John GRAUNT
b. 24 April 1620 - d. 18 April 1674

Summary. Arguably the Father of Modern Statistics, Graunt produced the first life table and, together with William Petty, founded the English School of "Political Arithmetic".

John Graunt was born in London, the eldest child of Henry and Mary Graunt. His father was a draper who had moved to London from Hampshire. Graunt served an apprenticeship and eventually succeeded to his fathers drapery business, becoming quite prosperous. He was made a Freeman of the Drapers' Company at age 21, and eventually rose to the important position of Warden of the Company which he held in 1671-1672. Graunt held various civic offices at the ward level and ultimately on the common council. He was a captain in the (military) band, and a major in his last years (1671-1674). He died on 18 April 1674 at age 53.

Graunt lived in a period of great intellectual activity. It was a period which cradled modern science. The Royal Society of London, which played a seminal role in this, was founded in 1660. The old learning, with its appeal to authority, was being replaced by enquiry and experiment.

In 1662 Graunt published his famous *Natural and Political Observations on the London Bills of Mortality*. This was the first treatise on vital statistics, and shows the earliest attempt to apply theory, if only "shop arithmetic", to real statistical problems. Later, his friend Sir William Petty (1623-1687) used similar methods on Irish data (principally in *The Political Anatomy of Ireland* (1672, published 1691) and *Observations upon the Dublin Bills of Mortality* (1681)). The two men, between them, founded the English School of what was called "Political Arithmetic". Graunt has been assessed by Karl Pearson (q.v) as the Father of Modern Statistics.

Graunt explained in the Preface to *Observations* how he had become interested in the *Bills of Mortality*, weekly reports whose publication had begun in 1592. These had been a subject of curiosity but he sought to distinguish between impression and fact and found much underlying regularity in the data. He implicitly accepted the stability of statistical ratios, such as the (number of burials/population), and if the ratios were not stable he sought reasons. Thus, when he made what was the first attempt at a life table, he based his results on the twenty years 1629-1636 and 1647-1658 which were

relatively less effected by plague [1].

The basis on which Graunt made his calculations is not evident, although he may have used a geometric series. Amongst the calculations is an estimate of the size of an army which could be raised in London based on the assumption that there are 107 males for each 100 females. Graunt seems have been the first to make such an observation about the sex ratio. He deduced that 34% of the male population would be aged between 16 and 56. Typical of other calculations are that of 100 persons born, 36 die before age 6 and 7 survive to age 70.

Graunt's first crude life table led on to the mathematical work of Edmund Halley (1656-1742) and thence to the foundations of actuarial science. He had foreseen what we needed, namely the following of a given group from birth to death. As it was, he did not have the ages of individuals at death, and his data was effected by migration into the city of London.

The *Observations* were well received. On 5 February 1662 50 copies of the book were presented to the Royal Society. A Committee was appointed to examine the book and reported favourably. King Charles II was also impressed and recommended Graunt to the Society, and on 26 February 1662, only a month after publication of the book, Graunt was elected to the Society. In November 1664 he was elected to the Council of the Society and he was a regular participant in Council meetings until April 1666.

Late in his life, Graunt descended into poverty. This started off with the destruction of his house in the Great Fire of London in September 1666. But a major cause was that he ceased his trade and all public offices, apparently on religious grounds, after his conversion to Roman Catholicism. At the time this was a controversial and unpopular step.

There were various further editions of *Observations* - a second edition in 1662 and a third, much enlarged, and fourth in 1665. A fifth edition appeared in 1676, two years after Graunt's death, apparently overseen by Petty. This contained a very few "further observations".

It is worth noting that Bills of Mortality began to be published in Paris just before 1670, apparently in response to the appearance and evident value of Graunt's *Observations*. Indeed, Graunt's work led on rather naturally to the universal registration of births, marriages, and causes of death for purposes of the State.

It has sometimes been suggested that Petty was the author of *Observa-*

[1] The Great Plague occurred in London in 1665.

tions and, indeed, he made some claims to this effect after Graunt's death. But on balance the suggestion does not seem well founded. A careful assessment has been given by Karl Pearson in Pearson (1978, Chapter II). It should be noted, in particular, that Petty was a member (chair) of the Royal Society Committee which considered *Observations* after its receipt from Graunt in 1662 and reported positively prior to his election to the Society.

References

[1] Pearson, E.S. (Ed.) (1978). *The History of Statistics in the 17th & 18th Centuries against the changing background of intellectual, scientific and religious thought. Lectures by Karl Pearson given at University College London during academic sessions 1921-1933*, Griffin, London (especially Chapter II).

[2] Sutherland, I. (1963). John Graunt: a tercentenary tribute, *Journal of the Royal Statistical Society Series A*, **126**, 537-556.

C.C. Heyde