

See Pg 12  
ON  
14  
SOME IMPORTANT RELATIONS

BETWEEN

CENSUS STATISTICS AND SANITARY STATISTICS.

BY

THOMAS W. GRIMSHAW, M.A., M.D.;

FELLOW OF THE KING AND QUEEN'S COLLEGE OF PHYSICIANS;

REGISTRAR-GENERAL FOR IRELAND,

ETC., ETC.

Reprinted from the Transactions of the Academy of Medicine in Ireland.

DUBLIN:

PRINTED FOR THE AUTHOR

BY JOHN FALCONER, 53, UPPER SACKVILLE-STREET.

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It is often said that statistics can prove anything, and there can be little doubt that statistics have been so often employed for purposes for which they never were compiled, and figures, collected with one object, have been so often used to illustrate another, that this charge has considerable foundation, in the fact that they are frequently misused in the way indicated, and have consequently fallen into disrepute.

In using census statistics as standards whereby to calculate or measure death-rates, and thus estimate the sanitary condition of the people, many fallacies are likely to arise. I do not propose to deal with all or many of these. There are, however, one or two which are of primary importance. The first is that of striking death-rates for the general population. The usual method of striking death-rates is to estimate the population according to the increase or decrease between two census periods, thus fixing an estimated population for the middle of the year, and calculating the death-rate for the whole year and each part of the year according to that standard. Now, taking very large populations over very large areas, with varying conditions in different parts of such areas, this is probably a fair method of proceeding, especially where there is an increasing population; but, on the other hand, if the population is a comparatively small one—say, a quarter of a million or half a million in an increasing town—or if the population of the whole country (as in



Ireland) is decreasing, the estimate may be very fallacious. In a paper recently published by Dr. Russell, Medical Officer of Health of Glasgow, entitled "The Decennial Census as a Basis for the Statistics of intervening Years, illustrated by the case of Glasgow, &c.," this is forcibly pointed out. Dr. Russell shows that while the census enumeration of 1881 gave the population of Glasgow as 511,520, an estimate made by Dr. Russell placed it at 538,128, or 26,608 more; while the Registrar-General for Scotland estimated it at 601,266, or 89,851 more than it actually was. Thus the death-rate of Glasgow had for many years been published at a lower rate than it actually was. The Registrar-General for Scotland estimated the population by the usually recognised method of taking the rate of increase between 1871 and 1881. The method of the Medical Officer, on the other hand, was "to ascertain from the number of houses inhabited by the census population the average number of inhabitants per house, and then in each succeeding inter-census year, to apply this average as a multiplier to the number of inhabited houses for that year." Dr. Russell points out that these are the only two available methods of making estimates. Let us see how far this method is applicable to Dublin. The population of the Dublin registration district between 1861 and 1871 was practically stationary; therefore no estimate could be founded on census statistics. There was no available record of inhabited houses, and therefore no estimate could be made; but at the census of 1881 the houses were enumerated as usual. The result proves that in the Dublin registration district, if the number of inhabited houses had been known in 1881, before the census enumeration, a fair estimate of the population could have been made. Thus in 1871 there were 37,349 houses, with an average of 8.93 persons per house. In 1881 there were 39,513 houses. An estimate of the population in 1881, founded on the number of houses and the population per house in 1871, would have given the number 352,851, while the enumerated population was 346,693, or 6,158 less than the estimate, the actual average number of persons to a house in 1881 being 8.77. It will be observed that the error is in the same direction as that of Dr. Russell, the reason



of the error being evidently that there is an increased tendency among Dublin people to obtain better house accommodation. This is also shown in the decrease of persons living in fourth class accommodation in Dublin in 1881, as compared with 1871. If we turn to Belfast, a rapidly increasing town, we find that, although not giving so close an approximation as for Dublin, the method would have been more accurate than estimating by the rate of increase between 1861 and 1871. Thus, if the population of Belfast in 1881 were estimated according to the rate of increase between 1861 and 1871, we have the following:—Population in 1861 was 121,602, in 1871 it was 174,412, the rate of increase was 43·43 per cent. Estimated at this rate the population in 1881 should have been 250,159, but it actually was 208,122, or 42,039 less. If, however, we estimate by the number of inhabited houses, we find that in 1871 the number of inhabited houses was 27,691, or 6·3 persons per house. In 1881 the number of houses was 34,982, and if the population were estimated at the rate per house of 1871 it should have been 220,386, or 12,264 over the actual number. The error here also is in the same direction as that of Dr. Russell; in Belfast the case is much more striking than in Dublin, for the population was increasing in the former between 1861 and 1871, whereas in the latter it was stationary. If we test the question by statistics of English and Scotch towns, we find, in England, that in twenty towns, where an estimate founded on the census increase of 1861–1871 was made, the total population was estimated at 7,616,417 in the middle of the year 1881, whereas the estimate formed on the census of 1881 was 7,610,217, or 6,200 less. This is not much of an error in so large a number, but if we look at the accompanying table it will be seen that in London there was an error of 124,589, the population being greater than the estimate founded on the increase of the decade of 1861–71. On the other hand, in Sheffield there was an error of 27,324 in the opposite direction. In Salford, where an attempt was made to revise the estimate by the ascertained number of inhabited houses, the estimate was 16,315 more than it should have been; whereas in Nottingham, where a similar correction was made, the error was 10,000 in the opposite direction.

*Discrepancies between the Estimates of Population in the middle of the Year 1881 of the English Towns included in the Weekly Returns of the Registrar-General for England, as calculated (1) on the Rates of Increase between 1861 and 1871,<sup>a</sup> and (2) on the Numbers enumerated in April, 1881.*

Cities and Boroughs	POPULATION IN MIDDLE OF 1881		Difference shown by Calculation No. 2 when compared with No. 1	
	1.	2.		
	Calculated at rate of increase between 1861 and 1871. <sup>a</sup> (From Return for Week ending 15th January, 1881)	Based on Numbers enumerated in April, 1881. (See Annual Sum- mary London, &c.)	+	-
In 20 Towns, -	7,616,417	7,610,217	-	6,200
London, - -	3,707,130	3,831,719	124,589	-
Brighton, - -	109,062	107,953	-	1,109
Portsmouth, - -	136,671	128,372	-	8,299
Norwich, - -	86,437	88,037	1,600	-
Plymouth, - -	75,700	73,925	-	1,775
Bristol, - - -	217,185	207,522	-	9,663
Wolverhampton, -	76,850	75,963	-	887
Birmingham, - -	400,680	402,314	1,634	-
Leicester, - - -	134,350	123,146	-	11,204
Nottingham, - -	177,964	187,964	10,000	-
Liverpool, - - -	549,834	554,073	4,239	-
Manchester, - -	364,445	341,173	-	23,272
Salford, - - -	194,077	177,762	-	16,315
Oldham, - - -	119,658	112,176	-	7,482
Bradford, - - -	203,544	184,035	-	19,509
Leeds, - - -	326,158	310,483	-	15,675
Sheffield, - - -	312,943	285,619	-	27,324
Hull, - - -	152,980	155,122	2,142	-
Sunderland, - -	118,927	117,048	-	1,879
Newcastle-on-Tyne,	151,822	145,811	-	6,011

<sup>a</sup> Except for Nottingham, Salford and Oldham, which were "based upon special returns of inhabited houses existing within those boroughs."



In the eight principal towns of Scotland, with a population of 1,206,057, there was an error of 110,980 in the estimate, founded upon the increase of 1861–71, as compared with the ascertained increase, 1871–81, the error being in excess of the actual population. The population of four towns was estimated at too high, and that of the other four at too low a rate.

#### ★ EIGHT PRINCIPAL TOWNS IN SCOTLAND.

*Discrepancies between the Estimates of Population in the middle of the Year 1881, as adopted by the Registrar-General of Scotland before the taking of the Census, and those deduced by him from the “unrevised” Census Returns.*

TOWNS	POPULATION IN MIDDLE OF 1881		Difference shown by Calculation No. 2 when compared with No. 1	
	1.	2.		
	Adopted before date of Census. (From Return for Week ending 12th February, 1881)	Based on unrevised Census figures. (From Return for Week ending 31st December, 1881)	+	—
8 Principal Towns in Scotland, - -	1,317,037	1,206,057	-	110,980
Glasgow, - -	601,266	512,034	-	89,232
Edinburgh, - -	233,666	229,030	-	6
Dundee, - - -	159,341	143,045	-	16,296
Aberdeen, - -	105,212	105,515	303	-
Greenock, - -	81,826	69,141	-	12,685
Paisley, - - -	49,087	55,841	6,754	-
Leith, - - -	59,958	61,607	1,649	-
Perth, - - -	26,681	29,844	3,163	-

In Ireland no attempt was made to estimate the population, and the error was 49,362 in the total of sixteen towns—eight towns being under and eight over the numbers used for calculating the death-rates.

## SIXTEEN TOWN DISTRICTS IN IRELAND.

*Differences between the Population in 1871 (adopted in Weekly Returns up to Week ending 11th June, 1881) and the Population according to the Census of 1881.*

TOWNS AND DISTRICTS	POPULATION		Increase or Decrease between 1871 & 1881	
	In 1871	In 1881	Increase	Decrease
Total of 16 Town Districts,	794,732	844,094	49,362	-
Dublin Registration District,	333,401	346,693	13,292	-
Urban Sanitary Districts :				
Belfast, - - -	174,412	208,122	33,710	-
Cork, - - -	78,642	80,124	1,482	-
Limerick, - - -	39,353	38,562	-	791
Londonderry, - -	25,242	29,162	3,920	-
Waterford, - - -	23,349	22,457	-	892
Galway, - - -	15,597	15,471	-	126
Drogheda, - - -	13,510	12,297	-	1,213
Newry, - - -	13,364	14,808	1,444	-
Kilkenny, - - -	12,710	12,299	-	411
Wexford, - - -	12,077	12,163	86	-
Dundalk, - - -	11,327	11,913	586	-
Sligo, - - -	10,670	10,808	138	-
Lurgan, - - -	10,632	10,135	-	497
Queenstown, - -	10,334	9,755	-	579
Clonmel, - - -	10,112	9,325	-	787

From the foregoing remarks it is clear that none of the plans followed for estimating populations is accurate.



YEARS	DUBLIN REGISTRATION DISTRICT				BELFAST				CORK			
	Births	Deaths	Excess of Births over Deaths	Population at end of Year	Births	Deaths	Excess of Births over Deaths	Population at end of Year	Births	Deaths	Excess of Births over Deaths	Population at end of Year
1871, part of	6,415	5,569	846	334,247	4,839	3,042	1,797	183,879	1,830	1,678	152	92,117
1872, -	8,499	8,973	-474	333,773	6,652	4,456	2,196	186,075	2,402	3,135	-733	91,384
1873, -	9,032	8,212	820	334,593	6,568	4,585	1,983	188,058	2,647	2,389	258	91,642
1874, -	8,903	8,190	713	335,306	6,677	5,195	1,482	189,540	2,371	2,203	168	91,810
1875, -	8,972	8,482	490	335,796	6,634	5,356	1,278	190,818	2,492	2,661	-169	91,641
1876, -	9,006	8,097	909	336,705	6,900	4,483	2,417	193,235	2,539	2,438	101	91,742
1877, -	9,325	8,795	530	337,235	6,567	5,055	1,512	194,747	2,525	2,388	137	91,879
1878, -	9,513	9,269	244	337,479	6,824	5,152	1,672	196,419	2,546	2,464	82	91,961
1879, -	9,993	11,235	-1,242	336,237	6,987	5,608	1,379	197,798	2,707	2,689	18	91,979
1880, -	10,060	11,308	-1,248	334,989	6,946	5,340	1,606	199,404	2,620	2,837	-217	91,762

Now turning especially to Ireland, I find, as stated in my Quarterly Report for the second quarter of 1881, that—

“A review of the populations of the large towns of Ireland, as enumerated on the 3rd of April last, shows that in Dublin, Belfast, Cork, Londonderry, Newry, and Dundalk, the populations were understated in the publications already referred to, and therefore the birth and death-rates over-estimated; that there is no appreciable change in Galway, Wexford, or Sligo, and that in Limerick, Waterford, Drogheda, Kilkenny, Lurgan, Queenstown, and Clonmel, the populations were overstated, and therefore the birth and death-rates were under-estimated.

“The cases of Dublin, Belfast, and Cork, serve to illustrate this point. The published birth and death-rates for these three towns have hitherto been calculated on the population of 1871.

“An attempt to estimate their population would have given the results shown on p. 9, if no allowance had been made for immigration.

“Now, between 1861 and 1871 the populations of Cork and Dublin were practically stationary, and, therefore, populations as above noted during that decade would have probably proved correct, if the means of making such estimates had been available.

“The result of the late census shows that in the case of Cork there has been a slight increase in the population, but it is practically stationary, and a comparison between the estimated population as given above and the enumerated population shows a discrepancy of only 16 persons. It therefore appears that the birth and death-rates of Cork have been rightly stated in all the published reports. In the cases of Dublin and Belfast the matter is different, as the natural increase of population in Dublin, calculated as above, would have left it practically stationary, leaving an increase of but 742 in the decade, owing to the low birth-rate and high death-rate in the district. There is, however, in the Dublin district an increase of 13,536 above this estimate, owing to immigration. In Belfast, where the death-rate is not so high as in Dublin, the natural increase would have been 5,525 according to the above method of estimating, but here there is again a discrepancy of 19,596 owing to immigration.”

Even in large populations an error may arise if we trust to



estimated rates according to increase or decrease. It would appear from the following table that the population of Ireland absolutely increased in the years 1876 and 1877. This estimate is formed by adding the number of registered births to the population, and subtracting the numbers of deaths and emigrants. The increase in 1876 was 10,558; in 1877 it was 7,613.

“The population of Ireland, estimated according to the plan pursued since 1871, was, to the middle of 1881, 5,294,436, whereas the enumerated population, according to the recent census (compiled from the enumerators’ returns) was 5,159,839, showing a discrepancy of 134,597, or 2·6 per cent. The following statement shows the population, estimated by adding the births in 1871 to the enumerated population of 1871, and subtracting the deaths and emigration.”

YEAR	Population <sup>a</sup> at beginning of Year	Births	Deaths	Emigra- tion	Total of Deaths and Emigration	Excess of Deaths and Emigration over Births	Population at end of Year <sup>a</sup>
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1871, part of,	5,412,377 <sup>a</sup>	109,740	61,928	59,885	121,813	12,073	5,400,304
1872, - -	5,400,304	149,278	97,294	78,102	175,396	26,118	5,374,186
1873, - -	5,374,186	144,377	97,537	90,149	187,686	43,309	5,330,877
1874, - -	5,330,877	141,288	91,961	73,184	165,145	23,857	5,307,020
1875, - -	5,307,020	138,320	98,114	51,462	149,576	11,256	5,295,764
1876, - -	5,295,764	140,469	92,324	37,587	129,911	-10,558 <sup>c</sup>	5,306,322
1877, - -	5,306,322	139,659	93,543	38,503	132,046	-7,613 <sup>c</sup>	5,313,935
1878, - -	5,313,935	134,117	99,629	41,124	140,753	6,636	5,307,299
1879, - -	5,307,299	135,328	105,089	47,065	152,154	16,826	5,290,473
1880, - -	5,290,473	128,610	102,955	95,517	198,472	70,462	5,220,011
1881, part of,	5,220,011	31,527	28,736	10,108	38,844	7,317	5,212,694 <sup>b</sup>

<sup>a</sup> The population entered for 1871 in column 2 is that shown by the census for that year; the figures for the end of the years 1871-80 are those arrived at by the means stated in the above remarks.

<sup>b</sup> At close of first quarter, estimated as above.

<sup>c</sup> In each of the years 1876 and 1877 the number of births registered exceeded the number of deaths registered and emigrants.



The conclusion which I arrive at from the foregoing considerations is, that none of the methods at present in use is sufficiently reliable for the purpose of health statistics; the least fallacious being the estimate founded on the average numbers of presumed occupants of inhabited houses. I have therefore arrived at the conclusion that in order to keep death-rates absolutely accurate, it will be necessary to collect facts more frequently than is usually done, and each sanitary authority should ascertain for itself the number of residents within its district at intervals much more frequent than the decennial periods. I believe that each year an estimate might be founded on the known number of inhabited houses, and in alternate years, or at triennial periods, a simple enumeration of the population might be made, not such as is taken at the census, but merely the few facts that are necessary for the striking of death-rates and for the estimation of water-supply, &c., which are so important to sanitary authorities.

The second point to which I wish to draw attention is the great importance, from a sanitary point of view, of having the population statistics arranged by social classes, so that we may have, as it were, a social stratification of society. Hitherto census statistics have not been arranged upon this basis. No doubt at each decennial enumeration the occupations of the people are carefully inquired into, and the information arranged in elaborately constructed tables. The classification under which these tables are drawn up is, however, altogether based on what may be termed economic or trade principles. It is, no doubt, a matter of the utmost importance to the State to know how many persons are engaged in each branch of industry, and to ascertain in what part of the kingdom the largest number of people are engaged in any particular manufacture. In fact, without such information statesmen would be at fault when engaged upon many important legislative measures. The result, however, of this arrangement is to throw together in one class or order a large number of persons varying much in social rank—thus great factory owners, their managers, foremen, artisans, and workmen, all appear together under one head. Now, if we were to attempt to strike a death-



rate for any particular trade, and compare it with the death-rate of some other trade, the result would be fallacious, as it would greatly depend upon the proportion of superior and inferior employees in each trade respectively. Again, in dealing with this question from a sanitary point of view, we find that the census statistics have not hitherto given the number of persons dependent on each trade for subsistence, as the wives and families of employed persons are omitted from the tables unless they themselves are employed at specific occupations. In dealing with comparative mortality statistics these difficulties have been long felt by sanitarians, and hence some sanitary authorities published the occupation of the deceased in their mortality tables. This has been done for many years by several local authorities, by grouping the occupations into social classes; but then without the population in each class it was impossible to know the force with which the death-rate fell upon each class. For some time past I have adopted the system of publishing the occupation of the deceased for each week for the Dublin district, and I believe this system has been attended with benefit by roughly indicating the classes of the community where deaths are most numerous. I refer to one example. Anyone who has carefully observed the weekly lists published by my department must have noticed the enormous mortality among the labouring class. Some years ago, before I was appointed to the office which I have now the honour to fill, I called the attention of the Dublin Sanitary Association to this question, and suggested that on the approach of the census for 1881 they should memorialise the Irish Government with the view of having a social census table constructed for Dublin. This was accordingly done, and the result is shown in Tables 87, 88, 89 of the General Report of the Census Commissioners of Ireland for 1881. In these tables the population is given, by age, sex, and social position, of every inhabitant of the Dublin registration district; all persons dependent on each occupation are added together, and the total given. Thus, for example, the number of carpenters, carpenters' wives and carpenters' children are given, and these again being added together give the total number of persons dependent on carpentering, and occupying the social



position of a working carpenter. We can thus strike a death-rate for carpenters as a distinct class of the community if we so desire.

Class	Occupation or Social Position <sup>a</sup>	Population in each Class and Group in 1881
	All Persons, - - - - -	346,693
	CLASSES.	
	Deaths in the Families of the—	
I.	PROFESSIONAL AND INDEPENDENT CLASS, -	30,129
II.	MIDDLE CLASS, - - - - -	56,761
III.	ARTISAN CLASS AND PETTY SHOPKEEPERS, -	106,142
IV.	GENERAL SERVICE CLASS, - - - - -	147,625
V.	INMATES OF WORKHOUSES, - - - - -	6,036
I.	PROFESSIONAL AND INDEPENDENT CLASS.	
	1. Clerical, Medical, Legal, and other Professions ; Naval and Military Officers, and Heads of Public Departments, - - - - -	8,728
	2. Merchants and Manufacturers, Higher Class, -	2,371
	3. Persons of Rank and Property not otherwise described, - - - - -	19,030
II.	MIDDLE CLASS.	
	4. General Body of Officials—Civil Service, Bank- ing, &c., - - - - -	5,138
	5. Traders (except Petty Shopkeepers), Business Managers, &c., - - - - -	18,207
	6. Clerks and Commercial Assistants, - - - - -	22,587
	7. Miscellaneous—including all Householders in 2nd Class Localities, not included in above, -	10,829
III.	ARTISAN CLASS AND PETTY SHOPKEEPERS.	
	8. Working Engineers, Engravers, Printers, Watch- makers, and Jewellers, - - - - -	7,863
	9. Building and Furnishing Trades, - - - - -	29,900
	10. Clothing Trades, - - - - -	30,299
	11. Food Supply Trades, - - - - -	7,082
	12. Other Trades and Callings ranking with Trades, -	23,536
	13. Petty Shopkeepers, - - - - -	7,462
IV.	GENERAL SERVICE CLASS.	
	14. Army, Police, Postal Delivery, and Prison Ser- vices, &c., - - - - -	13,335
	15. Domestic Servants, - - - - -	43,868
	16. Coach and Car Drivers, Vanmen, &c. - - - - -	9,486
	17. Hawkers, Porters, Labourers, &c., - - - - -	80,936
V.	INMATES OF WORKHOUSES.	
	18. Workhouse Inmates, - - - - -	6,036

<sup>a</sup> The 25,967 persons returned under the head "Unspecified," in Table 89 of the General Report on the Census, have been distributed *pro rata* among the several groups to which they most probably belonged.



In order to utilise this information in the direction in which it was intended, I have had a table (see page 14) drawn up and published in the weekly returns, showing in five general classes and eighteen groups the social position of the persons whose deaths are registered.

Although this table has been published for four weeks only, yet a glance at the statistics for this period will show how heavily the death-rate falls upon the lower strata of society. Thus we find that the mean rate of mortality for the four weeks in the total population was 30·6; while the corresponding rates for the several classes of the population were as follow:—Professional and independent class, 22·45; middle class, 25·4; artisan class and petty shopkeepers, 26·1; general service class and inmates of workhouses combined, 37·2. This has been only an experiment, but I hold that the object is so obviously good, and the value of the result likely to be so great, that it is a matter well worthy of consideration whether tables such as those added to the census report for Dublin at the request of the Dublin Sanitary Association should not become a regular part of the work of future censuses. A great many interesting questions will at once arise in the minds of sanitarians on the consideration of statistics such as the foregoing. It is evident that in certain ranks of society the death-toll is levied with a degree of severity quite inconsistent with our boasted civilisation and our national zeal for sanitary reform. Time, however, does not permit me to go into these matters in more detail, although the attraction to unravel the intricacies of the question is great. There are many other points arising out of census statistics which are of great interest from a sanitary point of view, which require great consideration, but which I cannot deal with here—such as the relative proportion at each age in the population of each district; the housing of the people not only in our great towns, but also in the rural districts, is a matter of extreme interest, especially in Ireland; and, to touch a burning question of the day, the means of subsistence of a large proportion of the population of Ireland, is a subject which cannot afford to be much longer neglected by sanitarians.

# Houses of the Oireachtas