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War and National Vital Statistical with Special Reference to the Franco-Prussian War

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Source: *Journal of the Royal Statistical Society*, Vol. 79, No. 4 (Jul., 1916), pp. 418-454

Published by: Wiley for the Royal Statistical Society

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WAR AND NATIONAL VITAL STATISTICS WITH SPECIAL REFERENCE
TO THE FRANCO-PRUSSIAN WAR.

By J. W. NIXON, B.Sc.

[Read before the Royal Statistical Society, May 16, 1916, the President,
The Right Hon. LORD GEORGE HAMILTON, G.C.S.I., in the Chair.]

1. THIS Paper consists chiefly of an attempt to trace the effect of the Franco-Prussian War upon the vital statistics of France, Prussia and neighbouring neutral States. Such subjects as mortality and sickness among troops, rates of recovery of wounded, &c., which I call for short, "direct" effects of war, are excluded, and I have confined myself to what I call "indirect" effects. I propose to ask how the civil population is affected in such matters as mortality, fertility, illegitimacy. Are the marriage-rate and infant mortality affected, and does the proportion of male births rise? It is not always possible to distinguish between these direct and indirect effects, especially among the male population. In the case of females, however, the direct effects are nil and hence, in the sections which follow, I have always where possible distinguished males and females.

2. I limit myself to the Franco-Prussian War in the first place because it was necessary to have statistics not only ample but also reliable—a condition which rules out the greatest of all past wars, the Napoleonic wars of 100 years ago; secondly, because it was advisable to choose a war which was waged at home—a condition which rules out the Crimean War and Indian Mutiny; and, thirdly, because it lasted sufficiently long to show definite effects—a condition which rules out the Austro-Prussian War which only lasted three months.

3. A concluding section deals with the present war. But this is only brief and incomplete, as figures, especially for enemy countries, are not yet available, and because the subject could be more satisfactorily dealt with in a separate paper when the war is ended.

4. The years I have taken are generally the three years preceding and the three years following the war, thus showing pre-war, war and post-war conditions. A longer period would have been more satisfactory, but in order to avoid the tables becoming unduly large

I have kept them to the six years 1868-73. For most of the charts, however, I have extended the figures both ways and show the fifteen years 1863-77.

I. MORTALITY.

5. I will take the effect of the war on mortality first. The total number of deaths in France¹ and Prussia for the six years 1868-73 is given in the following table. Stillbirths are excluded in both cases.

TABLE I.—*Gross Number of Deaths. France and Prussia, 1868-73.*

Year.	France.	Prussia.	Year.	France.	Prussia.
1868	922,038	658,756	1871	1,271,010	708,499
1869	864,320	632,197	1872	793,064	724,944
1870	1,046,909	665,987	1873	844,588	698,553

6. These figures include all deaths, civil and military, registered during these years, and to obtain the number of deaths among the civil population we must deduct the "military" deaths. For Prussia this is simple, for its vital statistics always show the civil and military population separately, except for 1870 and 1871, when the total deaths are given separately, but distribution by ages, months, &c., is given for the civil population only. In the case of France we have no complete figures. The number of "military" deaths registered was 94,329 (33,164 in 1870 and 61,165 in 1871), but these returns are notoriously defective, and various estimates have been made of her total losses. Von Fircks² states that the above figure should be increased by at least 60,000. He, however, is not an unbiased authority. The defectiveness in the returns is not, I think, of great importance for our purpose, for the total number of deaths registered being the sum of the civil and military deaths, by deducting the latter, however incomplete they may be, we should get the correct number of civil deaths. I have, therefore, deducted from the total number shown in Table I, 33,164 and 61,165 for 1870 and 1871 respectively to get the net number of civil deaths. These are shown in the following two tables distinguishing males and females, and giving the rates per 1,000 of the estimated population living in those years. No official figures appear to be available as to the estimated populations by sex, so to calculate the rates for

¹ It might be stated here that throughout this Paper, figures for Alsace-Lorraine are excluded from all statistics relating to France.

² Von Fircks, *Die Volkskräft Frankreichs und Deutschlands*. Berlin, 1875.

males and females, estimates were made based on the Prussian Census of 1871 and the French Census of 1872.³

TABLE II.—*Number of Deaths among Civil Population of France and Prussia, 1868–73.*

Year.	France.			Prussia.		
	Males.	Females.	Total.	Males.	Females.	Total.
1868 ...	471,227	450,811	922,038	341,418	317,310	658,728
1869	442,988	421,332	864,320	327,244	304,944	632,188
1870	519,873	493,872	1,013,745	332,250	307,807	640,057
1871	631,068	578,777	1,209,845	360,235	339,790	700,025
1872	409,811	383,253	793,064	372,941	351,914	724,855
1873	433,804	410,784	844,588	363,862	334,504	698,366

TABLE III.—*Death-rates per 1,000 of the Population.*

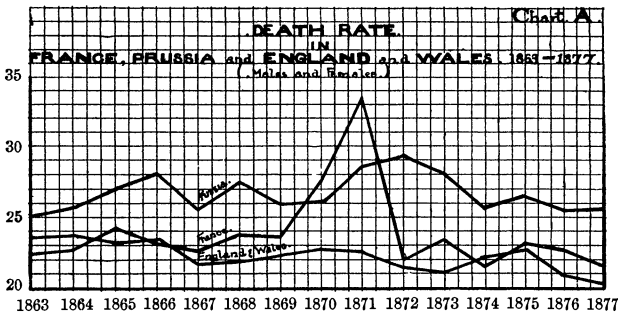
Year.	France.			Prussia.		
	Males.	Females.	Total.	Males.	Females.	Total.
1868	25·7	24·4	24·9	28·8	25·9	27·4
1869	24·1	22·8	23·5	27·4	24·7	26·0
1870	28·2	26·6	27·5	27·6	24·7	26·1
1871	34·7	31·6	33·4	29·8	27·2	28·4
1872	22·8	21·2	22·0	30·7	27·9	29·3
1873	24·0	22·6	23·3	29·7	26·3	28·0

³ It is of interest to compare here the French losses with the Prussian. For Prussia an elaborate account was published by Dr. Engel (*Die Verluste der Deutschen Armeen in Offizieren und Mannschaften im Kriege gegen Frankreich 1870–71*—Prussian Statistical Bureau, 1874), which gave the total German losses as follows:—

Killed	....	....	....	....	....	17,572
Died of wounds	....	....	....	....	....	10,710
Died of sickness	....	....	....	....	....	11,184
Others	....	....	....	....	....	1,415
Missing	....	....	....	....	....	4,009
						<u>44,890</u>

Of these about 35,000 were among Prussian Army Corps. The total strength of the German Army averaged about 900,000 (Prussian, 700,000). Certain tables given in the publication enable these losses to be apportioned at about 26,000 in 1870 and 9,000 in 1871. The French registered losses were 94,300, of which the great majority occurred in the second year of war, whereas nearly three-quarters of the German losses occurred in the first year.

7. The death-rates for the longer period of fifteen years are shown on the following chart :—

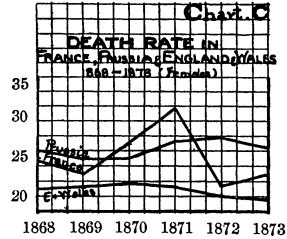
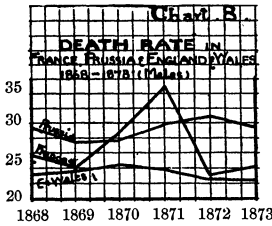


Prussia's death-rate is normally higher than that of France, while that of England and Wales was slightly less. In peace times the French and Prussian death-rates fluctuated fairly closely, but in the period 1869-73 there is a big divergence. France shows a large rise in 1870 and a further enormous rise in 1871, whereas the rise in the Prussian death-rate was in the years 1871 and 1872—a year later. Most noticeable is the recovery of the French death-rate in 1872; falling from 33·4 per 1,000 to 22·0 per 1,000, lower than any period before the war. Prussia's death-rate showed no such recovery, but continued high in 1872 and 1873. This high rate was, however, largely due to a small-pox epidemic which broke out in 1871. The number of deaths from small-pox in the period 1869-73 was as follows :—

	1869.	1870.	1871.	1872.	1873.
Number of deaths from small-pox. Prussia	4,638	4,470	56,826	65,109	9,939

Deaths from this cause alone amounted to 8 per cent. of the total deaths in 1871 and 9 per cent. in 1872, and these would largely account for the rise in the death-rate from 26·1 in 1870 to 28·4 in 1871 and 29·3 in 1872. As Prussia is the only foreign country which gave its total deaths analysed by causes, it is not possible to investigate the rise for other countries.

8. The figures of Table III showing the death-rate for males and females separately for the six years 1868-73 are shown in the following charts :—



9. From these, it will be noticed that the male and female curves show very similar features for all the three countries, and without exception the male death-rates are higher than the female. In both France and Prussia the female death-rate rose and fell to almost the same extent as the male. Taking the year 1868 as a standard year in which the death-rate was normal, the rise in the number of civil deaths was, in 1871, for France 33·9 per cent. for males and 28·4 per cent. for females ; for Prussia 5·5 per cent. and 7·1 per cent. respectively. Thus the male death-rate rose in greater proportion than the female for France, but the reverse was the case for Prussia.

10. It is interesting to compare the number of deaths in 1868-69, two years of normal mortality in peace time, with the number in 1870 and 1871, the two years of war. The following is the result :—

	France.	Prussia.
Civil deaths in 1868-69	1,786,358	1,290,916
Civil deaths in 1870-71	2,223,590	1,340,082
Increase	437,232	49,166
Increase per cent.	24·4	3·8

In both cases the number of civilian deaths is greater than the number of military deaths. In the case of France, the “indirect” effects of war enormously exceed the “direct” effects. France, of course, was the beaten country and endured the trials and privations of invasion and siege. How the two capitals fared during the war may be seen from the following table :—

TABLE IV.—*Deaths registered in Paris and Berlin, 1868–73.*

	Paris.				
	1868.	1869.	1870.	1871.	1872.
Males	24,166	23,969	40,126	50,445	21,331
Females	22,962	21,943	33,464	36,436	19,985
Total	47,128	45,912	73,590	86,881	41,316

	Berlin.				
	1868.	1869.	1870.	1871.	1872.
Males	13,127	12,123	13,801	17,063	14,865
Females	11,715	10,535	11,693	15,268	13,236
Total	24,842	22,658	25,494	32,331	28,101

11. The number of deaths in Paris rose from 45,912 in 1869 to 73,590 in 1870 and 86,881 in 1871—almost double. For Berlin, the number rose from 22,658 in 1869 to 25,494 in 1870 and 32,331 in 1871—a rise of 43 per cent. The siege of Paris at the end of 1870 and the beginning of 1871 was the cause of terrible distress among the civil population.

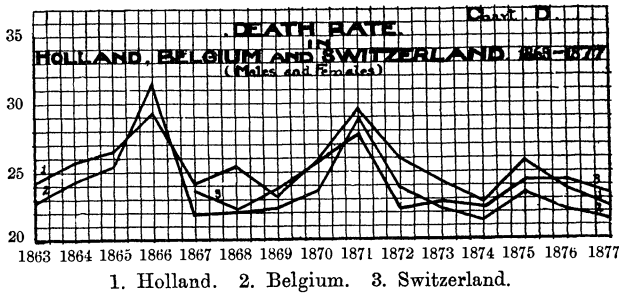
12. *Neutral Countries.*—We now consider certain states which were neutral during the war. I have selected England and Wales as the chief neutral State, and Belgium, Switzerland and Holland as three contiguous countries. The death-rates, distinguishing sex, in the years 1868–73 are shown in the next table.

TABLE V.—*Death-rates in certain neutral countries, 1868–73.*

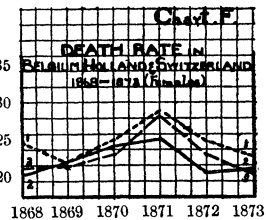
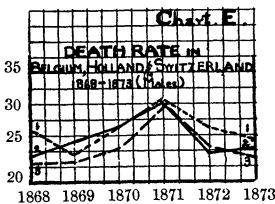
	Belgium.		Holland.		Switzerland.		England and Wales.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1868	22·4	21·5	26·3	24·7	23·3	20·9	23·1	20·7
1869	22·5	21·8	23·6	22·5	25·2	22·5	23·6	21·0
1870	24·2	23·2	26·6	25·1	27·0	24·5	24·2	21·6
1871	29·8	28·2	30·4	28·6	30·2	25·3	23·9	21·3
1872	24·5	23·1	26·9	24·9	23·8	20·8	22·7	20·0
1873	22·8	21·3	25·1	23·3	24·1	21·6	22·4	19·8

13. The total death-rate is shown on the following chart for the extended period of fifteen years as in Chart A. No figures are

available for Switzerland before 1867. To avoid confusion the rates for England and Wales are placed on Chart A.



14. England and Wales was apparently unaffected by the war. The death-rate rose slightly in 1870 and 1871, but higher death-rates were experienced in 1863, 1864 and 1865. With Holland, Switzerland and Belgium, however, we see a marked effect very similar to the course of mortality in France. The number of deaths in Belgium rose more in proportion than those of France, and those of Switzerland and Holland by almost as much. Belgium suffered more perhaps because of its being nearest to the theatre of war and on account of its industrial character. The number of deaths in 1871 was 35·4 per cent. higher than the year 1868 (*cf.* France, 31·2 per cent.). The death-rates for males and females separately, set out in Table V, are shown graphically on the next charts (for England and Wales on the previous charts B and C).



Again, the parallelism of the male and female curves especially in the case of England and Wales, Holland and Belgium is noticeable. The male death-rates are again higher than the female.

15. It will be noticed from Chart D that in 1866 there was also a peak in the death-rate curve. This was the year of the Austro-Prussian War. Both Belgium and Holland show a much larger

rise than Prussia itself (Chart A). There are no statistics as to causes of deaths for these countries, so it is impossible to analyse the rise further.

16. *Deaths by Months.*—The increase in mortality can be investigated more completely by examining the number of deaths registered in each month during these years. Unfortunately, data for both countries are not available. Monthly deaths are given for France, but these include “military” deaths and do not distinguish sex, so “indirect” effects cannot be measured. For Prussia, complete statistics of monthly deaths among the civil population are published.

17. For reasons of space the tables are not given here, but it may be remarked that similar fluctuations occur for males as for females. For Prussia, both sexes show a rise in August, 1870; a short temporary rise in December, 1870, and January, 1871, compared with the corresponding period twelve months before; a fall in February and March, 1871, and a rise again in April, 1871, which continued throughout that year, and lasted until October and November, 1872. The small-pox epidemic which broke out in 1871 no doubt accounts for most of this rise.

18. The French death-rate in 1870, before the outbreak of war, was somewhat higher than during the corresponding period of 1869. The figures during the war are not considered for the reason given above. After the conclusion of hostilities the death-rate still remained very high throughout the rest of the year. By January, 1872, a fall had set in which continued throughout the year.

19. *Deaths by Age.*—A further analysis of mortality is possible, viz., according to age. Again, we are hampered by incomplete data. For France, no figures are available for the Department of the Seine for 1870, and for Prussia the statistics of deaths were tabulated not by year of age but by year of birth. Hence the figures are not strictly comparable with those for other countries, especially at the earliest years of life. The method adopted has been to take the number of deaths in 1868 by age groups, and calculate the percentage increase in 1871 in the number of deaths in the same age group. For this period—three years only—the age distribution of the population remained fairly constant (except for males of military age) and the number of deaths in any age group can fairly be compared with the number three years before. For France the figures consist of all deaths, for Prussia civil deaths only. The following table gives the figures for France, Prussia, England and Wales and Belgium. The Department of the Seine has been excluded throughout from the French figures.

TABLE VI.—*Percentage increase in number of deaths in 1871 compared with the year 1868.*

Age Group.	France, (Ex. Dept. of the Seine).		Belgium.		England and Wales.		Prussia.	
	Males.	Females.	Males.	Females.	Males.	Females.	Year of Birth.	
							Males.	Females.
Under 1 year	3.0	5.1	19.9	22.6	3.5	2.5	Year of death	— 6.9
1-4 years	38.5	27.7	51.8	54.4	— 2.9	— 0.3	1st to 4th year after Birth	1.9
5-14	83.6	73.9	84.6	77.3	10.7	8.7	5th to 14th	— 0.4
15-24	204.6	62.4	95.7	55.3	15.7	9.2	15th to 24th	12.8
25-34	168.2	64.1	52.0	48.7	18.3	6.9	25th to 34th	20.2
35-44	90.2	61.3	46.1	41.4	11.8	9.4	35th to 44th	19.2
45-54	50.7	45.0	33.8	28.0	9.7	11.4	45th to 54th	18.1
55-64	30.5	26.9	16.6	14.9	10.1	12.6	55th to 64th	15.3
65-74	17.8	11.3	24.1	21.8	10.5	14.5	65th to 74th	9.4
75 years	15.6	11.9	27.7	19.0	9.4	9.7	75 and above	9.2
Total	46.9	28.4	36.1	34.9	7.4	6.8	Total	5.5
								7.1

20. For reasons stated above, the figures for males in the case of France must be neglected. The group "under one year" is dealt with later under "Infant Mortality," for this group is affected by the number of births. The remaining figures show somewhat diverse results. Looking at the figures for females, we note that the maximum increases are for France and Belgium in the age-group 5-14, for England and Wales in the group 35-44, and for Prussia in the period 35-44 years after birth. The lowest increases are for France, in the age-group 65-74, for Belgium in the group 55-64, and for Prussia in the group 75 and over. It might be urged, however, that the year 1868, taken as the base year, was not a year of normal mortality and that different results would be shown if another year, 1869 say, were taken as the base year. This can be tested by tracing the number of deaths in any particular age-group throughout a period of years. For this purpose, I took the age-group 5-14 years and the table in the Appendix shows for France, England and Wales, Belgium and Holland the number of deaths in the age-group 5-14 during the fifteen years, 1863-77. For all the countries concerned the year 1868 is seen to be a period of normal mortality, and the figures in Table VI may be taken as showing accurately the distribution of excessive mortality for the year 1871. It will be seen that the highest age-groups generally show the smallest increases in mortality, the highest increases being shown at periods of young and middle life. This, I think, is contrary to expectation. It is also contrary to certain definite conclusions based on the same figures, recently made in a Swiss publication. This pamphlet states that the effects of war on mortality are the greatest at the two extremes of life, and are lowest at the ages 10-14, *i.e.*, that the increases are greatest at ages of highest death-rates, and lowest at the ages of lowest death-rates. The method by which this conclusion is reached are, I think, fallacious. I have dealt with them in the footnote.⁴ The effect of the war, then, was not to increase mortality

⁴ The pamphlet is entitled *La mortalité chez les neutres en temps de guerre*, by Dr. Hersch of the University of Geneva, and deals with the effect of the wars of 1866 and 1870-71 on the mortality of Switzerland and Belgium in particular in comparison with that of France. As showing the incidence of mortality on the two sexes the author seems quite sound, but in dealing with the incidence of mortality at different ages of life, his analysis is statistically quite unsound. No figures are given in the pamphlet, but he translates them into numerous diagrams, obtained by the following method. The author takes the mean number of deaths in the years 1870-71, and finds the excess in these two years over the year 1869 per 1,000 of the population living at each age-group. He thus obtains a curve which reproduces in general outline the usual U-shaped mortality curve for ages, *viz.*, a very high death-rate at the two extremes of

to any exceptional extent in the case of old age. Was its incidence exceptionally severe at the other extreme of life? This we consider in the next section.

21. *Infant Mortality*.—Deaths of infants under one year of age are best considered in relation to the number of children born in that year, and this is the rate given by all the countries concerned, except Prussia. As no still-births are registered in England and Wales, these have been excluded throughout. The method of registration and the definition of still-births differs in various countries, and these affect the rates of mortality of live births, so that the infant mortality rates are not strictly comparable.⁵ For Prussia, however, there is a further reason why the figures are not comparable, in the fact that the number of infant deaths consists not of the number dying in any year under 1 year of age, but of the number dying in the (calendar) year of birth. For France, no statistics are available for the Department of the Seine in 1870, so this Department is excluded throughout. No figures of infantile deaths are published for Switzerland. The figures are set out in the following table:—

TABLE VII.—*Rates of Infant Mortality.*

	Number of Deaths under 1 year of age per 1,000 births.				Number of infants dying in year of birth per 1,000 births.
	France.*	England and Wales.	Belgium.	Holland.	Prussia.
1868	194·5	155	145·6	223·5	166·0
1869	178·0	156	130·5	182·3	145·4
1870	203·9	160	145·4	209·5	159·1
1871	231·6	158	173·4	225·4	166·5
1872	153·2	150	145·1	212·3	167·9
1873	181·2	149	142·3	205·3	159·8

* Excluding Department of the Seine.

life, and a low death-rate for the intervening ages. As persons over 65 had a high death-rate in 1869 and also a high death-rate in the years 1870–71, the difference between these two is likely to be much higher than the difference between the death-rates of a young age-group, *e.g.*, 15–20. By using this method of absolute increase in death-rates the author, in effect, says that a rise in the death-rate from (say) 10 to 15 per 1,000—*i.e.* a rise of 5 per 1,000—is much more serious than a rise in the death-rate from (say) 3 to 6 per 1,000—*i.e.*, one of 3 per 1,000. The former, however, is a rise of 50 per cent., the latter of 100 per cent., and these figures are the ones which should be compared.

⁵ See on this point: Dudfield, *Statistical Journal*, December, 1912, p. 1 *et seq.*

22. The results bear out the inferences drawn from the tables of deaths at all ages. The infant mortality of France was seriously augmented in 1870 and 1871, but rapidly recovered in the following year; that of Prussia rose to a level very slightly above that of 1868, and remained high during 1871 and 1872. Belgium and Holland both reached their maxima in 1871. The rise in the case of Belgium was a very sudden one but, as in the case of France, the rate rapidly recovered in 1872. It is unfortunate that no figures are available for the Department of the Seine in 1870, for this Department suffered more than any other. Some idea as to its extent can be obtained from the following table, which shows for each year the infant mortality in the three divisions into which French vital statistics are divided.

TABLE VIII.—*Infant Mortality in France.*

Year.	Department of the Seine.	Urban Population.	Rural Population.	Whole of France.
1868....	162	210	173	192
1869....	149	187	174	176
1870....	*	208	202	*
1871....	349	243	227	238
1872....	136	155	152	152
1873....	151	185	180	179

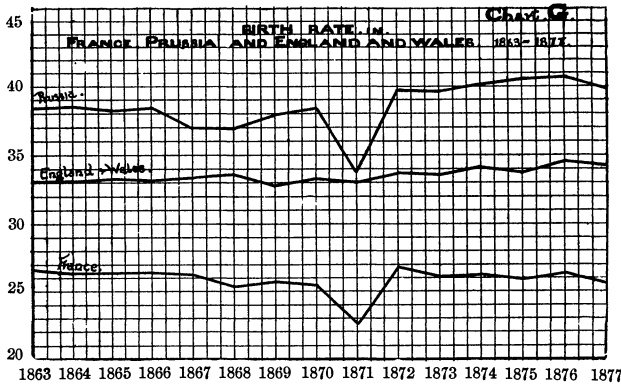
* Not available.

23. In 1871, infantile mortality in the Department of the Seine amounted to no less than 349 per 1,000—over a third of the number of children born—and during the first months of 1871 it must have been much higher still. It has, in fact, been stated that hardly a single baby born during the siege of Paris survived.

II. BIRTHS.

24. I will now pass to the subject of fertility, and the treatment followed will be similar to that in the case of deaths. Throughout this section, the term “births” except where otherwise stated means “live-births.”

25. The number of births and the rate per 1,000 for the years 1868–73 for France, Prussia and England and Wales are shown in the next table, and the birth-rates for a longer period of fifteen years are shown on Chart G.

TABLE IX.—*Number of births (excluding still-births), 1868-73.*

Year.	France.		Prussia.		England and Wales.	
	Number.	Per 1,000 Population.	Number.	Per 1,000 Population.	Number.	Per 1,000 Population.
1868	9,841	25·4	8,802	36·9	7,866	35·8
1869	9,845	25·7	9,193	37·9	7,734	34·8
1870	9,435	25·5	9,388	38·3	7,928	35·2
1871	8,261	22·6	8,234	33·8	7,974	35·0
1872	9,660	26·7	9,831	39·7	8,259	35·8
1873	9,464	26·0	9,880	39·6	8,298	35·4

Year.	Holland.		Belgium.		Switzerland.	
	Number.	Per 1,000 Population.	Number.	Per 1,000 Population.	Number.	Per 1,000 Population.
1868	1,261	35·6	1,561	31·9	791*	29·8*
1869	1,238	34·6	1,587	32·1	818*	30·8*
1870	1,300	36·2	1,645	33·0	792	29·7
1871	1,283	35·4	1,588	31·6	776	29·1
1872	1,317	36·1	1,674	33·1	803	30·0
1873	1,338	36·3	1,707	33·4	806	29·8

* Estimated.

26. France, as is well-known, is a country of low birth-rate, and during this period it was only two-thirds that of Prussia. The birth-rate of England and Wales was between the two. The chart clearly shows the sharp diminution in 1871, and a recovery in 1872 to a higher level than before the war. The birth-rate of England and Wales remained unaffected, only a very small fall having taken

place. It was seen that Prussia was hardly affected by the war in the matter of civil deaths; in the case of births, however, both France and Prussia suffered almost equally—the decline from 1870 to 1871 being 12·3 per cent. for France and 11·3 per cent. for Prussia. In the years following the war the birth-rate of Prussia seems to have been permanently augmented, the birth-rate of France resumed its normal level of about 26 per 1,000. The number of births were, of course, considerably increased immediately after the war owing to sudden increase in marriages as will be shown in the next section.

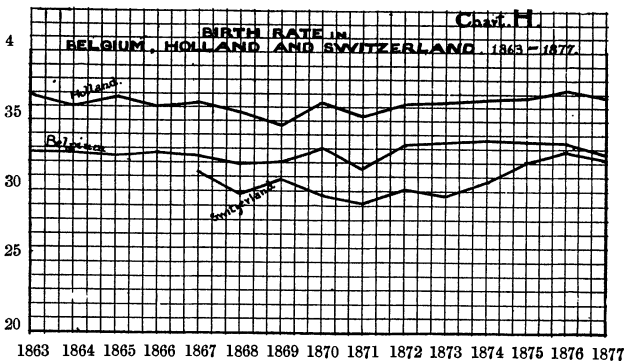
27. As in the case of deaths, I give a table showing the number of births in Paris and Berlin :—

TABLE X.—*Number of births. Paris and Berlin, 1868–73.*

	1868.	1869.	1870.	1871.	1872.	1873.
Paris	39,389	39,571	42,420	27,739	42,058	49,840
Berlin	29,220	29,539	31,766	29,159	35,500	36,104

The enormous decline in Paris in 1871, when the number of births was less than two-thirds of the number the year before, was almost entirely absent in Berlin. By 1872, the number was back at its pre-war figure in the case of Paris. In Berlin, the number of births recovered to a figure considerably above the pre-war level.

28. *Neutral Countries.*—The figures for the four neutrals have already been given in Table IX. The following chart shows the course of the birth rate for fifteen years for Belgium and Holland, and for Switzerland (from 1870). The curve for England and Wales has already been given with that of Prussia and France in Chart G.



Each country suffered a fall in 1871, but showed a recovery in 1872. The course of the birth rate in Belgium follows very closely that of

Prussia—a fall to the lowest rate of the period in 1871, followed by a recovery in 1872 to a rate substantially higher than the period before the war.

29. *Births by Months.*—Perhaps more than in the case of deaths, it is interesting to find more exactly the time when the effect of the war first showed itself. Figures are available for both Prussia and France (with the exception of those of the Department of the Seine for 1870) of the number of births in individual months. Space prevents their inclusion, but they are summarized in the next paragraph.

30. The fall in the French birth rate showed itself slightly in August, 1870. The rate remained about the same level until the middle of 1871, and fell to a minimum about November. By March, 1872, it had recovered its old level. For Prussia, the fall began, more abruptly than in the case of France, in May, 1871, and reached a minimum about October of the same year. By the beginning of 1872, it had recovered, and the number of births during the latter half of 1872 was almost exactly the same as the number in the last six months of 1869. For both countries there is a period of low birth rate for about the period six to nine months after the outbreak of war, and ceasing about five months after the conclusion of peace. Although peace was not finally concluded until May 5, 1871, hostilities had practically ceased by February, so the recovery showed itself about nine months after the cessation of hostilities. For Prussia, the period of low conception coincides very closely with the period of hostilities.

31. *Illegitimacy.*—Another aspect of the birth-rate of interest in war time is the one of illegitimacy. The exaggerated statements made during the early months of the present war as to the “torrents of births” of illegitimate children which were to be expected are still fresh in the memory. The figures will be examined in due course in the section on the present war. For France, Prussia and England and Wales, the number of illegitimate births per 10,000 total births in the period 1868–73 is shown in the next table. This rate is not the most satisfactory measure of illegitimacy, but it is the only one available for all countries.

TABLE XI.—*Number of illegitimate births per 10,000 births.*
(*Live-births only.*)

	1868.	1869.	1870.	1871.	1872.	1873.
France	762	748	746	716	721	746
Prussia	808	784	792	778	705	766
England and Wales....	588	578	564	562	542	520

32. In 1870, there was no appreciable change in the illegitimacy rate of either France or Prussia. In 1871, there was a decline. In 1872, it rose slightly in France and fell substantially in Prussia; in 1873, it rose in both countries. The reduction was much greater in the case of Prussia than in the case of France, probably due to the fact that during the war, numbers of adult males were absent from the country. France did not suffer any such absence of men from her country. A large proportion of the illegitimate births of France occur in Paris, and the strict law respecting prostitutes which came into operation in Paris at the beginning of the war may account for part of the French diminution. No rise in illegitimacy occurred in neutral countries, while in England and Wales, the illegitimacy rate declined each year. It cannot be said, then, that there was any increase of illegitimacy during this war.

33. *Still-births.*—Another aspect of fertility which I will briefly mention is that of still-births. It is sometimes said that the strain and shock occasioned by war would increase the number of still-births. How far this was so during the Franco-Prussian War, may be judged from the next table.

Still-births are not registered in England and Wales. In France and Prussia differences in practice exist as to the registration of still-births, *e.g.*, in Prussia children born alive but dead on registration are counted as live-births, in France as still-births.

TABLE XII.—*Still-births per 10,000 total births.*

	1868.	1869.	1870.	1871.	1872.	1873.
France	449	455	457	465	435	448
Prussia	408	409	410	403	397	397
Holland	495	510	512	539	526	521
Belgium	457	449	440	436	432	436

The yearly variation in the proportion of still to live-births was no greater in war time than in peace times. France showed a small increase of 0·8 per 1,000 in 1871, a quite insignificant one. Prussia's rate remained practically the same, showing a very small decrease. Belgium shows a continuous decline. The only country showing any substantial increase in 1871 was Holland. In this country, however, the registration of still-births is very defective. It is estimated that from 15–20 per cent. of the births registered as still are live-births.⁶ From none of the figures can we conclude that war has any effect on still-births.

⁶ See Dudfield, *Statistical Journal*, December, 1912, p. 65 note 4.

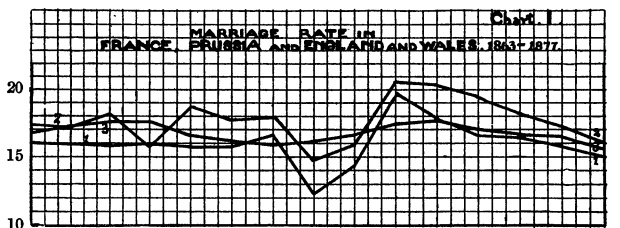
III. MARRIAGES.

34. The third branch of vital statistics I deal with is that of marriages. The effects of war on marriages may be to increase their number, *e.g.*, among soldiers before departure for the front, what are called "war-marriages," or it may diminish their number by leading to postponements until settled times. Which factor operated most strongly during the war of 1870-71 can be seen from the following table and charts.

TABLE XIII.—*Number of marriages and marriage-rate, 1868-73.*
(00's omitted.)

Year.	France.		Prussia.		England and Wales.	
	Number.	Rate.	Number.	Rate.	Number.	Rate.
1868	301,2	15·6	213,0	17·6	177,0	16·1
1869	303,5	16·6	216,9	17·8	177,0	15·9
1870	223,7	12·0	181,5	14·8	181,7	16·1
1871	262,5	14·4	195,9	15·8	190,1	16·7
1872	352,7	19·6	255,4	20·6	201,3	17·4
1873	321,2	17·8	252,9	20·3	205,6	17·6

Year.	Belgium.		Holland.		Switzerland.	
	Number.	Rate.	Number.	Rate.	Number.	Rate.
1868	363	14·8	277	15·7	174	13·1
1869	371	15·0	278	15·6	189	14·2
1870	353	14·1	286	15·9	186	14·0
1871	375	14·9	290	16·0	195	14·6
1872	401	15·9	302	16·5	212	15·8
1873	406	15·9	317	17·2	206	15·3



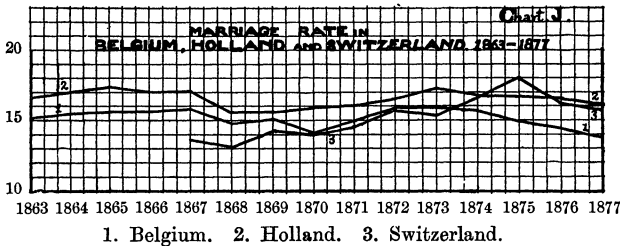
1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877

1. France. 2. Prussia. 3. England and Wales.

35. During the six years, 1868-73, the marriage rates of France and Prussia fluctuated very closely—both showing a large fall in

1870, a rise in 1871 to a very high rate in 1872, and a contraction in 1873. With France as in the case of births and deaths, the fluctuations were more violent than in Prussia. In 1870, its rate fell to 12·0 per 1,000 the lowest on record, and rose to 19·6 per 1,000 in 1872, the highest on record. In Prussia, the rates were 14·8 in 1870 and 20·6 in 1872—also the lowest and highest on record.

36. *Neutral Countries.*—The marriage rates of neutrals were hardly affected by the war. In England and Wales, the rate slowly and steadily increased each year (see Table XIII and Chart I). In Belgium and Holland, and in Switzerland since 1867, the course of the marriage rate is shown for the period 1868–73 on the following chart. (The numbers have already been given, Table XIII.)



37. The marriage rate of both Holland and Switzerland steadily rose during the war period. Belgium, as we have noticed in previous sections, was the neutral most affected, a decrease being shown in 1870. Also the general fall in the marriage rate which set in after 1872 in France and Prussia is noticeable in the Belgian marriage rate.

38. *Marriages by Months.*—The number of marriages in individual months is only available in the case of France, but no inference worth referring to has been deduced from them, save that the fall and recovery of the marriage rate coincided very closely with the period of the war.

IV. THE SEX RATIO.

39. The theory was revived at the beginning of this war that in war time the proportion of male births rises. Numerous cases have appeared in the press in which “runs” of male births have been sent up from remote villages. Many of the statements show ignorance of the fact that male births exceed female, in peace times.⁷ The

⁷ *E.g.*, *Observer* February 6, 1916, where the fact that “last week 117 male “births were registered in the High Wycombe Union and 112 females” is stated “to support a well-known theory.”

theory is a very old one. In *La Marseillaise* we find words which may refer to this belief:—

“ S'ils tombent nos jeunes héros,
La terre en produit de nouveau.”

Since, however, correspondents started sending up cases of “ runs ” of female births, the press seems to have dropped the subject. Even the *British Medical Journal* is inclined to put some faith in the theory, for it states (November 21, 1914, p. 886) that it is remarkable that in 1857, the year after the return of our army from the Crimea, the excess of male over female births was much higher than the average of the three previous and the three subsequent years, and again immediately after the Boer War, in 1901–2, it rose above the average for 1897–1900. It fails to notice other equally large rises in the excess of males in 1884–7, 1906 and 1909, which were years of peace.

40. I will deal first with the figures of the Franco-Prussian War. The following table shows the yearly ratio of male to 1,000 female births for the years 1863–77 for France and Prussia and three neutrals:—

TABLE XIV.—*The sex ratio (i.e., Number of male to 1,000 female births), 1863–77.*

(Note.—“ 10 ” is omitted before each figure, e.g., 50 stands for 1050.)

	1863.	1864.	1865.	1866.	1867.	1868.	1869.	1870.
France	50	56	52	54	43	48	50	48
Prussia	49	47	53	48	50	55	56	50
England and Wales	47	40	40	44	43	36	42	41
Belgium	55	55	46	42	57	49	51	51
Holland	65	51	52	53	60	54	49	56
	1871.	1872.	1873.	1874.	1875.	1876.	1877.	
France	49	49	50	53	51	47	45	
Prussia	53	53	52	57	61	54	54	
England and Wales	35	41	39	36	43	38	34	
Belgium	46	51	42	53	40	45	48	
Holland	40	48	48	52	63	54	52	

There is no trace here of any rise in the sex ratio. In every case (except Holland) the ratio fell in 1870, and in 1871 there was a further fall in neutrals. A slight rise was shown by France and Prussia, but both increases were insignificant. As 1870 and 1871 contained both months of war and months of peace, I give the monthly figures in the next table for Prussia (French figures not being available).

This table is based on all births, and the yearly figures, therefore, differ from those of the previous table which are based on live-births.

TABLE XV.—*The sex ratio in Prussia by months, 1869–72.*

(Note.—“ 10 ” is omitted before each figure.)

	Jan.	Feb.	Mar.	April.	May.	June.	July.
1869	60	58	66	54	71	67	69
1870	73	54	55	51	52	69	43
1871	69	67	59	54	53	73	58
1872	58	66	65	54	58	64	57
	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	
1869	72	72	54	59	62	64	
1870	69	68	46	60	63	59	
1871	64	46	79	62	59	61	
1872	63	63	62	58	69	62	

41. Again, there is no evidence of any effect of the war on these figures. The only large rise was from 1,043 in July, 1870, to 1,069 in August, 1870, but this ratio had been exceeded both before and after the war. The rise is insignificant when its probable error is considered.

42. I have applied the “theory of errors” to this question in the next section where I deal with the present war and the figures of the *British Medical Journal*.

43. The vital statistics of the Franco-Prussian War have now been passed in review, but before summarising the results I will deal briefly with the present war.

V. VITAL STATISTICS DURING THE PRESENT WAR.

44. It is yet too early to speak of the present war’s effect on vital statistics. The subject would yield an interesting paper after the war is over, though the effect of such a stupendous conflict will be felt for a very large number of years to come. The war has already lasted twice as long as the Franco-Prussian War, while the number of men engaged is measured not in hundreds of thousands but in millions.

45. Few figures are as yet available. For France and Germany, scattered references from the foreign press are almost the sole source and nothing is obtainable for Russia and the smaller countries. Only for our own country are adequate data published.

46. The number of births, deaths and marriages in England and Wales, are given below for the four quarters of 1913, 1914, and 1915.

TABLE XVI.—*Deaths, births and marriages. England and Wales.*

(00's omitted.)

	Deaths.			Births.			Marriages.		
	1913.	1914.	1915.	1913.	1914.	1915.	1913.	1914.	1915.
1st quarter	146,5	146,2	177,3	216,6	217,4	221,4	60,9	51,0	55,4
2nd „	121,7	124,1	138,6	227,5	226,1	213,1	65,9	81,1	97,0
3rd „	113,4	115,6	109,4	225,5	227,1	196,5	83,6	82,0	102,6
4th „	123,2	130,9	137,1	212,3	208,3	183,4	76,1	79,9	105,0
Year	505,0	516,8	562,3	881,9	878,8	814,5	286,6	294,1	360,0

The published rates for 1915 are based on the estimated population of 1914, that for 1915 not being available. This figure is probably too high owing to the number of troops abroad, which would make the rates (both of births, deaths and marriages) too low. On the other hand, the number of deaths is diminished by the absence of deaths among the millions of soldiers which would have occurred in normal circumstances. The number of deaths may, however, be somewhat raised by the deaths of wounded in this country. As we can only regard the rates for 1915, and to some extent those for 1914, as provisional, they are not used here.

47. *Deaths.*—The rise in the number of deaths was about 10 per cent. in 1915, and was confined almost entirely to the first six months of the year. The large rise in first quarter was partly due, no doubt, to the epidemic of measles which broke out and to the very wet winter. The number of deaths in the second six months of 1915 was no higher than that of 1914. As it is possible that other than civil deaths are included, we cannot say definitely at present that the war has adversely affected mortality. There is no appreciable increase in the number of deaths in Scotland and Ireland.

48. The only figures issued as to the ages at death in 1915 are those under 1 year, 1 year to 65 years, and over 65. The numbers dying under 1 year, and over 65 years are shown in the next table.

TABLE XVII.—*Number of deaths under 1 year and over 65 years of age. England and Wales, 1913-15.*

	Under 1 year.			Over 65 years.		
	1913.	1914.	1915.	1913.	1914.	1915.
1st quarter	26,473	25,017	28,417	47,832	48,663	60,690
2nd „	20,129	19,890	20,735	38,404	38,630	41,749
3rd „	25,183	25,465	19,249	31,070	31,245	31,343
4th „	24,012	21,792	20,894	37,061	40,300	45,719
Year	95,797	92,164	89,477	154,367	158,838	179,501
Rate per 1,000*	108	105	110	80·3	82·5	92·4

* Per 1,000 births for infants ; per 1,000 living for old persons.

The number of infant deaths shows no significant rise. The rate of infant mortality in 1915 being calculated on the number of births, it is not subject to the qualifications set out above for birth and death rates.

49. The rate rose from 105 in 1914 to 110 in 1915, the high rate in the first quarter being due to the measles epidemic. Deaths of old persons over 65 show a large increase in 1915, especially in the first quarter of 1915. The rates per 1,000 living over 65 rose from 80·3 in 1913 to 92·4 in 1915. The summer months show practically no increase.

50. Figures of deaths in France and Germany are not yet available, but figures for Paris and Berlin are given in the English "Quarterly Return," and others are found in the foreign press. The following table shows the number of deaths in Paris and Berlin 1913-15 by quarters, taken from our "Quarterly Returns" for Paris, and for Berlin partly from this source and partly from articles in *Vorwärts* (e.g., July 13, 1915, and February 2, 1916).

TABLE XVIII.—*Number of deaths in Paris and Berlin, 1913-15.*

	Paris.			Berlin.		
	1913.	1914.	1915.	1913.	1914.	1915.
1st quarter	12,685	13,550	12,793	7,621	7,055	?
2nd „	11,861	12,031	11,219	7,133	6,493	?
3rd „	9,556	9,836	8,660	6,286	?	?
4th „	11,253	10,056	10,294	7,432	?	?
Year	45,355	45,473	42,966	28,472	29,655	28,527

We cannot infer that there has been any appreciable rise in mortality even allowing for the diminished population. Conditions in the capital, however, are not representative of the whole country. Certain figures published in France for the 77 unoccupied Departments point to a rise in the death rate there.

51. There has been a slight rise in infant mortality in Paris from 111 in 1914 to 125 in 1915. In Berlin, there has been a decline from 142 in 1913 to 120 in the last quarter of 1915.

52. The results of a special inquiry among 25 large towns in Germany were published in the *Deutscher Reichsanzeiger* of February 8, 1916. During the three months, August–October, 1915, the number of infant deaths declined by 53 per cent., while the total number of deaths declined by 26 per cent. The improvement in infant mortality thus shown is attributed to “increased efficiency of” “measures of protection,” as there are fewer infants to attend to, and to the very favourable weather during these months. The *Berliner Tageblatt* of February 19, 1916, gives the following rates of infant mortality (under 6 months) in Prussia :—

December, 1912.	December, 1913.	December, 1914.	December, 1915.
206	189	179	144

53. *Births*.—A general decline in the number of births has been experienced. For England and Wales (Table XVI) the fall started in the second quarter of 1915, and by the end of 1915 the numbers had declined 15 per cent. on the corresponding period of 1914. For Paris and Berlin the figures as set out in Table XIX below show a drop of 40 per cent. for Paris and 25 per cent. for Berlin on the year 1913. For London the fall is 6 per cent. The fall set in, in the second quarter in the case of Paris. The temporary fall in the last quarter of 1914 I cannot explain. I have not been able to get all the quarterly figures for Berlin.

TABLE XIX.—*Number of births in Paris and Berlin, 1913–15.*

	Paris.			Berlin.		
	1913.	1914.	1915.	1913.	1914.	1915.
1st quarter	12,699	12,574	11,456	10,649	9,480	9,362
2nd „	12,469	12,466	7,309	9,800	9,288	?
3rd „	11,776	10,868	5,734	9,727	?	?
4th „	12,610	9,281	6,078	9,887	?	6,438
Year	49,554	45,189	30,577	40,063	37,493	30,031

54. *Marriages*.—The number of marriages in England and Wales by quarters has already been given in Table XVI. In the war of 1870–1 we saw for both belligerent countries a sudden fall in the marriage rate. The present war has had a different effect. A few scattered references in the German Press show that there has been no diminution in the marriage rate. For France, I have been unable to get any figures. The marriage rate in England and Wales reached 22·3 at the end of 1915, the highest ever recorded. The rise is, of course, almost entirely due to “war marriages.” The same phenomenon was experienced in Berlin for it is stated that during the first three months of war 70 per cent. of the marriages were “war marriages” (*Berliner Tageblatt*, August 16, 1915). The same newspaper for the 26th of April, 1916, however, gives the number of marriages in Berlin at 16,622 in 1915 (22,702 in 1914), a fall of nearly 30 per cent.

55. *Illegitimacy*.—The only information available is for the United Kingdom, shown in the following table:—

TABLE XX.—*Illegitimate births. England and Wales, 1913–15.*

	Number.				
	1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Year.
1913		Not available.			37,909
1914	9,223	9,997	9,391	8,718	37,329
1915	10,167	9,644	8,362	7,649	35,822
	Rate per 1,000 births.				
	1st Quarter.	2nd Quarter.	3rd Quarter.	4th Quarter.	Year.
1913		Not available.			43·0
1914	42·4	44·2	41·4	41·9	42·5
1915	45·9	45·2	42·5	41·7	44·0

The wild statements current a year ago are seen to be devoid of foundation. A small rise took place in the first quarter of 1915, but in the year the number was 1,500 less than in 1914. Owing to the smaller number of births, the illegitimacy rate shows a rise from 42·5 to 44·0 per 1,000 births. Illegitimacy probably increased where large numbers of soldiers were congregated, but, *ipso facto*, it would decrease in the districts from which these men had been drawn. As in the case of the Franco-Prussian War, the absence of some hundreds of thousands of young men with the colours involves a fall in illegitimacy.

56. *The Sex Ratio.*—Again, figures for our own country are the only ones available and the figures for each quarter in 1913, 1914, 1915 for England and Wales, London and Scotland are set out below :—

TABLE XXI.—*Number of male to 1,000 female births.*

Note.—“ 10 ” is omitted before each figure.

	England and Wales.			Scotland.			London.		
	1913.	1914.	1915.	1913.	1914.	1915.	1913.	1914.	1915.
1st quarter	41	31	32	58	35	74	46	24	21
2nd „	35	37	43	44	24	30	18	59	31
3rd „	40	31	44	26	32	46	40	32	28
4th „	35	43	44	37	47	42	44	69	28
Year	38	35	41	41	33	48	37	45	27

57. For none of the areas can one say that there was any significant increase. In London the ratio has fallen. The slight rise in England and Wales is well within the limits of the probable error of the sex ratio, as shown below. If the theory is true, one would expect that the longer the war lasted, the more would the desire for boys increase, and the more would the excess of male births increase. But there is no sign of this in these figures.

58. In order to test the fluctuations of the proportion of male births with the theory of errors, I took the total births, male and female, in England and Wales during the fifty-two years, 1864–1915. The proportion of male births thus found was 50.93 per cent. Applying the formula $\cdot 5093 n \pm \sqrt{\cdot 5093 \times 4907} n$, where n is the total number of births, to any particular year, gives us the number of male births to be expected, and the standard error within which the number might fluctuate. For 1901 and 1902, the years mentioned in the *British Medical Journal*, and for the quarters and year of 1915, the expected number and its standard error is compared with the actual number, in the following table :—

TABLE XXII.—*Comparison of “ expected ” male births with actual number.*

Year.	Expected.	Actual.
1901	473,551 ± 454	473,944
1902	479,001 ± 457	479,144
1915 1st quarter	112,793 ± 222	112,465
2nd „	108,534 ± 218	108,773
3rd „	100,082 ± 209	100,381
4th „	93,428 ± 202	93,683
Year	414,839 ± 425	415,302

59. In no case, it will be seen, is the actual number outside the limits of random sampling. It is always well less than twice the standard error. I think we can conclude that there is no evidence of any effect of the war on the sex ratio. The causes of the excess of male births are many and various, but no scientific textbook on the determination of sex ascribes any influence to war, and the latest one by Dr. Doncaster does not even mention the theory.⁸

Summary.

60. I have now traced the effect of the war of 1870 on the vital statistics of the chief countries concerned, and dwelt briefly on the available statistics of the present war. The effects of war on the demography of the countries concerned are seen to be as potent in their "indirect" effects (*i.e.*, on the civil population) as in their "direct" effects. We had in the Franco-Prussian War a "destructive" period, when the death rate rises and the birth rate falls, followed by a "recuperative" period, when the death rate falls and the birth rate is augmented. The immediate effect was a lowering of the marriage rate, followed slightly later by a rising of the death rate, and later still by a lowering of the birth rate. The death rate is the first to shake off the effects of war, and the high marriage rate which follows the conclusion of peace in its turn affects the high birth rate which results after the war. The war of 1870-71 seems to have affected mortality the most, both among belligerents and neutrals. The present war seems to have affected fertility the most. The number of deaths among the civil population, during the Franco-Prussian War, was greater than the number of losses on the battlefield. This was also the case during the Austro-Prussian War. This excess of mortality is felt equally by the two sexes. The war had no more adverse effect among old persons than among those of other ages, and infant mortality was not very seriously augmented unless, as in France, acute distress and privation are present. Still-births were not affected and illegitimacy decreased.

61. The vital statistics of England and Wales seem to have been remarkably little affected by war. During the Crimean War and Indian Mutiny, the average number of marriages did not fluctuate by more than 0.5 per 1,000 as compared with previous and subsequent years, and during the South African War they only slightly varied. The wars of 1866 and 1870-1 had no effect on the English birth rate. Since 1876, the birth rate has almost continuously declined, and the Boer War did not interrupt this fall.

⁸ *The Determination of Sex.* Camb. Univ. Press, 1915.

62. It is too early to summarise the effects of the present war. Its chief effect has been to depress the birth rate in this country to the lowest on record, and in France and Germany a similar reduction is taking place. In January, 1916, the population of Berlin was declining by 300 a week on the average. I have seen no figures for Paris, but they are probably still more serious.

63. Nature does not compensate for our losses in men by sending more boys than girls. There is always, in all European countries, an excess of male births, which war does not affect.

64. The vital statistics of England and Wales for 1915 are certainly not very pleasant reading—it has been suggested that “mortal statistics” would better describe them—and it is to be feared that those of France will be more alarming when published. Our natural increase was only half last year what it was a few years ago. Even our increased marriage rate is of little use at present from the point of view of fertility. Let us hope that when the war is over, complete and adequate vital statistics will be available for all countries so as to enable a thorough study to be made of the present and ultimate effects of this war—one far more adequate and satisfactory than the present one, written at extreme pressure of other work.

In conclusion, I wish to thank Dr. Snow for advice and criticism in many ways.

APPENDIX.

Table showing number of deaths in the age group 5–14 years, 1863–77.

Year.	France.		Belgium.		Holland.		England and Wales.	
	Males.	Females.	Males.	Females.	Males.	Females.	Males.	Females.
1863	19,180	20,947	3,383	3,788	2,694	1,850	17,857	17,564
1864	18,193	20,451	3,824	4,252	2,889	1,938	17,593	17,107
1865	20,971	22,499	4,270	4,602	2,919	2,135	15,359	14,794
1866	21,279	22,320	6,083	6,143	4,131	2,531	15,117	14,200
1867	18,366	19,802	2,911	3,259	2,397	1,825	12,915	12,251
1868	20,036	21,726	3,008	3,296	2,360	1,920	15,019	14,423
1869	19,801	21,211	3,300	3,572	2,287	1,781	16,029	15,324
1870	23,325*	24,113*	3,592	3,970	2,734	1,982	17,373	16,517
1871	36,746	37,799	5,553	5,843	3,843	2,742	16,627	15,643
1872	19,192	21,047	4,171	4,310	3,248	2,124	14,799	13,905
1873	18,200	20,430	2,713	3,137	2,615	1,793	12,978	12,292
1874	17,099	17,349	2,627	2,852	2,205	1,625	15,531	15,090
1875	16,950	18,064	2,674	2,890	2,320	1,831	14,825	14,104
1876	16,945	18,053	2,563	2,943	2,227	1,876	13,960	13,343
1877	16,419	17,783	2,645	3,113	2,047	1,765	13,676	13,058

* Excluding Department of the Seine.

DISCUSSION ON THE PAPERS BY SIR JERVOISE A. BAINES AND
MR. J. W. NIXON.

MR. BERNARD MALLET said he had much pleasure in rising to propose a vote of thanks to the authors of the two Papers on a subject which he supposed was perhaps the most important one the Society could consider at the present moment. That of Sir Athelstane Baines struck him as singularly able and interesting, and the figures, as usual with him, were very skilfully presented. He thought most of them would agree that his conclusions were sound. He asked whether it was quite correct to suggest, with regard to the death-rate, that the improvement had not been so marked among the very young as among adolescents and those in the prime of life. Excluding the abnormal year 1911, the rates for the last period dealt with by Sir Athelstane Baines showed a more substantial gain in recent years in the first five years of life than any other age period. That also seemed to be true of the period beginning with the present century. Taking the periods 1896 to 1900 and 1912 to 1914, the fall in the death-rate was as follows:—Age 0-5, 40 per cent. ; 5-10, 22 per cent. ; 10-15, 17 per cent. ; 15-20, 20 per cent. ; 20-25, 26 per cent. ; 25-35, 28 per cent. ; 35-45, 28 per cent. ; 45-55, 18 per cent. Then as regarded sex distribution, Sir Athelstane Baines had remarked on the lower average of girls born than boys born in comparison with other countries, and had quoted M. Bertillon's opinion that that was due to their defective system of registration. He had no wish to pose as an apologist for their registration laws, which no doubt in many directions cried out for reform, but in that respect he was sure that M. Bertillon's allegation was unfounded. There were other and more probable reasons for the differences. There were two general facts with regard to the year 1915 which might be noted. First, the actual proportion of male to female deaths showed an increase in the civil population, in spite of the number of men in the Forces. Also the proportion of female births showed an increase. Mr. Nixon's Paper covered so much ground that he felt it was very difficult to deal with it at all adequately. He must leave it to others to criticise his figures about France and Prussia in 1870 and afterwards. Perhaps they could say whether the registration in the countries affected by the war was sufficiently complete to enable them to draw any very definite conclusions. The figures of the military deaths struck one as rather curious. He did not know whether they were really accepted figures. He felt greater interest therefore in the section dealing with the present war, incomplete as it necessarily must be. The numbers of deaths given in Table XVI were for *all* deaths occurring in England and Wales, both civil and military. Mr. Nixon seemed to be in some doubt about this. Then there was the total figure in Table XVIII of

deaths in Berlin in 1915. The figure of 28,527 must be far below the truth. During the fourth quarter alone they numbered 11,738, according to the Registrar-General's quarterly return and annual summary. With regard to the birth-rate in Germany, he could add a little to the information given by Mr. Nixon. For the eight months ending December 31, 1915, that was to say, for the first eight months in which the birth-rate would feel the full effect of the war, the birth-rate in German towns with a population of over 15,000 fell about 33 per cent., as compared with the corresponding period in 1913. The numbers were 418,000 in 1913, and 281,000 in 1915. Both speakers had dealt with the sex ratio in an interesting manner. There was one more quarter to be added to Mr. Nixon's Table XXI for England and Wales. The ratios for the last four completed quarters would therefore now stand at 1043, 1044, 1044 and 1050. It was impossible to say that those figures were conclusive, but they seemed to give some colour to the popular idea of more boys being born in war times than at other times, and to the conclusion arrived at by Von Fircks as to the effect of the wars of 1866 and 1871 on sex ratios in Prussia. A rather interesting figure had been given to him about the Prussian figures. 1871 might perhaps be taken as the year in which the direct effects of the war would be most felt. According to the Prussian Census of 1910, the male survivors of persons born in 1871 preponderated over female survivors. There were 204,576 males and 201,716 females. There must have been a very considerable preponderance in the birth of boys in 1871 to produce that result. There was a similar preponderance of surviving males, though less in amount, amongst persons born in 1873 and 1874. So far as they had traced them, all other years appeared to show a female preponderance, both before and after the war. It was a small point, but it seemed to him to be of some interest. He begged to move a hearty vote of thanks to Sir Athelstane Baines and Mr. Nixon.

Mr. E. A. H. JAY said he had great pleasure in seconding the vote of thanks for the two very important and interesting Papers they had heard read. Dealing with the question of the birth-rate, he had made enquiries in an important East End Borough, and had found one very remarkable thing, which was perhaps typical of industrial districts. In one district the birth-rate had fallen from 41·6 to 29·7 from 1905 to 1913, whereas in another quite adjacent district the birth-rate had only fallen from 32·9 to 32·8, which was very remarkable. He believed the reason was the different kind of population. In the latter case, where the fall in the birth-rate was so slight, they had practically the same people following the same occupation in the next generation, whereas in the district first mentioned there was a changing population. At the time when the birth-rate was so high, there had been a considerable influx of aliens. The difference in the rate of decline was remarkable. The rate was usually calculated on the expected trend of population during the years following the last

decennial period, on the assumption that it would follow exactly the same course as it did in the previous ten years. That was not always quite the case. He believed that frequently there were considerable changes, owing to emigration and immigration. In one case he knew of, if that had been taken sufficiently into consideration, it would have raised both the birth-rate and the death-rate. He did not know how far that would affect the whole population of the country. He was very much interested in the question of infant mortality, because that seemed to be a sphere in which they could possibly do most to counteract the influences which were undoubtedly causing a gradual decline in the birth-rate. He did not know what steps it was possible to take to arrest that. It was largely a moral question. He took it that the raising of the standard of comfort, coupled with an absence of the sense of responsibility, was spreading down to the lowest strata of society, and having its effect there. At any rate he thought they could do something to counteract that effect by as far as possible lowering the rate of infant mortality. He believed it had been established that wherever they got a very high death-rate at the earliest stages, that was followed right up. Where they had a very high rate amongst children under one year; they found the same thing continued right up through childhood, and it was found to be due to housing and sanitary conditions, and ignorance and neglect on the part of parents, and their habits of life. That had its effect both before birth, immediately after birth, and for a considerable period afterwards. In one East End Borough in which he had made some enquiries, it appeared that 25 per cent. of the mortality amongst infants was due to such causes as atrophy, debility and diseases of the digestive organs, all of which were more or less attributable to ignorance and neglect on the part of parents, causes which one might hope were capable of being considerably affected by the remedies which were now being applied. In that respect they might hope for considerable results from the various agencies, such as Infant Care Associations, which have received grants from the Local Government Board for carrying on their operations, in the way of providing instruction for mothers, both before and after parturition. He hoped before very long they would begin to see definite results from the operations of such agencies. With regard to the death-rate at the most productive age, a large proportion was no doubt due to phthisis and tuberculosis amongst that section of the population. That had affected the death-rate amongst the population between 30 and 40; but tuberculosis dispensaries and other such agencies which were now actively at work, ought to have their effect in time. It seemed rather a remarkable statement to make with regard to the lower death-rate in Prussia, that owing to there being a smaller number of infants it had been possible to deal with them more effectually, and therefore the rate had decreased. If that were so in Germany, it ought to be universal. He did not know why it should apply more to Germany than to other countries, unless Germany had been more successful in taking steps to deal with it.

No more important subject could have been brought before them, and he expressed his thanks to the authors for their Papers.

Dr. T. H. C. STEVENSON said he concurred in the expression of their obligation to the authors of the two extremely valuable and interesting Papers they had heard. They were of great interest to him personally, and were likely to afford him subject for consideration for some little time. With regard to Mr. Nixon's remark that he looked forward to the treatment of the effect of the present war upon the vital statistics of their community, he thought everybody concerned should clearly bear in mind that that effect could never be thoroughly studied unless this country obtained a Census directly after the war. The migration of population brought about through the war would have been so great that any Returns for districts, as the last speaker had pointed out, would be very greatly affected, and accuracy would be almost impossible to secure. As some of them had experienced, it was difficult enough to get over that difficulty in peace times, but under the circumstances of the moment, he almost despaired of any reliable figures for portions of the country, and in a lesser degree even for the whole of the country, after the war. Dealing with Sir Athelstane Baines' Paper, he said that Sir Athelstane quoted what would strike one at first as very alarming figures as to the preponderance of marriageable women over marriageable men; but as he thought he showed afterwards, that preponderance was in the main composed of elderly widows, and it might be of interest to mention the fact that at the ages at which the marriage condition of people was most interesting from the point of view of vital statistics, namely, 15 to 45, the preponderance was only $4\frac{1}{4}$ per cent. as against almost 20 per cent. for the whole period. Sir Athelstane remarked that: "It would be useful to know how far the decreased fertility in question is due to the curtailment of the period of childbearing by the later age at which women have been marrying in recent years." He thought it was possible to express the extent to which it was due numerically, and he had made an attempt to do it. He thought the amount of fall due to that cause was about 5 per cent. Taking the birth-rate of the present day, and contrasting it with that of forty years ago, taking the years 1874 and 1914, the fall in the crude and standardized birth-rates was identical, namely, 34 per cent. They might therefore take it that the fall in crude birth-rate correctly expressed the decrease in fertility. But of the factors enumerated by Sir Athelstane Baines, the increase in the proportion of people of productive age would account for an increase in the birth-rate of 8 per cent., and the diminution in the proportion of married at that age would account for a decrease in the birth-rate of about 3 per cent. But as the crude birth-rate correctly represented the actual fall in fertility, they might take it that that favourable balance of 5 per cent. was wiped out by some other factor, namely, the diminution of fertility owing to women marrying later. He therefore thought they might put the numerical value of 5 per cent.

upon that (*i.e.*, 5 per cent. out of the total fall of 34 per cent., or about 15 per cent. of the recorded fall), thus redressing the balance and accounting for the fall of the crude rate being the same as the fall in the standardized rate. He expressed his agreement with all that was said as to the probable explanation of the decline of the birth-rate, and wished to mention one or two facts which seemed to him to support that conclusion. If standardized birth-rates, by which inequalities of opportunity, consisting as they did of the differing proportions in different populations of married women of the various fertile ages could be eliminated were worked out, they found in two neighbouring towns, Hull and Bradford, that the rates were almost identical in 1881. Thirty years later the rate for Hull had fallen from 31 to 26, and the rate for Bradford had fallen from 31 to 18. It seemed to him very difficult to conceive of any cyclical influence affecting the fertility in two towns in the same County in such different degrees in the same time. The same difficulties were met with if they compared the different countries making up the United Kingdom. They found that as between 1881 and 1911 the rate for England and Wales had fallen 30 per cent., that for Scotland had fallen 24 per cent. and that for Ireland had risen 5 per cent. If they confined their attention to the most Irish part of Ireland, namely, the Province of Connaught, they found the rate had risen 34 per cent. The figures were rather remarkable. In 1881, the standardized birth-rate for England and Wales was 34.65 and for Connaught 33.81, slightly lower; whereas in 1911 the rate for England and Wales was 24.67 and for Connaught 45.34, not very far off double. It might be suggested that difference in race came in, and that the cyclical influence applied to one race and not to the other; but he believed that opinion was veering round to the belief that the difference in race was less fundamental than at one time it was assumed to be. In any case the experience of Wales and the Highlands of Scotland was very different from that of Ireland. He thought it was of interest in that connection to point out the trend of events in the German Empire. The standardized rate there did not fall at all after 1891; but in the twenty years which elapsed between 1891 and 1911 it fell by 26 per cent., and one wondered whether one of the considerations which might have been present in the mind of the authorities in Germany in deciding on war was that their position as regarded the proportion of men of military age in their population was likely to become more unfavourable as time went on, owing to the decline in their birth-rate. The decline was greater than in England. The decline in England for thirty years was 30 per cent., whereas in Germany the decline for twenty years was 26 per cent. It fell from 40.45 in 1891 to 29.87 in 1911. In calculating the standardized rates, the fact emerged very clearly, as Sir Athelstane Baines had pointed out, that the population of this country in 1901 was of maximum favourability for giving a low death-rate. Taking the population in 1901 as the standard, then the death-rates before and since had to be increased to allow for the gradual change towards and away from

that optimum constitution. A population may either be too young or too old for the purpose of producing a low death-rate. If the proportion of young children was high, then the death-rate tended to be high, because of the large number of infant deaths included, as they saw in the case of the Russian population. If it were too old, as in the case of the French population, then the large number of old people with their relatively high mortality also turned the scale in the same direction; and it so happened that in 1901 the population of this country was such as to be most favourably situated for not only a low death-rate but a high birth-rate, and to yield the maximum number of men of military age. He was afraid that they had then begun to go down hill in all those three respects. It was rather curious that approximately the same constitution of population should apply for all three.

Dr. SALEEBY thanked Mr. Nixon for sending him an invitation to be present. He had with him a copy of the proof of the Report of the Malthusian League of the present year, which was a most outrageous document—scoffing, for instance, at the assertion that our rising age constitution, due to the continued fall in the birth-rate, must ultimately lead to a rise in the death-rate. He thought Mr. Nixon would be interested to know the special figures of Scottish infant mortality last year. It would be worth while putting in a footnote. A most excellent report on that subject had been prepared for the National Association for the Prevention of Infant Mortality by Mr. D. W. Kemp. Scottish infant mortality had jumped up very abruptly, and almost sensationally, last year. It was stated that the rise in infant mortality in England and Wales last year was principally due to measles. But the rise in the Scottish mortality, which was much more marked, was in no degree due to measles or any other epidemic. The weather was favourable, and there was no rise in infant diarrhoea or any epidemic; but it jumped up to 128 per 1,000, a higher figure than it had been since 1901, and a higher figure than 1855. The birth-rate in Edinburgh last year was less than 18—the lowest ever recorded in Scotland. A very interesting article by Dr. Norman Maclean, on the Scottish birth-rate, and notably Edinburgh, would interest Mr. Nixon. In Edinburgh last year it was one half of what it was in 1871. And though there were so very few infants born in Edinburgh, the death-rate among those infants abruptly rose, showing it did not merely depend upon the fall in the number of infants. The best comment on the idea that infant mortality simply followed the birth-rate, as the Malthusians asserted, was furnished by a comparison of the infant mortality in Paris and Edinburgh since the war began. In Edinburgh, with very few infants born, there was a greatly raised infant mortality, due without the slightest doubt to maternal drinking of spirits. In Paris the figures of the present war were much more interesting than Mr. Nixon had revealed in his Paper. According to a report by Professor Pinard, the greatest French authority on the care of infants, and Professor of Clinical Obstetrics in the University of Paris, great and unheard of measures were taken directly the war broke out to save

the infants in Paris. As Mr. Nixon had recorded, they knew that practically no infants survived the Siege of Paris. They placarded Paris with notices calling for persons to come and help the infants, and had gathered a number of women together who had set to work to visit the mothers and take care of the infants. The death-rate among the infants fell to the lowest recorded figure. The infants were heavier at birth on the average than they had ever been, because they were carried longer by their mothers, and there were the fewest still births on record. The most remarkable results, which were obtained in the first six months of the war, had begun to fall off, according to Pinard, partly owing to a diminished enthusiasm on the part of the visitors, and partly owing to the extension of the occupation of women outside the homes, in the making of munitions, for instance. As he had taught for fourteen years, the immediate maternal environment of the infant was the vital thing; the war factors as such, and the movements of the birth-rate, were perfectly insignificant as compared with the maternal environment of the infant, which is *the* cardinal factor of infant survival or destruction.

Captain M. GREENWOOD joined with the other speakers in congratulating the authors of the Papers on their very interesting contributions. He thought Dr. Saleeby was mistaken in assuming that Neo-Malthusians were responsible for the view that the birth-rate and infant death-rate tended to vary together. It was a view which was held, and always had been, by all statisticians. The point was that no sound statistician argued that there was an essential and necessary causal relation between them. The vital statistics of every country showed the correlative variation. The most useful data on that particular subject were those of Bavaria, as published by Groth and Hahn, because in those data birth-rate, infant death-rates, proportions of bottle-fed infants and a measure of poverty were provided for each of several districts, so that four variables were available for study. Treating these by the method of multiple correlation, one found there was a residual connection between fertility, as measured by the corrected birth-rate, and the infant death-rate, a partial correlation. The suggestion made in some quarters that the whole, or practically the whole, of the infant death-rate was preventible, was in all probability fallacious; and the explanation which was the most plausible one, was that owing to the introduction of artificial methods of limiting the birth-rate, the latter was selective and unfavourably selective. In other words the fitter members of the community, in a physical sense, had a lower birth-rate and a lower infant death-rate, so that there was inevitably correlation between the fertility rate and the mortality rate. When artificial methods had thoroughly permeated the community, it would be interesting to see whether that high correlation between the mortality rate and the fertility rate still subsisted. If the theory he had suggested were correct, there would cease to be a high partial correlation between the two. If not, it

would remain. To the illustrations which had been given by other speakers might be added that of the enormous fall in the corrected birth-rate of a well-to-do London borough such as Hampstead (30·01 in 1881, 17·55 in 1911), as contrasted with the almost stationary rate of working-class parishes such as Shoreditch (31·32 in 1881, 30·16 in 1911).

The CHAIRMAN (The Right Hon. LORD GEORGE HAMILTON) said he wished to express their sense of obligation under which the authors had placed them. Speaking as a very moderate statistician, one of the advantages he had often derived from the Papers was that they got rid of myths. A very pleasant myth he had on several occasions heard propagated in speeches with regard to careless mothers, was that he had heard people, including clergymen and others, impress upon their audiences the enormous influence of the maternal factor, and had given as an illustration that during the Siege of Paris, notwithstanding the fact that the women were half starved, the infant mortality was less than it was in normal times, in consequence of the greater care which the mothers gave. Unfortunately Mr. Nixon had annihilated that pretty theory by declaring that none of the babies born during that time lived. He thought one of the Papers had very clearly shown that the further theory that when there was a war there was immediately a large crop of male infants as compared with female infants, was also a myth. The nation was only following its usual custom of producing more males than females. They had had a great many statistics which were very interesting; and there were certain ages, both of men and women, where they were more prolific than others. He wondered whether any statistician had ever gone into the question of what the relative age of a man and a woman should be. He was told that in France there was a rule that the perfect proportion of age between a man and woman was that the woman should be half the years of the husband, plus seven. So that if a man married at twenty-five, the woman should be about twenty, and if the man was thirty, the woman should be twenty-two, and if the man married at forty, the woman should be twenty-seven. He had the theory, which was supported by statistics, that families were larger when there was a difference between the age of the man and the woman. Mr. Mallet had alluded to the rather defective system of registration which prevailed in this country as compared with other countries. He had noticed that the Englishman thought that it was one of his innate privileges not to be registered. It was an insult to the average Englishman to call upon him to register. He believed that one of the advantages of the Liability to National Service Bill, which would go through the House, and which he hoped would always be in operation, would most enormously improve the general system of registration because, when the law was passed that everybody who attained a certain age was liable to military duty, the actual numbers who came under the scope of the law, and the specific years when they came under it would be obtained, and in that

way universal liability to service would have an important effect upon the whole system of registration.

Sir J. A. BAINES, in reply, thanked those who had taken part in the discussion for their kindly references to the Paper, and for their criticism of certain points. To some of the latter he would reply as far as time allowed. In regard to the relative extent of the fall in child and adolescent mortality respectively, the former had, no doubt, improved of late more than that in later life, but he referred in his paper to the general course of the rates since 1871, during which time the decline in infantile mortality, at least, had been the later and more irregular. He would admit, however, that a closer study of the re-modelled tables of Dr. Stevenson than he had hitherto been able to give might alter his opinion on the whole case. As to the rising proportion of male births, Mr. Bernard Mallet was right, of course, as to the great rise in 1915, but the ratio seems to have been going up for some time, though very slightly. It was a difficult question to solve. Darwin had referred to an ardent desire for male offspring as an influence in the production of more male births, and this might be the case at the present crisis here. In India, where amongst important high castes, there was a positive aversion from female children, it was still uncertain how far the paucity of the latter was due to this cause or to some other and less abstruse. He had remarked in connection with this argument, long ago, that so strong a tendency, if valid, would ultimately lead to the extinction of the caste for want of mothers. Mr. Jay's remark about the uncertainty of the intercensal population of urban districts had been answered by Dr. Stevenson. In dealing, as in this paper, with the population of the country as a whole, the difficulty is less. But as far as the very interesting vital statistics for 1915 are concerned, no doubt the basis of population has to be ascertained by special means before use can be made of them statistically. The association of a high birth-rate with high infantile mortality, mentioned by Dr. Saleeby, is almost universal, and he could not enter into it on this occasion. He would refer, however, to the Local Government Board Reports upon the great improvement effected in Lancashire by well-devised systems of local instruction and supervision of the conditions preceding, as well as following, birth. In regard to the "fertility rate" he was not sure that he had used the term in the same sense as Dr. Stevenson had done. Possibly he misunderstood him. The ratio between legitimate births and the married women between fifteen and forty-five, however, had declined more in the forty-three years in question than the birth-rate. Dr. Saleeby had mentioned the publications of a "Malthusian," or "Neo-Malthusian," Society, and in connection with this nomenclature he always felt inclined to ask the classical question—"Why drag in Malthus?" The important question raised by the President as to the influence of difference of age between married couples upon the progeny, was one which had received much attention from various writers from Sadler downwards, but was still unsolved. That the

difference has some effect, there is no doubt, but its limits had not been satisfactorily determined.

Mr. J. W. NIXON, in reply, said that several of the points had been covered by Sir Athelstane Baines, and he did not need to deal with them. Referring to the question (raised by Mr. Mallet), the reliability of the figures, he could say that he thought the Prussian figures were fairly reliable. But as regarded the French figures, he was a little doubtful about this period, especially as no vital statistics for 1870 had been collected for the Department of the Seine. The figures of the military deaths in France were also very doubtful, and there were no possible means of getting accurate figures. The very elaborate volume by Dr. Engel, giving the number and regiment of every German soldier killed or wounded at various dates, showed that the figures could be fairly relied upon. He was not quite certain as to whether deaths of wounded soldiers occurring in this country were included in the English vital Statistics, and was glad to be confirmed on that point by Mr. Mallet. The Registrar-General for Scotland had separated them in his annual report for 1914 ; but the English report said nothing about them. He certainly did not agree with the theory that the smaller number of infants born led to greater protection and reduced mortality. The figures he had quoted from the German Press in this respect were not very reliable. He hoped that the quinquennial census which the Society had urged for a great many years, and which fell due next year, would be taken. He thanked them for the kind expressions contained in the vote of thanks.

The following Candidates were elected Fellows of the Society :—

Oswald T. Falk.

Roy A. Snell.