bedford Street	...	...	2	2	...	...	...	4
Basil Place	...	...	...	...	...	...	1	1
Cairns Street.....	...	...	...	1	2	...	2	5
Castle Road	...	1	...	...	2	...	1	4
Cockburn Street ...	...	...	...	...	...	...	1	1
Cathays Terrace ...	...	...	...	...	...	...	1	1
Cranbrook Street ...	...	...	...	...	...	...	1	1
Dumfries Place	...	...	...	1	...	...	...	1
Flora Street	...	...	1	...	...	...	...	1
George Street	...	1	1	1	...	...	...	3
Harriet Street	...	...	...	...	...	...	1	1
Letty Street	...	...	1	...	...	...	...	1
Nazareth House ...	...	...	...	...	...	...	2	2
Penlline Street	...	1	...	...	...	...	...	1
Parade	...	...	1	...	...	...	...	1
Rink Buildings	...	1	...	...	..	...	...	1
Russell Street	...	1	...	...	...	...	2	3
Richmond Road ...	...	...	2	...	...	...	1	3
Richard Street	...	...	...	..	...	...	1	1
Salisbury Road	...	...	...	...	1	...	...	1
Woodville Road ...	...	...	...	...	...	...	1	1
Total		5	8	5	5		15	38

South Side.

Names of Streets.	S. Pox.	Measles	Scarlatina.	Diphtheria.	W. Cough.	Fever.	Diarrhœa.	Total.
Adam Street	...	1	1	...	...	...	...	2
Augusta Street	...	...	1	...	...	...	...	1
Bute Street	...	1	...	...	...	...	...	1
Bute Buildings	...	...	...	...	...	...	1	1
Buzzard Street	...	...	...	...	...	...	1	1
Caroline Street	...	...	1	...	...	...	...	1
Cathedral Road.....	...	1	2	...	...	...	...	3
Cowbridge Road ...	...	...	...	...	...	...	1	1
Cemetery Road.....	...	...	...	...	...	1	...	1
Dudley Street	...	...	...	...	...	...	1	1
Evelyn Street	...	...	...	...	2	...	...	2
East Dock	...	...	...	...	...	...	1	1
Ellen Street	...	...	2	...	...	...	...	2
East Terrace	...	...	1	...	...	...	...	1

CARDIFF DISTRICT.—South Side (*Continued*).

Names of Streets.	S. Pox.	Measles	Scarlatina.	Diphtheria.	W. Cough.	Fever.	Diarrhœa.	Total.
Frederick Street ...	...	...	3	...	1	...	...	4
Frederica Street ...	...	...	...	...	...	...	2	2
George Street	...	1	...	..	...	...	...	1
Guildford Street ...	...	...	...	...	...	...	1	1
Gough Street.....	...	...	...	...	...	...	2	2
Harrowby Street ...	...	1	...	...	...	...	...	1
Hodges Row	...	...	...	...	...	...	1	1
Havelock Street ...	...	...	1	...	...	...	...	1
Hamadryad	1	...	...	...	...	3	...	4
Ivor Place	...	...	...	...	...	...	1	1
Ivor Street.....	...	...	1	...	...	...	...	1
John Street	...	...	...	...	...	...	1	1
Louisa Street.....	...	1	...	...	...	...	...	1
Love Lane.....	...	...	1	...	...	...	...	1
Millicent Street.....	...	1	...	...	...	...	2	3
Mark Street	...	...	...	1	...	...	...	1
Margaret Street.....	...	...	...	1	...	...	...	1
Moira Crescent	...	...	...	...	...	...	1	1
North Church Street	...	...	1	...	...	1	2	4
Patrick Street	...	...	2	...	...	...	1	3
Plymouth Street ...	...	...	1	...	...	...	...	1
Pendoylan Street ...	...	...	1	...	...	...	...	1
Rodney Street	...	...	...	...	...	...	1	1
Sophia Street.....	...	...	...	...	...	...	2	2
Stanley Street	...	...	...	...	...	...	1	1
Sandon Place.....	...	...	...	...	...	1	...	1
Stuart Street.....	...	...	...	...	...	1	...	1
Temperance Street...	...	...	...	...	1	...	...	1
Tredegar Street.....	...	...	1	...	...	...	2	3
Tressillian Place ...	...	...	...	...	...	...	1	1
Union, The	...	...	...	...	1	1	5	7
Union Street	...	1	1	...	...	..	...	2
Union Buildings ...	...	...	...	...	...	...	1	1
Victoria Street	...	...	...	...	...	...	1	1
South William Street	...	...	1	1	...	...	1	3
William Street	...	...	...	...	...	...	1	1
Windsor Road	...	...	2	...	...	...	...	2
Windsor Esplanade..	...	...	...	1	...	...	...	1
Total	1	8	24	4	5	8	35	85

ROATH DISTRICT.

NORTH SIDE.

Names of Streets.	S. Pox.	Measles	Scar-latina.	Diph-theria.	W. Cough.	Fever.	Diar-rhœa.	Total.
Clive Place	...	1	...	...	...	...	...	1
Clive Street	...	...	...	2	...	...	1	3
Charles Street	...	...	1	...	...	...	...	1
Croft Street	...	...	...	...	...	...	1	1
Elm Street.....	...	...	...	...	...	...	1	1
Elm Place	...	...	...	...	...	...	1	1
Milton Street.....	...	...	...	...	3	...	...	3
Newport Road	...	...	...	...	...	1	...	1
Oxford Street	...	...	...	...	...	1	1	2
Partridge Road	...	...	1	...	...	...	...	1
Penylan Road	...	...	...	...	...	...	1	1
Rose Street	...	...	...	...	...	...	1	1
Shakspeare Street ...	...	...	...	1	...	...	...	1
Snipe Street	...	...	1	...	...	...	...	1
Woodland Place ...	...	1	...	...	...	...	...	1
Wordsworth Street..	...	...	...	...	...	...	1	1
TOTAL		2	3	3	3	2	8	21

SOUTH SIDE.

Names of Streets.	S. Pox.	Measles	Scar-latina.	Diph-theria.	W. Cough.	Fever.	Diar-rhœa.	Total.
Adamsdown	...	1	...	...	...	...	...	1
Agate Street	...	...	...	...	1	...	...	1
Arthur Street	...	...	...	...	1	...	...	1
Ascog Street	...	1	...	...	...	...	...	1
Bertram Street	...	...	1	...	...	...	1	2
Broadway	...	...	...	...	1	...	2	3
Cecil Street	...	1	1	...	1	...	...	3
Constellation Street.	...	...	1	...	...	...	3	4
Clifton Street	...	...	...	2	1	...	2	5
Copper Street	...	...	...	1	...	...	...	1
Cumria Street	...	...	...	...	1	1	2	4
Comet Street.....	...	...	...	...	...	...	1	1
Diamond Street.....	...	...	...	...	...	...	3	3
Emerald Street	...	...	1	...	...	...	...	1
Gold Street	...	...	...	...	2	...	...	2
Gwendoline Street...	...	...	...	...	1	...	...	1
Helen Street	...	2	1	...	...	...	1	4
Harold Street	...	1	...	...	...	...	...	1
Iron Street	...	1	2	...	...	...	1	4

ROATH DISTRICT.—South Side *(Continued).*

Names of Streets.	S. Pox.	Measles	Scarlatina.	Diphtheria.	W. Cough.	Fever.	Diarrhœa	Total.
Inchmarnock Street.	...	...	...	1	...	...	...	1
John Street	...	...	...	...	...	...	3	3
Kingarth Street.....	...	...	1	...	...	...	...	1
Killcatton Street ...	...	...	...	1	1	...	...	2
Lady Margaret Ter..	...	...	1	...	...	...	1	2
Lead Street	...	...	...	...	...	...	1	1
Maude Street.....	...	...	1	...	...	...	...	1
Meteor Street	...	1	...	...	1	...	2	4
Metal Street	...	...	...	3	...	...	1	4
Moon Street	...	1	...	...	...	...	..	1
Newport Road	...	...	1	...	...	...	...	1
Orbit Street	...	...	...	1	...	...	...	1
Ordell Street	...	...	...	1	2	...	...	3
Planet Street.....	...	...	1	...	...	...	1	2
Pearl Street	...	...	...	1	1	1	1	4
Ruby Street	...	...	...	1	...	...	...	1
Richard Terrace ...	...	...	...	1	...	...	...	1
Railway Street	...	...	...	1	1	...	1	3
Silver Street	...	...	1	...	...	...	...	1
Stacey Road	...	...	1	1	...	1	3	6
System Street	...	...	...	...	2	...	1	3
Sapphire Street.....	..	...	...	...	...	...	1	1
Sanquhar Street ...	...	...	...	...	...	...	1	1
Tin Strect	...	1	...	...	...	...	2	3
Theodore Street ...	...	...	1	...	...	1	...	2
Zinc Street	...	...	...	...	...	1	...	1
Total		10	15	15	17	5	35	97

CANTON DISTRICT.

North Side.

Names of Streets.	S. Pox.	Measles	Scarlatina.	Diphtheria.	W. Cough.	Fever.	Diarrhœa.	Total.
Albion Road	...	...	1	...	...	...	...	1
Conybeare Road ...	...	1	...	...	...	...	2	3
Cowbridge Road ...	...	...	1	...	1	...	1	3
Conway Road	...	...	1	...	...	...	...	1
Clive Road.....	...	...	...	...	1	...	...	1
Devonshire Place ...	...	...	...	...	...	...	1	1
Egerton Road	...	...	1	...	..	...	...	1
Ely Road	...	...	...	...	...	1	...	1
Glamorgan Street ...	...	...	1	...	...	...	1	2

CANTON DISTRICT.—North Side *(Continued).*

Names of Streets.	S. Pox.	Measles	Scarlatina.	Diphtheria.	W. Cough.	Fever.	Diarrhœa.	Total.
Harvey Street	...	...	1	...	...	...	...	1
Halket Street	...	...	...	...	1	...	...	1
King's Road	...	...	1	...	...	...	2	3
Market Road	...	1	...	...	...	...	...	1
Mortimer Road	...	...	...	...	1	...	...	1
Severn Road	...	2	...	...	...	...	1	3
Stag Terrace	...	...	2	..	...	...	...	2
Union Street	..	...	1	...	...	...	1	2
Wyndham Road ...	...	1	...	...	...	...	...	1
Total		5	10		4	1	9	29

South Side.

Names of Streets.	S. Pox.	Measles	Scarlatina.	Diphtheria.	W. Cough.	Fever.	Diarrhœa.	Total.
Atlas Terrace	...	...	1	...	...	...	...	1
Edward Street	...	...	2	...	1	...	2	5
East Street	...	...	...	...	...	...	1	1
Hewell Street	...	...	...	...	...	1	...	1
Herbert Street	...	...	...	...	...	...	1	1
Holmsdale Street ...	...	...	...	...	...	...	1	1
Knole Street	...	...	1	...	...	...	...	1
Kent Street	...	...	...	...	...	1	1	2
Lewis Street	...	...	...	...	...	...	1	1
Oakley Street	...	.	...	...	1	...	...	1
Picton Place	...	..	2	...	...	...	...	2
Van Street	...	...	...	...	...	...	1	1
Wellington Street ...	...	1	...	...	2	...	1	4
Total		1	6		4	2	9	22

The following Table gives the total deaths, and death rate of the seven chief zymotic diseases for each year during the six years ending 1881, with mean of same; also, deaths and death rate.

Years	1876		1877		1878		1879		1880		1881		Mean of six years		1882	
Estimated Population	73,075		75,663		78,251		80,839		83,427		86,015		79,545		88,603	
7 Chief Zymotic Diseases.	Deaths	Death Rate	Deaths	Death Rate	Deaths	Death Rate	Deaths	Death Rate	Deaths	Death Rate	Deaths	Death Rate	Deaths	Death Rate	Deaths	Death Rate
Small Pox	1	0·013	3	0·039	1	0·012	...	...	1	0·011	2	0·023	1·3	0·019	1	0·011
Measles	8	0·109	126	1·665	3	0·038	10	0·123	67	0·803	1	0·011	35·8	0·458	32	0·361
Scarlatina	201	2·750	30	0·396	10	0·127	44	0·544	29	0·347	20	0·232	55·6	0·732	67	0·756
Diphtheria	10	0·136	1	0·013	12	0·153	9	0·111	10	0·119	12	0·139	9·0	0·112	27	0·305
Whooping Cough ...	25	0·342	40	0·528	70	0·894	20	0·247	77	0·922	58	0·673	48·3	0·556	38	0·428
Fever	25	0·342	36	0·475	28	0·357	21	0·259	23	0·275	21	0·244	25·6	0·328	18	0·203
Diarrhœa	69	0·944	19	0·251	73	0·932	33	0·408	99	1·186	50	0·581	57·1	0·717	110	1·241
Total	339	4·636	255	3·367	197	2·513	137	1·692	306	3·653	164	1·903	232·7	2·960	293	3·306

Small Pox.—Five cases of sickness from Small-pox eame under my observation during the year. Of these, one was fatal, the other four recovered.

The history of these cases is as follows :—On Saturday, the 16th January, I was requested to visit the ship "Roekland," which had arrived that morning in the Penarth Doeks, direet from the Port of London. On visiting the ship, I found a seaman on board suffering from Small-pox, and immediately caused him to be removed to the "Hamadryad Seamen's Hospital," where he afterwards reeovered.

I have detailed all means adopted to prevent the spread of the infection in my report to the Port Sanitary Authority.

On the 6th April, the "Prinee Frederick Carl" arrived in the Roads, also from the Port of London, with a seaman suffering from Small-pox. He was immediately removed to the Hospital, and afterwards recovered.

Late on the evening of the 12th April, a suspeeted case of Small-pox in David Street was reported to me, and, on visiting the house, I found that the patient was a hobbler's wife. An eruption was developing itself, and I eaused the woman to be immediately removed to the Hamadryad Hospital. She reeovered, but on the 25th of the same month, I was asked to see the husband, when I found him suffering from intense headache and pain in the baek, and I, therefore, removed him to the same Hospital, where the eruption of Small-pox developed itself in a confluent form the next day, and he subsequently sueeumbed to the disease. When I first visited the house in David Street, I made careful enquiries to aseertain the source of infeetion. The woman, as far as I could learn, had not left her home for many weeks, nor had anyone, it appears, visited the house. The husband's oceupation was connected with vessels at the Doek, and it is extremely probable, therefore, that he eonveyed the infeetion to his own home. When his wife first siekened, he was for a time apparently well, but after thirteen days from the eommeneement of her illness, the man showed symptoms of the disease. He must, therefore, have eaught it from his wife. I caused the house to be thoroughly disinfeeted, and the bedding destroyed. I then carefully inspeeted the whole of that portion of the distriet, with a view of aseertaining the effieieney of vaeeination ; the result being that I examined the arms of six hundred and twenty-three ehildren, and found that, with few exeeptions, the eicatriees were satisfactory. In the few instances in whieh suffieient evidenee was not observable, I caused the ehildren to be re-vaeeinated, and eight others, previously unvaccinated, were sent to the Publie Officer for vaeeination. It is gratifying to know that no other ease of Small-pox oeeurred in the district.

On the 1st November, I was requested to visit the steam ship "Carmona," a vessel that had arrived that morning in the Penarth Dock from the Port of London. I found one of the crew on board suffering from Small-pox, and ordered him to be removed into the Hospital, where he recovered.

MEASLES.—The total deaths from Measles during the year were 32, and was at the rate of 0·361 per 1,000 ; the mean of the previous six years being 0·058. 12 of the deaths occurred in Roath ; 14 in Cardiff, and 6 in Canton. The first case reported to me broke out in the Cardiff sub-district in August. In September the disease appeared in Roath, and in November in Canton.

SCARLATINA was fatal in 67 cases, being at the rate of 0·756 per 1,000 ; the mean of the previous six years being 0·732. This epidemic prevailed in the district more or less throughout the year, but was at no time severe. Immediately cases came under my observation I enforced all available means for preventing further extension of the disease. Each case was isolated—children from infected houses were forbidden to attend school, and this instruction was communicated to the several Schoolmasters. Infected rooms were exposed to the action of sulphur fumes, and the bedding and clothes of the sick, as well as the garments worn by the nurses, were disinfected by means of dry air, heated to a temperature exceeding 230°F. Much might be done to minimise the extent to which this epidemic prevails if the latter means were in all cases—not coming under the notice of the Officer of Health—adopted by those in charge of the sick. It is for the purpose of impressing this provision strongly on the minds of the public that I detail at some length on the nature of contagious diseases, and show that the germs of disease possess great vitality and are capable of resisting ordinary exposure for hitherto unconceived duration of time. It has been conclusively shown that clothing retains them (the germs) for months, in such a condition that they can, at any time, assume activity. The vitality of germs is not destroyed by boiling water, so that washing articles of linen worn by the sick is not only useless for the purpose of destroying the infection, but is really an element of danger, by conveying the germs to other similar articles mixed with these in the process of washing.

DIPHTHERIA.—The deaths from Diphtheria were 27, being at the rate of 0·305 per 1,000. This was much in excess of the previous six years, when the mean rate was 0·112. The disease prevailed more extensively in the southern portion of Roath than in any other part of the district, confirming an opinion I have expressed in former Reports, that the disease, as an epidemic, was spread by sewer exhalations.

Frequently, in my enquiries, I ascertained that no attempt was made to disinfect the excretal and other discharges from the sick, but that these were simply received into vessels and thrown into the pan of the W.C., or down the drain for receiving surface water; the germs thus pass direct into the main sewers, where they diffuse through the sewer gases and finally escape into the atmosphere.

Whooping Cough.—The deaths from Whooping Cough were 38, being at the rate of 0·428 per 1,000, as against 0·556, the mean death rate of the previous six years.

Fever.—There were only 18 deaths from Fever during the year, being at the rate of 0·203 per 1,000. This was the lowest mortality from Fever recorded during the last 30 years. Of these deaths, three were foreign seamen removed from shipping into the "Hamadryad Hospital." The remaining 15 were distributed throughout the district, and were probably sporadic.

Diarrhœa.—Of all the diseases incidental to infancy, diarrhœa is the most fatal, and it is, therefore, most important that its causation should be ascertained, so that all possible preventive measures may be adopted.

The total deaths from diarrhœa registered in this district during the year were 110, representing the death rate of 1·241 per 1,000 per annum, the mean average deaths of the previous six years being 57, with a death rate of 0·717.

The following tables show the deaths of each month throughout the year, and their distributions, the temperature, and age in each case :—

TABLE No. 1.

Month.	Deaths.				Death Rate.	Temperature.					
	Districts.					Maximum.	Minimum.	Mean of Max.	Mean of Min.	Mean of Month.	No. of Wet Days.
	Cardiff.	Roath.	Canton.	Total.							
January ...	2	...	...	2	0·29	6th, 52·0	22nd, 29·0	45·8	38·5	42·1	13
February ...	1	2	...	3	0·44	21st, 57·0	4th, 30·5	48·2	39·1	43·6	15
March	3	2	1	6	0·88	15th, 56·9	22nd, 31·5	52·7	40·0	46·3	19
April	...	...	...	...	...	8th, 61·5	20th, 31·3	55·7	41·8	48·7	20
May	3	1	1	5	0·73	31st, 69·1	15th, 39·5	62·0	43·0	52·5	13
June	3	1	2	6	0·88	30th, 72·4	17th, 41·3	63·0	49·4	56·2	20
July	4	4	2	10	1·35	29th, 74·0	27th, 46·9	66·5	53·7	60·1	24
August... ...	21	13	7	41	5·99	12th, 76·3	28th, 46·7	66·8	53·6	60·2	16
September ...	4	10	2	16	2·21	1st, 66·1	13th, 37·2	61·1	47·6	54·3	17
October ...	4	10	2	16	2·32	1st, 64·4	26th, 33·2	55·4	45·2	50·3	23
November ...	3	...	1	4	0·57	5th, 59·8	18th, 28·1	49·1	39·2	44·1	21
December ...	1	...	...	1	0·13	31st, 53·7	11th, 20·2	43·8	36·8	40·3	25
Total... ...	49	43	18	110	1·24						

DEATHS AT AGE. TABLE No. 2.

Month.	Months.					Years.													Total
	0	1	3	6	9	1	2	3	4	5	10	15	25	35	45	55	65	75	85	
January ...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	2
February ..	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	1	...	...	...	3
March ...	...	3	...	1	1	1	...	...	...	...	..	...	...	...	...	...	...	...	...	6
April ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...
May ...	...	...	3	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	5
June ...	...	1	...	...	3	1	...	...	...	...	...	...	...	1	...	...	...	...	...	6
July ...	1	2	4	1	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	10
August ...	5	12	11	5	3	1	...	...	...	...	...	...	1	...	...	1	1	...	1	41
September.	2	6	5	...	1	...	...	...	...	...	...	...	...	1	1	...	...	...	...	16
October ...	2	6	3	3	1	...	...	..	...	...	...	...	...	...	...	...	...	...	1	16
November.	1	...	2	1	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	4
December .	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Total ...	11	30	28	12	11	7	..	...	...	1	...	...	1	2	1	3	1	...	2	110

Table showing the deaths from diarrhœa in each sub-district, with death rates according to estimated population :—

No. 3.

Sub-districts.	Population.	Deaths from Diarrhœa.	Death Rate.
Cardiff	49·406	49	0·99
Roath	24·963	43	1·72
Canton	14·234	18	0·93
Total	88·603	110	1·24

Towards the end of June my attention was directed to an increasing mortality from Diarrhœa. I then visited every fatal case to enquire into its history and etiology, for the purpose of ascertaining whether there were any excitant or predisposing causes operating in such a manner as to make it assume an epidemic form. Previous to this the disease was sporadic, and apparently due, to a great extent, to dietetic causes. The result of these enquiries induced me to conclude that temperature, age, diet, and, possibly, local defective sewer arrangements, were the chief factors contributing to this excessive prevalence of diarrhœa.

In order that you may recognise the data on which these conclusions were based, tables Nos. 1, 2, and 3 have been constructed.

Temperature.—The mean temperature of any month previous to the latter end of June was not above 52°. During this portion of the year the monthly average of deaths from diarrhœa did not exceed three, but towards the middle of June the temperature rose considerably, and on the 30th the thermometer registered 72·4°. During the first fortnight of June the weather was exceedingly cold, and up to the 26th of the month only two deaths from diarrhœa were recorded ; but on the four remaining days there were four fatal cases. In July, with a maximum temperature of 74°, and a mean of 60·1°, the deaths from diarrhœa were ten. In August, with a maximum temperature of 76·3°, and a mean of 60·2°, the deaths from this disease reached 41. In September, with a maximum temperature of 66·1°, and a mean of 54·3°, the deaths fell to 16. In October, with a maximum temperature of 64·4°, and a mean of 50·3°, the deaths from diarrhœa were 16. In November, with a maximum

temperature of 59·8°, and a mean of 44·1°, the mortality from diarrhœa decreased, and only four deaths were recorded. In December, with a maximum temperature of 53·7°, and a mean of 40·3°, only one death was recorded.

Age.—The total death rate of children from all causes under the age of five years, compared with total births, was 220·6 per 1,000.

The death rate of infants under the age of one year, from all causes, compared with total births, was 143·9 per 1,000.

The death rate from diarrhœa of children under the age of five, compared with total births, was 29·1 per 1,000.

The death rate from diarrhœa of children under the age of one year, compared with total births, was 27·0 per 1,000.

The percentage of deaths of children under the age of five years, compared with total deaths from diarrhœa, was 90·0.

The death rate of infants under the age of one year during the 18 weeks ending 31st October, compared with total deaths during that period from diarrhœa, was 87·3 per cent.

The figures just enumerated are the result of observations made by myself in the examination of the Registration Book of Deaths, and indicate that the disease, as an epidemic, was essentially infantile. This opinion is borne out by the fact that no second case occurred in the same family; that the adult deaths were few, and though slightly above the average, nothing more than might be expected from the proclivity to intestinal irritation during the hot months of summer and autumn, and the consumption of fruits or other indigestible vegetable matters.

Diet.—A reference to table No. 2 shows that out of 110 deaths from diarrhœa 95 were at the nursing period of life.

76 infantile deaths occurred between the 26th of June and the 31st October, and a careful enquiry into the diet of these children elicited the following facts:—

One had been fed on breast milk alone.
Six had been fed on breast and cows' milk.
Nine had been fed on breast, cows' milk, and farinaceous food.
Seventeen had been fed on cows' milk with sugar and water only.
Thirty-two had been fed on cows' milk, farinaceous, and other food.
Six had been fed on condensed milk.
Two had been fed on condensed and cows' milk.
Three had been fed on condensed milk and farinaceous food.

It will thus be seen that only one death was recorded when the infant was fed by breast milk only; the remaining 75 received some description of animal milk with or without farinaceous food.

The following are quantitative analyses of breast milk and cows' milk :—

	WOMAN'S MILK	COWS' MILK
Water	88·35	86·80
Casein and Albumen	3·15	4·14
Sugar	4·37	4·53
Butter	3·87	3·93
Salts	·26	·70

The above analyses show that the difference between breast milk and cows' milk is not great; the latter contains a larger quantity of casein, therefore is richer, but, if diluted with water and given in proper quantities, is the best article of diet where the mother is unable to nurse her infant. Cows' milk may, however, become injurious as an article for infantile diet under the following circumstances:—If it is abnormal in composition; if changed in chemical constitution; if polluted by matters floating in the atmosphere, or by germs evolved from the excreta of sewage; if polluted by water contaminated with sewage matter, either added as an adulterant or employed for the purpose of cleansing milk vessels; if mixed with the acid residuum left in feeding bottles improperly washed; or if it has been exposed in open vessels in situations where noxious gases are set free.

Milk abnormal in composition :—Human milk, immediately after the birth of the infant, or cows' milk, directly after calving, contains a peculiar principle termed colostrum. This is laxative in its effect, and is intended by nature to remove the meconium or contents of the intestines of the new-born offspring. The colostrum contained in cows' milk is a much more powerful laxative than that present in the human secretion, hence it follows that cows' milk in this condition is calculated to exert an injurious effect and give rise to intestinal irritation if taken by infants. As a matter of fact, it is generally considered that the milk drawn from a cow that has calved within three weeks is unfit food for infants, especially during the autumnal months, when there is a proclivity to intestinal irritation. In this district the demand for milk is much in excess of the local supply, and, as a consequence, the sale of the milk affords more profit than if it were used for feeding calves, hence there is a temptation to mix the milk of cows which have recently calved with the ordinary supply.

Milk changes in chemical constitution:—During the summer months cows' milk rapidly becomes sour. This change of condition, until recently, was regarded as the ordinary process of so called fermentation common to all natural organic products. In the case of malt extract, which, like milk, is a highly saccharine liquid, the fermentative process is taken advantage of to favour the conversion of the saccharine constituents into alcohol in order to produce beer. This alcoholic or vinous fermentation is always best developed when a moderately low temperature prevails. Now, if the malt extract contains much nitrogenous matter, great difficulty is experienced in maintaining true vinous fermentation, and preventing the formation of acid products. A high temperature, combined with certain conditions of the atmosphere, which we usually designate *close* or sultry weather (when the diffusive power of the atmosphere is at its minimum), favours, in a marked degree, the development of the acid or so-called putrefactive process, hence it will be seen that, whatever bearing this may have upon the public health, or the generation of diarrhœa, the hot, close temperature of the summer months would be that most conducive to the induction of acid fermentation in food liquids. Liquids like milk, containing a large proportion of nitrogenous matter, almost always undergo a putrefactive process or acid fermentation in contradistinction to vinous fermentation. Now food preparations, or natural animal secretions, whether partaken of when either the vinous or acid fermentation is proceeding vigorously, are liable to modify, if not to stultify altogether, the true digestive process, and the stomach for the time being would be unable to perform its usual functions. Under these circumstances the food would pass into the intestines whilst the fermentative or acid putrefaction was still going on, and, as a consequence, the abnormal condition of things thus proceeding would naturally give rise to more or less intestinal irritation, and diarrhœa probably occur. This result may be regarded as due to chemical, physical, or mechanical action, or more correctly, perhaps, to a combination of the three. When any like changes have occurred, therefore, in cows' milk, it will be seen that serious results may follow if such food is given to infants.

Milk polluted by matters floating in the atmosphere, or by the germs evolved from the excreta of sewage:—In the foregoing remarks I confined myself almost entirely to the dangers arising from the occurrence of changes in the chemical constitution of milk. Are these changes purely chemical? If so they are due to the dissociation or oxidation of the milk constituents. From the experiments of Tyndall, Pasteur, and other authorities, it transpires that in an atmosphere free from floating particles (dust, &c.), milk, and such

like animal fluids, are preserved, and do not undergo decomposition when special precautions have been observed to ensure the absence of certain matters which give rise to incipient decomposition in the milk itself. Let us then briefly enquire what these matters are which induce fermentation or decomposition. Returning for a moment to vinous fermentation, an opportunity is afforded for observing the rapid development and growth of the yeast plant employed, and here the cell is of sufficient size, and its growth so readily observable, that one can easily believe it to be a vital organism. No such definition of origin can be noticed in connection with the process of acid fermentation. When milk, which has become what we commonly term sour, is examined microscopically, it is found to be swarming with myriads of minute organisms of varied types. Some of these germs are supposed to be, and doubtless are, one and the same organism in the various stages of development which it undergoes, and possibly many are inert in their action so far as the human economy is concerned; but one thing very noticeable and significant is that certain of the organisms flourish, while others show a marked decadence, and others do not assume activity until their fellows almost disappear. These changes and stages occupy some time, and in cold weather they are modified to a considerable degree as well as much retarded, so that we can assume with tolerable certainty that milk is not kept long enough in the colder months of the year to favour the process of organic development alluded to. In warm weather, however, these changes and extinction of species, so to speak, occur with great rapidity, affording an opportunity for the generation and revivification of species incapable of rapid propagation in the earlier stages of the acid fermentation. Hence it will be seen that the specific germs of any particular disease have a much better chance of assuming energetic vitality during the warm months of the year. As I shall have occasion to point out further on, milk is often kept by the cottagers in a position where sewer-gas makes its escape into the dwelling. This gas is charged with floating matter, containing, it may be, the germs which give rise to, or which are characteristic of diarrhœal disease (by reason of the excreta of persons suffering from diarrhœa finding its way into the sewers). These germs, by diffusion through the atmosphere, come in contact with the milk, and finding there a menstruum specially adapted for their growth and development, soon assume activity and multiply enormously. The milk is used subsequently for infants' food, and diarrhœa results in consequence.

Milk polluted by water contaminated with sewage matter, either added as an adulterant or employed for the purpose of cleansing milk vessels:—Instances have occurred—notably one at Newport, some

two years ago—in whieh milk vendors have adulterated their milk with stagnant water from moor ditches and field ponds eontaining eontaminated water. Fortunately these cases are of rare oecurrenee, else there is no telling the evils whieh may result from sueh base practiees.

Milk may be injuriously affeeted by noxious matters received into the vessels used at the dairy, or into the tins employed for eonveying the milk into the town for distribution. A remarkable instance of this came reeently under my observation. My attention was called to some fatal eases of Diphtheria at a farm house in the country. Milk for town distribution was obtained from this farm, and fearing that the well water was at fault I caused it to be examined, and found that it eontained an exeessive amount of sewage eontamination. The use of the well for drinking purposes was prohibited by the Rural Sanitary Authority, but it was not forbidden for other general use. My attention having been ealled to some fatal cases of Diphtheria in the town, I then aseertained that the milk used by these children was obtained from the farm alluded to. I further learned that the tin vessels used for eonveying the milk into the town were rinsed, night and morning, by water obtained from this well. An order was then obtained for the well to be permanently elosed, and no other fatal ease afterwards oecurred.

Milk mixed with the acid residuum left in unwashed feeding bottles:—Milk may also be rendered unfit for use by being mixed with the matter left in feeding bottles not properly cleansed, and so favouring the changed condition I have alluded to. I pointed out, in some detail, the importance of giving attention to this matter in my last Report.

It may be kept in improper places:—In the eourse of enquiries made in my house visitations, I frequently found that the milk was kept in a very small pantry, probably only four feet square, its window being about two feet above the drain used for carrying the surface water. This drain was often imperfectly trapped and communicated direct with the main sewer. In other cases the pantry was elose to a foul and offensive w.e., and under both these eircumstanees I found the atmosphere of the pantries smelling very offensively of sewer gas. Now it will be found that liquids like milk—rich in organic constituents—readily absorb offensive gases and assume their eharacteristic smell. In this condition milk is liable to give rise to nausea, the result being that the digestive organs are impaired, followed by intestinal irritation set up by the abnormal changes whieh supervene.

Defective sewer arrangements:—The connection between defective sewer arrangements and Diarrhœal disease has long been recognised. It was most marked during the prevalence of the present epidemic. In that portion of the district of Roath on the south side of Newport Road, the streets are built on a low level, the sewers are laid with small gradients, and from the limited means at command for flushing them frequent excretal deposits are formed. This is especially the case in hot and dry weather, when there is an absence of storm water. On the occasion of my daily visits to this district, in the autumn, I found the atmosphere frequently impregnated with a smell of sewer gas, and especially in those streets where a ventilating shaft existed. Here the atmosphere was most offensive. The estimated population of this portion of the district is 17,500, and the deaths from Diarrhœa were 35, being at the rate of 2 per 1,000. On the north side the drains have sharper gradients, and the means of flushing are more available. The estimated population here is 7,500, and in either case, so far as class constitution is concerned, the districts are relatively balanced. On the north side the deaths from Diarrhœa were only 8, the death rate being 1 per 1,000. Although the consequences of defective sewer arrangements have a direct and serious bearing upon the generation of Diarrhœal disease, I will not dwell upon this theme here, as I especially alluded to it in my remarks on Zymotic diseases generally.

Constitutional Diseases.—These show a death rate of 3·318 per 1,000, as against the mean rate of 4·108 for the kingdom, extending over a period of 30 years. This improvement is due to a lesser mortality from Scrofula, Tabes Mesenterica and Phthisis.

Local Diseases.—The diseases comprised in this head are less amenable to sanitary provisions than any other class—the mortality being chiefly from acute inflammatory affections, induced by temperature causes. The death rate of the district was 8·003, that of the kingdom being 8·721.

Developmental Diseases.—There are no special observations necessary respecting the mortality of this class. The death rate of the district was 2·810, against 3·464 of the kingdom.

Violent.—The deaths from violence are always considerably more in this district than the average of the kingdom. The death rate this year was 1·297, against 0·758, the mean death rate of the kingdom. This excess is necessarily associated with the special occupations of our working classes, who are employed in the extensive docks and works connected with our commerce. These occupations necessarily expose them to frequent accidents.

The following is a summary of the sanitary duties discharged during the year :—

9,258 day and 2,348 night visits were made by the Inspectors of Lodging-houses, and the condition duly reported to me.

141 houses were found to be over-crowded, and in each case notices were served upon the occupiers and complied with.

482 houses required to be cleansed and lime-washed. The occupiers of these houses were furnished on loan with lime-brushes and other necessaries for cleansing and purifying them.

104 houses were fumigated with sulphurous acid and chlorine gases after fever and other zymotic diseases, and the bedding and clothes belonging to the sick were exposed to the action of dry air heated to a temperature exceeding 230°F.

494 house and surface drains in a defective state were remedied.

91 cesspools were emptied in accordance with the Bye-Laws.

181 cattle-sheds were cleansed and white-washed.

313 accumulations of house and refuse matter near dwellings were ordered to be removed.

10 Wells were peremptorily closed by order of the Magistrates, the water being polluted and unfit for dietetic or domestic purposes.

625 lbs. of Beef, 495 lbs. of Pork, and 214 lbs. of Fish, in all 1,334 lbs., were destroyed by order of the Magistrates.

Towards the end of the year, Mr. James, your chief Sanitary Inspector, resigned his appointment, and has been succeeded by Mr. Gover. These two officers, for some years, discharged their duties with great zeal and industry. On Mr. James's resignation two other inspectors, Messrs. Leyshon and Vaughan, were appointed, and I am able to state that they are discharging their duties with great efficiency.

I have the honour to be, Gentlemen,

Your obedient Servant,

H. J. PAINE, M.D.,

Medical Officer of Health, Cardiff Urban Sanitary Authority.

APPENDIX.

CARDIFF URBAN SANITARY DISTRICT.

Deaths registered at several groups of ages from different causes during the year 1882.

CAUSES OF DEATH.	AGES. Under 1 year.	1 and under 5.	5 and under 15.	15 and under 25.	25 and under 65.	65 and upwards.	Total.	Death Rate in Cardiff per 1000 Inhabitants, 1882.	Mean Death Rate per 1000 Inhabitants of Kingdom for 30 years.
CLASSES.									
I. Zymotic	144	123	45	12	25	5	354	3·981	4·845
II. Constitutional ...	28	32	20	53	143	18	294	3·318	4·108
III. Local	172	88	34	18	240	160	712	8·003	8·721
IV. Developmental ...	131	10	1	8	18	81	249	2·810	3·464
V. Violent	14	8	12	11	62	8	115	1·297	·758
Totals ...	489	261	112	102	488	272	1724	19·457	22·105
CLASS.									
I. ZYMOTIC.									
Smallpox... ...				1			1	0·011	·221
Measles	5	25	2				32	0·361	·413
Scarlet Fever (Scarlatina) ...	4	45	17	1			67	0·756	·717
Diphtheria		11	16				27	0·305	·128
Quinsy	1						1	0·011	·015
Croup	4	10	2		1		17	0·191	·228
Whooping Cough	16	22					38	0·428	·519
Enteric or Typhoid Fever ...	1	1	3	4	5	1	15	0·169	·300
Simple Continued Fever ...		1		1	1		3	0·033	·031
Erysipelas	5			1	3	1	10	0·112	·096
Diarrhœa	92	7	1		7	3	110	1·241	·872
Remittent Fever	1		1				2	0·022	·013
Rheumatism			3		1		4	0·045	·115
Other Zymotic Diseases ...	1			3			4	0·045	·004
Syphilis	9	1			3		13	0·146	·066
Stricture of Urethra ...					1		1	0·011	·010
Want of Breast Milk ...	3						3	0·033	·053
Alcoholism { a. Del. Tremens					2		2	0·022	·022
Alcoholism { b. Intemperance				1	1		2	0·022	·018
Thrush	2						2	0·022	·054
Totals	144	123	45	12	25	5	354	3·981	4·845
CLASS									
II. CONSTITUTIONAL.									
Dropsy		1					1	0·011	·344
Cancer				1	23	13	37	0·417	·389
Cancrum Oris (NOMA) ...			1				1	0·011	·006
Scrofula	4	5	1	2	1	1	14	0·157	·141
Tabes Mesenterica... ...	7	5	1				13	0·146	·290
Phthisis	4	3	10	48	118	4	187	2·110	2·491
Hydrocephalus	13	18	7	2	1		41	0·462	·362
Totals	28	32	20	53	143	18	294	3·318	4·108
CLASS									
III. LOCAL.									
Cephalitis		6	6		3		15	0·169	·213
Apoplexy					8	11	19	0·214	·490
Paralysis... ...		1			19	29	49	0·553	·488
Chorea			1		1		1	0·011	·003
Epilepsy			1	1	2		4	0·045	·115
Convulsions	102	26	7				135	1·523	1·222
Brain Disease	2	1	3	1	15	5	27	0·305	·240
Aneurism					5		5	0·056	·023
Heart Disease	1		3	5	59	30	98	1·106	·971
Laryngitis	1	1	4		1		7	0·079	·070
Bronchitis	37	54	1		34	45	141	1·591	1·740
Pleurisy					2	1	3	0·033	·047
Pneumonia	22	21	5	3	28	11	90	1·015	1·141
Asthma					2	3	5	0·056	·188
Lung Disease	1	4	1		5	2	13	0·146	·202
Gastritis					1		1	0·011	·038
Enteritis		1		1	1		3	0·033	·155
Peritonitis			1	2	5	3	11	0·124	·078
Ascites						1	1	0·011	·032
Ulceration of Intestines ...					1	1	2	0·022	·046
Hernia	1	1		1	2	1	6	0·067	·043
Ileus					1	2	3	0·033	·060
Intussusception	1						1	0·011	·014
Stricture of Intestines ...					3		3	0·033	·014
Stomach Disease, &c. ...					1		1	0·011	·125
Jaundice	1				2	3	6	0·067	·070
Liver Disease					8	2	10	0·112	·247
Nephritis						1	1	0·011	·023
Bright's Disease				2	23	6	31	0·349	·095
Diabetes					1		1	0·011	·030
Cystitis					2	2	4	0·044	·018
Kidney Disease				2	1		3	0·033	·114
Ovarian Dropsy					3		3	0·033	·011
Joint Disease		1	1				2	0·022	·075
Phlegmon	2	1			2	1	6	0·067	·025
Skin Disease	1						1	0·011	·017
Totals	172	88	34	18	240	160	712	8·003	8·721
CLASS									
IV. DEVELOPMENTAL.									
Premature Birth	42						42	0·474	·583
Spina Bifda	4						4	0·044	·018
Other Malformations ...	1						1	0·011	·021
Teething... ...	6	4					10	0·112	·204
Child Birth				7	16		23	0·259	·107
Old Age						80	80	0·902	1·330
Atrophy and Debility ...	78	6	1	1	2	1	89	1·004	1·172
Totals	131	10	1	8	18	81	249	2·810	3·464
CLASS									
V. VIOLENT.									
Accident or Negligence ...		1	1		3		5	0·056	
Fractures and Contusions ...		1	1	4	21	2	29	0·327	·291
Burns and Scalds	1		3		1		5	0·056	·101
Poison		1					1	0·011	·068
Drowning		2	5	5	13		25	0·281	·127
Suffocation	3			1			4	0·044	·070
Murder and Manslaughter ...			1		1		2	0·022	·014
Suicide					2		2	0·022	
Other Violent Deaths ...					1		1	0·011	·005
Not Classed	10	3	1	1	20	6	41	0·462	
Totals	14	8	12	11	62	8	115	1·297	·758

Table of Deaths during the year 1882, in the Urban Sanitary District of Cardiff.

CLASSIFIED ACCORDING TO DISEASES, AGES, AND LOCALITIES, AND SHEWING ALSO THE POPULATION OF SUCH LOCALITIES, AND THE BIRTHS THEREIN DURING THE YEAR.

(1) Names of Localities (being Parishes, Groups of Parishes, Townships, Wards or other areas of known population adopted for the purposes of these Statistics; public institutions being excluded.	Population at all Ages.		Mortality from all causes, at subjoined Ages.						Mortality from subjoined causes, distinguishing Deaths of Children under Five Years of Age.																	
	Census 1881.	Estimated to middle of 1882.	At all ages.	Under 1 year.	1 and under 5	5 and under 15	15 and under 25	25 and under 60	60 and upwards.		Smallpox.	Measles.	Scarlatina.	Diphtheria.	Croup (not specified).	Whooping Cough.	Continued Fevers.			Diarrhœa and Dysentery.	Erysipelas.	Pyæmia	Puerperal Fever.	Phthisis.	Bronchitis, Pneumonia, and Pleurisy.	Heart Disease.	Injuries.	All Other Diseases.
																	Typhus.	Enteric or Typhoid.	Other or Doubtful.								
1.	2.	3.	5.	6.	7	8.	9.	10.	11.		12.	13.	14.	15.	16.	17.	18.	19.	20.	21.	22.	25.	26.	27.	29.	30.	31.	32.	33.
District of Cardiff	85,378	88,656	1724	489	261	112	102	488	272	Under 5	...	30	49	11	14	33	...	2	1	96	5	1	...	5	103	1	29	350
										5 upwds.	...	2	18	16	3	...	...	10	2	9	2	...	1	157	108	85	68	328
Public Institutions. Infirmary	.....	.....	40	1	2	5	11	17	4	Under 5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1
										5 upwds.	...	...	...	...	...	...	...	...	...	...	...	...	...	1	3	4	17	12
Union	.....	.....	124	15	6	2	8	44	49	Under 5	...	...	...	...	...	1	...	...	...	2	...	...	...	2	1	...	...	15
										5 upwds.	...	...	...	...	...	...	...	...	...	3	...	1	1	16	14	5	1	60
Hanadryad, Seamen's Hospital	.....	.....	29	...	...	...	6	23	...	Under 5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
										5 upwds.	1	...	...	...	...	...	...	3	...	...	3	...	...	6	5	3	7	1
Gaol	.....	.....	...	...	...	...	1	...	...	Under 5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
										5 upwds.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
Totals	.....	.....	1724	480	269	112	102	486	275	Under 5	...	30	49	11	14	33	...	2	1	98	5	1	...	7	104	1	22	366
										5 upwds.	1	2	18	16	3	...	...	13	2	12	5	1	..	180	130	97	93	402

Table of New Cases of Sickness, coming to the knowledge of the Medical Officer of Health, during the year 1882, in the Urban Sanitary District of Cardiff.

CLASSIFIED ACCORDING TO LOCALITIES AND DISEASES.

NAMES OF LOCALITIES.	New Cases of Sickness in Persons belonging to the District, distinguishing those in Children under Five Years of Age.													
		Smallpox.	Measles.	Scarlatina.	Diphtheria.	Whooping Cough.	Continued Fevers.		Diarrhœa and Dysentery.	Rheumatic Fever.	Erysipelas.	Ague.	Other Diseases, such as Chicken Pox, or Pneumonia, which the Medical Officer of Health thinks will to record.	
							Typhus.	Enteric or Typhoid.	Other or Doubtful.					Phthisis. Pl., Pn., & Br.	Injuries.
1.	12.	13.	14.	15.	16.	18.	19.	20.	21.	22.	24.	25.	28.		
Workhouse, In	Under 5.	..	20	1	...	5	...	...	...	9	...	...	...	...	...
	5 upwards.	..	...	...	...	...	...	4	...	14	20	2	1	81	27
,, Out	Under 5.	..	26	24	...	16	...	...	11	28	2	..	...	51	...
	5 upwards.	..	43	36	...	19	1	3	14	16	135	7	...	360	..
Infirmary, In	Under 5.	..	...	...	...	...	...	...	...	1	...	...	...	...	...
	5 upwards.	..	...	...	...	...	...	...	...	...	16	..	...	21	209
,, Out	Under 5.	..	61	72	2	10	...	...	4	53	...	...	...	...	...
	5 upwards.	..	43	64	1	32	...	13	11	18	18	7	..	..	...
Seamen's Hospital	Under 5.	..	...	...	...	...	...	...	...	...	...	...	...	...	...
	5 upwards.	5	3	2	...	..	1	17	1	10	45	5	10	43	103
In-patients, Gaol	Under 5.	..	...	...	...	...	...	...	...	...	...	...	...	...	...
	5 upwards.	..	...	...	...	...	...	...	...	7	...	...	...	19	...
Other Practice	Under 5.	..	...	...	...	...	...	...	...	...	...	...	...	..	...
	5 upwards.	..	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	Under 5.	..	107	97	2	61	...	...	15	91	2	...	...	51	...
	5 upwards.	5	89	102	...	51	2	37	26	80	264	21	11	524	339