The Female Life Span

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There is widespread awareness of the increased longevity of the population of Great Britain and of the socio-medical problems which the care of those no longer capable of an independent life impose upon the nation. The actual numbers involved and the progressive increase in those living to an advanced age are not so fully appreciated. Figure 1 and Table 1 show the position in England and Wales over the last half century. In 1981 there were more than four times as many women over the age of 85 as there had been 40 years earlier in 1941, while over the same period the number of males of this age trebled [1-5]. The proportion of very old people relative to the total population of each sex has steadily increased and by 1991 may for women exceed 2 per cent. This demographic and social change was considered in an earlier publication [6] which this contribution endeavours to amplify and to take a step further.

The factors underlying increased life expectation are multiple. Progressive improvement in social conditions is probably the most important. Better housing, better nutrition, clean air, central heating and improved water supply and sanitation have become available to the majority. In addition, free medical care, the advent of Table 1. Population of England and Wales over age 85 by Decade and Sex.

| Year | Male   | Female  | Percentage over 85 of total of sex |
|------|--------|---------|-----------------------------------|
| 1941 | 42,000 | 89,000  | 0.24  0.41                        |
| 1951 | 59,000 | 132,000 | 0.28  0.58                       |
| 1961 | 92,000 | 205,000 | 0.41  0.86                       |
| 1971 | 107,000| 313,000 | 0.45  1.25                       |
| 1981 | 125,500| 410,700 | 0.52  1.61                       |

Fig. 1. Population of England and Wales over age 85 by sex and percentage of the total population of their sex.
antibiotics and improved surgical and anaesthetic skill must have played their part. The virtual conquest of great killers of a bygone age such as tuberculosis and smallpox and the effective prophylaxis of poliomyelitis, whooping cough, diphtheria and other infections have reduced the death rate from these diseases while the enormous reduction in perinatal mortality has allowed more babies, who previously would not have survived, to live to swell the population in their second and subsequent years.

The extent to which life span can continue to increase may have a finite limit. To date, authentic records show the longest surviving male in England and Wales to have died at 111 in 1968 and the longest surviving female at 112 in 1973[7]. It may well be that in the future a few will live for longer than this but the probable trend will be for more men and women to live to extreme old age and for there to be more centenarians; but the numbers living beyond 110 are likely to remain small.

That more females than males survive to an advanced age has long been known. In 1841 there were 78 female and only 36 male centenarian deaths[8] and in 1910 the numbers were 43 female and 22 male[9]. The extent of the increasing female preponderance is shown in Figure 1 and Table 1. Figure 2 shows the number of men and women aged 100 or more who died in England and Wales in 1982[10].

The causes underlying the sex difference in longevity are complex. In the years 1941–81 the total population of England and Wales contained a million more women than men (Table 2) although at birth there was a slight male preponderance (Table 3) which was maintained until the age of 50–54 years. This was despite a higher perinatal mortality in males than in females and despite a higher death rate in male infants from congenital malformations. Indeed more male than female deaths occurred until the age of 80 years (Table 4) when the reduction in the number of male deaths resulted chiefly from the fact that there were fewer men than women of that age available to die rather than a smaller proportion of the

### Table 2. Population England and Wales.

| Year | Male | Female |
|------|------|--------|
| 1941 | 17,228,000 | 21,515,000 |
| 1951 | 21,049,000 | 22,751,000 |
| 1961 | 22,346,000 | 23,820,000 |
| 1971 | 23,797,000 | 25,097,000 |
| 1981 | 24,121,000 | 25,472,000 |

*Figures influenced by 1939–45 war*

### Table 3. Number and sex of babies born in 1941–81 in England and Wales.

| Year | Male | Female | M/F ratio |
|------|------|--------|-----------|
| 1941 | 280,000 | 268,000 | 1.045 |
| 1951 | 346,000 | 328,000 | 1.055 |
| 1961 | 403,000 | 382,000 | 1.035 |
| 1971 | 401,500 | 380,100 | 1.056 |
| 1981 | 324,900 | 309,500 | 1.050 |

### Table 4. Number of deaths in 1981 in England and Wales by sex.

| Age | Male | Female |
|-----|------|--------|
| 0-4 | 4,770 | 3,431 |
| 5-9 | 447  | 302   |
| 10-14| 573  | 368   |
| 15-19| 1,734| 650   |
| 20-24| 1,576| 642   |
| 25-29| 1,427| 718   |
| 30-34| 1,754| 1,033 |
| 35-39| 2,143| 1,451 |
| 40-44| 3,392| 2,291 |
| 45-49| 5,920| 3,820 |
| 50-54| 10,969| 6,693 |
| 55-59| 19,688| 11,268|
| 60-64| 27,170| 15,943|
| 65-69| 40,298| 25,100|
| 70-74| 51,891| 37,662|
| 75-79| 50,959| 49,320|
| 80-84| 33,815| 54,234|
| 85-89| 19,406| 43,416|
| 90-94| 7,357 | 22,827|
| 95-99| 1,563 | 6,627 |
| 100-104| 161 | 940 |
| 105-109| 8   | 60  |
| 110 +| 1   | 2   |
| Total | 289,022 | 288,068 |

Fig. 2. Centenarian deaths England and Wales 1982 (actual number)
male population in that age group dying[1-5]. In 1976, and earlier, the death rate in women overtook that in men in those aged 75-79 and this upward change reflects the enhanced life expectation for men. It is remarkable that with the wide differences in the number of male and female deaths from birth onwards the numerical supremacy of men in the population is not finally eroded until the age of 50-54, but with a total population of 50 million in England and Wales it requires a disproportion of deaths between the sexes of half a million to produce a one per cent change in the sex structure of the population. It must be emphasised too that in the fourth and fifth decades the difference in the sex population is small and before 1981 the change over in numerical sex supremacy occurred at an earlier age, being in the age group 45-49 in 1971 and 35-39 in 1961[1-5]. The recent upward trend again reflects the improved life expectancy of men and possibly also the receding effects of the 1939-45 war.

From birth up to quite an advanced age, therefore, more men than women die each year. Each death, male or female, depletes the numbers entering the next and subsequent years and the excess of male over female deaths up to the age of 80 means that each year there are more women going forward to the next year than men. From the age of 80 onwards there are even more females than males surviving to enter the subsequent year because the male population over the age of 80 is so small.

The causes of the higher male death rate are shown in Table 5 which lists the diseases in which there is a significant sex difference in the numbers dying. Tuberculosis, neoplasms (particularly of the lung and bronchus), ischaemic heart disease, chronic obstructive airways disease, accidents and suicide are largely responsible. These deaths remove large numbers of males in middle life, leaving fewer to progress with their contemporaries and with females of the same age to the next and subsequent years. The excess of some 27,000 male over female deaths in 1981 is paralleled in other years but is often less in degree. It occurs despite the large numbers of women dying from breast, uterine and ovarian cancer and the predominance of females among those dying from cerebrovascular disease. However, most females who die from strokes do so between the age of 70 and 95: of the 43,047 women who died of a stroke in 1981, 35,467 were aged 70 or over[5].

It is obvious that the age at death plays a crucial part in determining the numerical disproportion between the sexes. If the years lost by death are considered in the principal causes of death in men and women, the extent to which the male population is depleted in middle life will be immediately evident (Table 6). While cerebrovascular disease causes marginally more years lost in women than in men, the years lost to age 65 and to age 85 from deaths due to neoplasms, ischaemic heart disease, chronic obstructive airways disease, accidents, and suicide are very much greater in men than in women[5].

It must be emphasised that a larger female population and a higher male than female mortality rate have been a feature of England and Wales since accurate records have been kept[8,9,11-13]. Currently, a considerable number of the male deaths in middle life appear likely to have resulted from smoking. How then can a similar situation in respect of male mortality be explained during a long period before the cigarette arrived? Table 7 shows some of the causes of death in 1911 where it will be seen that infections, particularly tuberculosis and pneumonia, suicide and violence, and perinatal mortality were responsible for very many more male than female deaths[14]. A similar pattern was seen throughout the second half of the nineteenth and early decades of the twentieth centuries. Why perinatal death claims more male than female infants is uncertain. The higher congenital malformation rate in males only explains a small part of the difference. If the consumption of tobacco is reduced by health education it is possible that in a decade or so men may have a life expectation similar to women. Of the 1,975 deaths certified in 1981 as due to senile dementia 574 were male and 1,441 female[5]. It will be of interest to see whether, when men live longer, they experience the same incidence of senile dementia as do women now, or whether women are particularly prone to this disorder.

It may well be, however, that in blaming tobacco for male attrition one is tending to overlook other factors which may be of equal or greater importance. Under good laboratory conditions the male mole rat lives longer than the female, probably as a result of protection from predators (see also a similar situation in mice[15]), and

| Table 5. Major causes of death where there is marked disproportion between the sexes England and Wales 1981. |
|---------------------------------|----------------|----------------|
|                                | Male Number    | Female Number  |
| Tuberculosis                   | 385            | 172            |
| All neoplasms                  | 69,920         | 61,771         |
| Oesophagus (2,242)             | (1,613)        |                |
| Stomach (6,305)                | (4,347)        |                |
| Colon (4,428)                  | (3,940)        |                |
| Rectum (3,281)                 | (2,772)        |                |
| Lung & bronchus (26,297)       | (8,430)        |                |
| Female breast                  | (12,513)       |                |
| Cervix, uterus & ovary         | (7,239)        |                |
| Prostate (5,151)               |                |                |
| Diabetes                       | 1,994          | 2,632          |
| Thyroid disorders              | 76             | 375            |
| Mental disorders               | 1,137          | 2,304          |
| Senile dementia (534)          | (1,441)        |                |
| Rheumatic heart disease        | 896            | 2,224          |
| Ischaemic heart disease        | 89,104         | 66,092         |
| Hypertensive heart disease     | 2,458          | 2,955          |
| Cerebrovascular disease        | 26,604         | 43,047         |
| Chronic obstructive airways    | 17,587         | 7,309          |
| disease                        |                |                |
| Musculoskeletal disorders      | 823            | 2,289          |
| Congenital anomalies           | 1,665          | 1,374          |
| Perinatal                      | 1,605          | 1,054          |
| Injury and poisoning           | 11,588         | 8,200          |
| Road traffic accidents         | 2,889          | 1,156          |
| Suicide                        | 2,761          | 1,658          |
| Total                          | 231,582        | 204,612        |

Note: Items in parenthesis are part of ‘All neoplasms’ or Mental disorders’ and do not add to the total.
not having to compete for food and living space[16]. In the Hutterite and Amish communities in the USA males live longer than females, 55.6 per cent of the Amish over 60s being male. This is thought to result from their large family size, their self sufficient agrarian existence and their social and cultural isolation. It certainly appears to be environmental rather than genetic for the Amish came to the USA from Berne via Alsace Lorraine only about two and a half centuries ago[17]. Among humans in this country those with Down’s syndrome are probably the most protected group; they do not have to serve in wars, they are not often exposed to the risk of accidental death and they are provided with food and a home either by their parents or by the state. Their life expectation has increased since 1929 from nine years[18] to about 50 years now[19-23] and today the major cause of death is premature senility (Alzheimer’s disease). While it may reasonably be argued that much of this improvement stems from the prevention or control of infections there seems little doubt that the unavoidable pattern of living imposed on patients with Down’s syndrome favours their increasing life span and male survival. There is a male preponderance among mongols born alive[20,21]. Although earlier writers report the majority dying in their first year to be female, this is no longer evident[23] and after one year there is no clear difference between male and female mortality. In consequence, a male preponderance remains until death.

So, therefore, it may be with normal humans. The female has a more sheltered life than the male and is under less risk of physical injury; other indirect factors which threaten life affect her less and so she usually lives longer than her male counterpart. Evidence currently available strongly favours environmental rather than genetic influences in female longevity and it may well be that a more wholesome lifestyle for the male might result in his living as long as the female.

Table 6. Mortality rates per 10,000 population, age at death and years lost by death—England and Wales 1981.

| Disease                        | Male                | Female               |
|--------------------------------|---------------------|----------------------|
|                                | Mortality rate      | Mean age at death    | Years lost to age 65 | Years lost to age 85 | Mortality rate | Mean age at death | Years lost to age 65 | Years lost to age 85 |
| All neoplasms                  | 28                  | 68.8                 | 1131.5               | 4663.3               | 24              | 69.3               | 687.3               | 1124.0               |
| Ischaemic heart disease        | 37                  | 69.8                 | 229.1                | 1371.2               | 26              | 76.8               | 49.9                | 577.6                |
| Cerebrovascular disease        | 11                  | 74.1                 | 38.0                 | 298.4                | 17              | 78.6               | 33.3                | 307.6                |
| Chronic obstructive airways    | disease             | 6                   | 73.4                 | 20.6                 | 159.4           | 2                   | 73.6                | 12.9                 | 67.3                |
| Accidents                      | 3                   | 45.1                 | 173.9                | 303.4                | 2               | 65.7               | 52.9                | 113.2                |
| Road traffic accidents         | 1                   | 37.4                 | 84.1                 | 137.7                | 0               | 49.1               | 22.9                | 41.6                 |
| Suicide                        | 1                   | 48.1                 | 51.4                 | 101.9                | 1               | 55.7               | 20.4                | 48.6                 |

Table 7. Some major causes of death in England and Wales in 1911.

| Cause                      | Male    | Female   |
|----------------------------|---------|----------|
| All causes                 | 272,512 | 255,298  |
| Infections                 | 49,551  | 43,377   |
| Tuberculosis               | (29,227) | (23,893) |
| Pneumonia                  | 21,582  | 16,060   |
| Perinatal mortality        | 19,560  | 15,144   |
| Violence and suicide       | 14,405  | 5,929    |

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