

IX. *Observations on the Population and Diseases of Chester, in the Year 1774.* By J. Haygarth, M. D.

Read Jan. 22, 1777. **T**HE facts ascertained in the following tables prove Chester to be healthy in such an uncommon degree, as will astonish those who are best acquainted with the general state of mortality in large towns. In order to deduce satisfactory and useful conclusions from these facts, it seems necessary to describe a few peculiarities in the situation of this city, which probably contribute to produce a salutary effect. The intelligent reader will remark, in the following account, that the structure of Chester prevents, in an uncommon degree, two principal sources of disease, stagnant moisture and putrefaction.

Chester is placed on a red, sandy, mouldering rock (*saxum arenarium friabile rubrum*) which forms a rising promontory, whose summit is elevated exactly one hundred feet above high water mark, and forty feet above the adjacent country; from this point the streets descend with a gentle declivity every way to the edge of the rock,

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whence

whence there is a perpendicular fall of many yards from every part of the town.

The loose rock on which the town is built absorbs moisture: for being cut into filtering stones, water soon passes through its pores. The principal streets that meet in the centre of the city, are deeply excavated out of the rock, being sunk six or nine feet lower than the surface of the ground. By this structure the foundations of the houses are kept perfectly dry, as the streets quickly drain off the water, and the rock absorbs all the remaining moisture. For these reasons the cellars in general are dry, a circumstance that greatly contributes to health. Stagnant water in a cellar is probably very often the unsuspected cause of putrid diseases: its pernicious influence seems to resemble, in some degree, that of bilgewater in a ship.

There is a form of building peculiar to Chester, called the Rows, which are covered galleries that make a complete communication between most of the principal streets. The Rows are always dry and clean even in wet and dirty weather; they moderate the heat of summer, and the coldness of winter. These uncommon advantages oftener tempt abroad persons of a delicate and valetudinary constitution, whether they be engaged in business or amusement; by which they obtain

the benefit of fresh air and exercise, without incurring danger from catching cold.

The walls are near two miles in circumference, and surround the central part of the city: they are dry and clean immediately after the heaviest rains. The Rows form a dry communication with the walls from nearly every place within their circuit: their frequent ascents and descents; their elevated, airy situation, and varied prospects; all contribute to render walking upon them peculiarly well adapted to preserve or restore health.

The Dee, a large navigable river, divides a small part of the town from the rest, skirts the left, and surrounds three quarters of the larger portion. Where it makes this division, it falls over a causeway, forming a widely extended cascade, and then runs with rapidity down loose rocks; the whole descent is thirteen feet. The tide always flows up to the town, where it rises, on a medium of spring tides fifteen feet, the highest tides twenty-one feet: every new and full moon, about six or eight tides flow over the causeway, and sometimes more than twenty miles above the town. Besides washing away the liquid filth, which quickly runs into the river by a short course from nearly all quarters of the town, the agitation of the waters both by the cascade and tides is probably of farther service in purifying the atmosphere.

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The air of Chester is uncommonly clear. In a register of the weather, kept for the last four years, there were only six foggy and thirty-two hazy mornings. In general, the atmosphere on the western is much clearer than on the eastern shore of Britain, though more rain falls on the west than on the east side of the island.

The modern refinement of manners, under the opprobrious name of luxury, is generally thought to be peculiarly destructive to health; but the true friend of mankind will candidly, and without prejudice, inquire into the facts which only can determine his judgement on this important subject. A large portion of the inhabitants of Chester enjoy, with temperance, the elegant refinements of life; yet no disorder, except the gout, can be peculiarly ascribed to this cause, in the tables of diseases for the last three years, that is, no more than two deaths out of 1277. But it is to be observed, that refined manners here, as they generally do every where, entirely banish the destructive excesses of gluttony and drunkenness. It is the large quantity, rather than the rich quality or exquisite flavour, of what we eat and drink, that is injurious to health.

As the healthiness of Chester must appear so very extraordinary as to be almost incredible, it is necessary to declare, that the enumeration was made with all possible
care

care and fidelity; and that the errors are, for obvious reasons, rather on the side of defect than excess, so as to make the proportional mortality rather appear greater, not less, than the truth. Two facts may be mentioned in proof of this position. In 1772 the inhabitants of St. Michael's parish were reckoned to be 618, and there cannot be the smallest suspicion that there are fewer than this number; and yet by the survey, Table v. they are only 575. Again, the deaths, by fever, appear to be 35 from the parish-registers, and only 28 from the survey. I know no error on the side of excess, except in Trinity parish, where a new street has been inhabited only six years. This circumstance will clearly occasion this district to appear in Table VII. more healthy than the truth.

In estimating the health of the district which belongs to the Cathedral, because it appeared so very extraordinary, particular care was taken to ascertain the exact truth. As some of these houses have not been built the whole period included in this calculation, more than a proportionable allowance of death is made for this deficiency.

In order to exhibit a just and most striking view of the health of Chester, especially the center, beyond other places both of town and country, the reader is particularly requested to compare the seventh with the eighth table.

table. The seventh table is composed by finding the proportion of inhabitants in the different parishes separately and together in the fifth, to the burials for ten years recorded in the sixth table. In the seventh table the mortality of whites in Jamaica is taken from Dr. LIND; of Liverpool and Manchester from Drs. ENFIELD and PERCIVAL, who directed particular surveys of those towns; of the other places, both town and country, from Dr. PRICE: so that no facts can be ascertained on more respectable authorities. That the inhabitants of Chester should have near an equal chance of living to twice the age of the inhabitants of Vienna, London, or Edinburgh; and that no large town, as far as inquiries have been hitherto made, should approach to a nearer proportion of longevity than as 28 to 40, are astonishing facts. The center is by far the most salubrious part of the city; the average of deaths within the walls is only 1 in 58, a degree of longevity much superior to what in general is recorded even of the country. The parishes which include the suburbs, *viz.* St. Oswald's, John's, Mary's, and Trinity, are of the largest size, and comprehend many central parts of the town which are undoubtedly as healthy as any of the rest, but they also contain all the out-skirts, which consequently must be much more unhealthy than appears to be the general average of deaths

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in those parishes. It has been suspected, as a reason why the central parishes appear most healthy, that more who die in the city may be buried in the suburbs than the contrary; and, as a reason why the whole town appears so healthy, that more persons who die in it may be buried in the country than the contrary; but on strict inquiry I can find no foundation for either supposition. The extent of the survey both in each parish, and in the town in general, corresponds with much exactness with the extent of the register. However it must be confessed, that there is one circumstance which makes the center appear more healthy than the suburbs, though it rather tends to prove the reverse. The central parishes have a smaller proportion of inhabitants in the weakest period of life, or under the age of 15. The number under 15 in these parishes is 888; whereas, had it borne the same proportion to the whole number that it bears in the town in general, it would have been 1067. But this consideration could only reduce the average of deaths from 1 in 53 to 1 in 55; so that, making all due allowance of this account, the center is still proved to be remarkably the most healthy.

There is one probable cause that renders the suburbs more unhealthy than the rest of the town. A part of the putrid filth, which flows from the center to the circum-

ference, stagnates in the ditches of the suburbs, viz. the Headlands, Barker's-lane, Horn-lane, and Greg's-pit, in John's parish; Fluckerbrook and Cow-lane, in Ofwald's parish; Nun's-lane and garden, Skinner's-lane and Styelane, in Mary's parish; the Sluices and the Rood Eye, in Trinity parish. There is not one instance of stagnant water within the city walls, except in Nun's-lane and garden. As there is a sufficient declivity from all these ditches into the river, it would be a very easy and most salutary improvement to drain them perfectly, and seems highly to deserve the attention of our magistrates. The ancients were particularly attentive to such regulations, as appears from a letter of the younger Pliny to Trajan. *Amastrianorum civitas, domine, et elegans et ornata, habet inter præcipua opera pulcherrimam, eandemque longissimam plateam: cujus a latere per spatium omne porrigitur nomine quidem flumen, re vero cloaca fœdissima: quæ sicut turpis, et immundissima aspectu, ita pestilens est odore terribissimo. Quibus ex causis, non minus salubritatis quam decoris interest eam contegi.*

By the induction of numerous facts, two principal sources of continued fevers have been discovered, that is, the contagion of human effluvia, and of marsh miasmata: the latter is distinguished by frequently assuming an intermittent type, or changing into a dysentery. It may be doubted, to which kind of pestilence

lence the putrid ditches of towns belong. From this filth being chiefly of animal origin, and from the absence of both intermittents and dysenteries, even in their neighbourhood at Chester, I should conclude that they produce the same kind of fevers as human contagion: and yet I doubt, whether the agues and dysenteries of Edinburgh can probably be attributed to any other cause, unless the frequent fogs of that place, or *miasmata* from the north loch, and from the moist foundation of the houses in the Cowgate, &c. where there was formerly a loch, may be supposed to produce such an effect.

Another reason of greater mortality in the suburbs seems to be, that their inhabitants in general are of the lowest rank: they want most of the conveniences and comforts of life: their houses are small, close, crowded, and dirty: their diet affords very bad nourishment, and their cloaths are seldom changed or washed. These parts of the town are supplied less plentifully than the rest with water. The air they breathe at home is thus rendered noxious by respiration and putrefaction. These miserable wretches, even when they go abroad, carry a poisonous atmosphere round their bodies that is distinguished by a noisome and offensive smell, which is peculiarly disgusting even to the healthy and vigorous, exciting sickness and a sense of general debility. It cannot,

therefore, be wonderful that diseases should be produced where such poison is inspired with every breath. This noxious air is the most frequent cause of malignant fevers. In these poor habitations, when one person is seized with a fever, others of the family are generally affected with the same fever in a greater or less degree. This dreadful consequence is naturally to be expected, as putrid steams arising from the diseased body are added to the other increasing causes that produce noxious air.

If a regulation could be universally adopted of immediately removing out of the family such of the poor people as are seized with fevers, it is evident that the most salutary consequences would follow. Reasonable objections might be made to receiving such patients into the general infirmary, even into separate wards, lest the infection should spread through the whole house, which in a former paper on this subject was proved to be healthy to an uncommon degree when compared with other hospitals. But might not this and every other objection be obviated by erecting, on the ground which adjoins and belongs to the infirmary, a building, to be divided into spacious, airy, separate apartments, where patients infected with fevers, and properly recommended, might be received on any day of the week? Besides medical assistance, they would here enjoy clean linen,

linen, airy rooms, careful attendance, and wholesome diet.

Towards the latter end of August there appeared a fever which from its frequency might be called epidemic. It was preceded by sultry weather, and commenced immediately after a strong gale of wind from the west on the 17th, succeeded by eight fair days. It has been remarked by Dr. STEDMAN, that storms prevent epidemics. I would not alledge this as an instance to refute the ingenious observation: but the want of rain during, and eight days after, the high winds, was perhaps the cause why they produced a pernicious rather than a salutary effect. The admirable discovery of Dr. PRIESTLEY, that water corrects and purifies air rendered noxious by respiration and putrefaction, makes this conjecture extremely probable.

From the fifth table it appears, that this fever attacked 285, and was fatal to 28, that is, to 1 in 10. It had the common symptoms of malignant fevers produced by human effluvia, and particularly affected the head with pain, giddiness, and delirium. This fever attacked in general the lowest, few of the middle, and none (or only one) of the highest rank. Among the poor, when one was seized, the rest of the family suffered more or less with like symptoms; but in no instance did any
marks

marks of infection appear, even in the nurseries, where the patients enjoyed the comforts of clean linen and airy rooms.

Antimonial of various kinds were given at different periods of the fever. They rendered the pulse less frequent in some instances, if reckoned immediately after the operation, but in very few cases produced any lasting abatement of symptoms. After a full effect of the antimonials, the Peruvian bark was given in a considerable quantity; but it neither abated nor aggravated the fever. The remedy of most manifest service in this epidemic was topical evacuations from the head by leeches and blisters.

From the second table it appears, that there were four fatal instances of the puerperal fever in 1774; a disease which frequently occurred this year, though I had never before seen it in Chester, during seven years practice.

In making the general survey of the town, particular inquiries were made concerning the proportional fatality of the natural small-pox, in order to demonstrate the advantages of inoculation, and to discover at what age this operation should be performed that it may become the most extensively beneficial to society. The proportion of deaths by the natural small-pox to all the deaths this year is 1 to 2 and 7-10ths. From the fifth table it is evi-

dent that 1060 have never had the small pox out of 14713 inhabitants, that is 1 in 14.

The facts recorded in Table IV. seem to determine the age when children should be inoculated in order to secure the greatest possible benefit to mankind. It appears here, that under one month old not one died of the small-pox; that, under six months old only 7 out of 202; and yet that above a quarter of the whole died under one year old. My ingenious friend Dr. PERCIVAL first discovered at Manchester the fatality of the small-pox in early infancy, which induced him with much candour and good sense to correct a former opinion on this subject founded on the greater safety of inoculation in children a few years old. Indeed, where children can be secured from all danger of the natural infection, the greater hazard to young infants from inoculation will be a sufficient reason to defer the operation for three or four years. The small-pox was fatal to 22 males and 29 females under one year old, that is, to seven more females. This fact confirms what Dr. PERCIVAL observed at Manchester. The epidemic small-pox began near the summer, and almost ended at the winter solstice, only 19 remaining ill of the disease in January 1775, when the general survey was taken.

Dr.

Dr. PRICE, in his excellent observations on annuities, has adduced numerous facts to prove that women live longer than men. These tables afford many confirmations of the remark. There died this year, under 20 years old 162 males and 149 females, that is, a majority of 13 males; 52 husbands and 50 wives, that is two more husbands; 28 widowers and 48 widows, which is only a majority of 20 widows; though by the general survey, Table v. there are in Chester 258 widowers and 736 widows, or near three times the number. The total of males is 6697, of females 8016, hence there is 1319 or nearly a fifth majority of females: it may not be improper also to observe, that the women, especially in the higher and middle ranks of society, are remarkably beautiful. These facts clearly prove, that the manners and situation of Chester are peculiarly favourable to the female constitution.

Other observations may be deduced from these tables, which confirm, correct, or illustrate, various questions of importance to society. The number of married persons in Chester is 4881, of unmarried 9832, that is, nearly one-third is married, which is a common proportion. Upwards of one-half of the inhabitants above 15 years old are or have been married, the proportion being as 4 to 7. Though Chester is so uncommonly healthy, yet this,
like

like most other great towns, is unfavourable to population. Thus it appears, from the general bill for ten years, that, on an average, one marriage produces less than three children. One cause of this small proportion is probably the want of manufactures, which might enable the lowest class of people to marry in earlier youth: taking the whole town, the number of persons in each family is 4 and 1-3d. The inhabitants under 15 years old are 4486, that is, more than a third. The proportion of deaths this year to the number of inhabitants is nearly at 1 to 27: this difference from the common degree of health is occasioned by the unusual fatality of the small-pox. Table III. shews that the greater mortality of the summer than the winter quarter of 1774 was occasioned by the epidemic small-pox, which began in July: yet still that winter and autumn taken together were more fatal than the spring and summer in the proportion of 326 to 220, that is, near one-sixth more died in the former than in the latter portion of time.

There is a general prejudice in Chester, that it is unhealthy to inhabit the Rows; a prejudice most clearly refuted by many of the preceding observations. The Rows run along the central streets, which include incomparably the most healthy part of the town.

That the center is the most healthy part of the city; that a less proportion die annually here than in most country villages; and, as far as observations have hitherto been made, that it is probably as healthy as any spot upon earth, are surprizing facts: yet these facts are clearly evinced by the united evidence of six separate districts taken on a medium of ten years. Some conjectures, supported by a few facts, are hazarded concerning the cause of unhealthiness in the suburbs. Future observations of a like kind, in different situations, will confute or confirm these conjectures, which, if true, may be of great importance to society by discovering and avoiding the source of disease. Towns divided and numbered in separate districts, compared with their respective registers, and illustrated with a description of every circumstance peculiar to each, that may be supposed to influence health, might, by a numerous induction of facts, lead to a certain investigation of the cause that renders towns so generally unhealthy. A diligent and sagacious attention to this subject might produce a discovery how to make towns as healthy as the country: a discovery of the most beneficial consequence in this age of elegant refinement which collects the greatest part of mankind into large towns.

TABLE I. Deaths, Ages and Conditions.

Ages.	Males.	Females.	Ages.	Batches.	Husbands.	Widowers.	Maids.	Wives.	Widows.	Total.
Under 1 month —	11	6	20-25	6	2		6	2		16
Between 1—2 months	9	8	25-30	5	2	1	3	11		22
2—3	4	1	30-35	2	3		3	4	1	13
3—6	9	5	35-40	3	4	1		5		13
6—9	16	10	40-45	2	3	2	2	6	2	17
9 months and 1 year	7	19	45-50		4			3	2	9
1-2 years old	30	22	50-55		4	2	2	5	2	15
2—3	19	16	55-60	2	6	3	2	5	1	19
3—4	24	22	60-65	3	7	1	4	3	4	22
4—5	7	9	65-70	1	7	2	2	1	5	18
5—10	18	12	70-75	2	6	1	4	1	9	23
10—15	1	4	75-80		3	6		3	5	17
15—20	7	5	80	1		2			4	7
Total	162	149	81			3			2	5
			82			1			3	4
			83			1			2	3
			84				2	1	2	5
			85						1	1
			86		1	1				2
			87						1	1
			88			1				1
			89							
			90						2	2
			Total	27	52	28	30	50	48	235
										162
										140
										546

T A B L E III.

Total of Deaths.				Deaths by Small-pox.			
Winter	107	46	- - -	January	- - -	0	1 - Winter.
		30	- - -	February	- - -	1	
		31	- - -	March	- - -	0	
Spring	90	25	- - -	April	- - -	0	6 - Spring.
		30	- - -	May	- - -	3	
		35	- - -	June	- - -	3	
Summer	130	32	- - -	July	- - -	11	65 - Summer.
		53	- - -	August	- - -	26	
		45	- - -	September	- - -	28	
Autumn	219	69	- - -	October	- - -	46	130 - Autumn.
		76	- - -	November	- - -	44	
		74	- - -	December	- - -	40	
<hr/> Total 546				<hr/> Total 202			

*Igitur saluberrimum ver est: proximè deinde ab hoc
 biems: periculosior æstas: autumnus longè periculossimus.*
 CELS. lib. II. c. I.

T A B L E IV.

Deaths by the small-pox under one year old.

	Males.	Females.	Total.
Under 1 month	0	0	0
Between 1 and 2 months	1	1	2
2 and 3	1	0	1
3 and 6	2	2	4
6 and 9	12	10	22
9 months and 1 year	6	16	22
Total	22	29	51

TABLE

T A B L E II. D I S E A S E S.

I. FEBRILE DISEASES.	Under 1 year.	Betw. 1 and 2	2—3	3—5	5—10	10—15	15—20	20—30	30—40	40—50	50—60	60—70	70—80	80—90	90— 100	Total.
Fever (Gen. 5, 6.)	1	1			5		3	11	3	3	4	4				35
Puerperal fever (5.)								3	1							4
Mortification (7.)					1					1	1	3				6
Sore-throat (10.)		1		3					1							5
Inflam. of the bowels (16.)											1					1
Gravel and stone (19.)												1				1
Teething (Sauv. 198.)	3	1														4
Rheumatism (22.)											1					1
Gout (23.)												1				1
Natural small-pox (26.)	51	38	42	49	22											202
Miliary fever (29.)									1	1						2
Consumption (35.)			1	1		1	8	11	9	12	6	5				54
Hæmorrhage (puerperal) (37.)								2								2
II. NERVOUS DISEASES.																
Apoplexy and sudden death (40?)								2			1		2			5
Palsy (41.)										1	2		4			7
Indigestion (43.)									1		1					2
Locked jaw (46.)									1							1
Convulsion (48, 50.)	37	11		6	1	1					1					57
Asthma (52.)										1	6	6	3			16
Colic (55.)						1										1
Infancy (63.)												1				1
III. DISEASES of the HABIT.																
Weakness of infancy (65.)	13		2	1		1										17
Decay of age (66.)											2	14	25	29	2	72
Dropy (71, 75.)					1			1	5	1	5	1				14
Dropy of the brain (72.)						1										1
Dropy of the chest (74.)											1					1
Venereal disease (81.)								1								1
Jaundice (87.)								1	1							2
IV. LOCAL DISEASES.																
Cancer (114.)											1	1				2
Rupture (124.)													1			1
Inv. uterus (puerperal) (125.)									1							1
Fistula (128.)								2								2
Ulcer (128.)										1						1
Unknown disease				1				1	2	5		2	4			15
Casualty				1			1	3			1	1	1			8
Total	105	52	45	62	30	5	12	38	26	26	34	40	40	29	2	546

T A B L E V.

State of population, small-pox, and Fevers, in 1774.

Parishes.	Families.	Inhabitants.	Males.	Females.	Married.	Widowers.	Widows.	Under 15 years old.	Above 70 years old.	Recovered small-pox in 1774.	Dead of small-pox in 1774.	Ill of small-pox in Jan. 1775.	Not had small-pox in Jan. 1775.	Recovered fever in 1774.	Dead of fever in 1774.	Ill of fever in Jan. 1775.
St. Oswald's,	924	4027	1421	1340	64	189	1302	143	321	40	5	350	58	2	1	
John's,	774	3187	1411	1776	51	190	970	153	284	52	6	218	55	4	3	
Mary's,	583	2392	1097	1295	892	41	89	805	100	240	45	3	205	70	5	8
Trinity,	330	1605	730	875	485	43	95	521	65	127	24	3	97	9	—	1
Peter's,	193	920	414	506	267	8	28	221	43	52	6	—	39	15	1	3
Bridget's,	154	623	283	340	218	7	27	170	26	52	6	1	35	4	2	—
Martin's,	154	611	280	331	230	12	30	164	30	47	18	—	35	9	3	5
Michael's,	135	575	239	336	152	22	40	130	30	15	2	—	31	4	2	—
Olave's,	134	536	246	290	194	4	37	185	21	42	8	1	43	22	9	3
Cathedral,	47	237	83	154	46	6	11	18	14	3	1	—	7	1	—	—
Total	3428	14713	5697	8016	4881	258	736	4486	625	1183	202	19	1060	257	28	24

T A B L E VI.

*General bill of the several parishes for ten years, viz. from
1764 to 1773 inclusively.*

			Chr.	Bur.	Mar.
St. Ofwald's,	. . . . .		949	1053	456
Mary's,	. . . . .		820	795	294
John's,	. . . . .		939	892	271
Peter's,	. . . . .		246	149	75
Trinity,	. . . . .		445	394	127
Olave's,	. . . . .		173	96	29
Michael's,	. . . . .		158	115	56
Bridget's,	. . . . .		131	110	69
Martin's,	. . . . .		101	103	50
Cathedral,	. . . . .		8	24	0
Total			<hr/> 3970	<hr/> 3731	<hr/> 1427
General Bill for	} males,	226	421	546	141
the year 1774,		195			

TABLE

T A B L E VII.

The numbers that die annually in the several parishes, taken upon an average of ten years, viz. from the year 1764 to 1773 inclusively.

St. Mary's,	. . . . .	1 in 30
Ofwald's,	. . . . .	1 in 36
John's,	. . . . .	1 in 36
Trinity,	. . . . .	1 in 41
Michael's,	. . . . .	1 in 50
Olave's,	. . . . .	1 in 55
Bridget's,	. . . . .	1 in 56
Martin's,	. . . . .	1 in 59
Peter's,	. . . . .	1 in 61
Cathedral,	. . . . .	1 in 87
The whole town,	. . . . .	1 in 40
The parishes within the walls, <i>viz.</i> Michael's,		} 1 in 58
Olave's, Bridget's, Martin's, Peter's, and Ca-		
thedral,		

T A B L E VIII.

*The proportionable number of inhabitants that die annually
in the following places.*

Whites in Jamaica,	. . . . .	1 in 5
Vienna,	. . . . .	1 in $19\frac{1}{2}$
London,	. . . . .	1 in $20\frac{3}{4}$
Edinburgh,	. . . . .	1 in $20\frac{4}{5}$
Leeds,	. . . . .	1 in $21\frac{3}{5}$
Dublin,	. . . . .	1 in 22
Rome,	. . . . .	1 in 23
Amsterdam,	. . . . .	1 in 24
Breslaw,	. . . . .	1 in 25
Berlin,	. . . . .	1 in $26\frac{1}{2}$
Northampton,	. . . . .	1 in $26\frac{1}{2}$
Shrewsbury,	. . . . .	1 in $26\frac{1}{2}$
Liverpool,	. . . . .	1 in $27\frac{1}{2}$
Manchester,	. . . . .	1 in 28

Country parishes.

Pais de vaud,	. . . . .	1 in 45
Country parishes in Brandenburg,	. . . . .	1 in 45
Others in Brandenburg,	. . . . .	1 in 50
A country parish in Hampshire for 90 years,	. . . . .	1 in 50
Island of Madeira,	. . . . .	1 in 50
Stoke Damerel in Devonshire, for one year,	. . . . .	1 in 54

