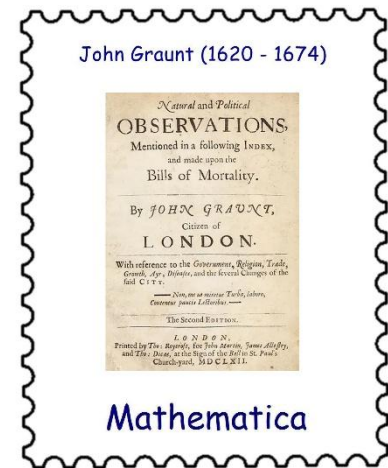


JOHN GRAUNT (April 4, 1620 – April 18, 1674)

by HEINZ KLAUS STRICK , Germany

February 4, 1662 is considered the birth of *demography*. On this day, JOHN GRAUNT, a London *haberdasher*, published the study *Natural and Political Observations made upon the Bills of Mortality*, a first systematic analysis of births and deaths in his home town.



JOHN GRAUNT was born the eldest of seven children to HENRY and MARY GRAUNT. The father, whose family came from the southern English county of Hampshire, ran a finished goods business in the London district of Cornhill, through which he had amassed considerable wealth. He was a respected member of the *Drapers' Company*, the guild of London cloth merchants (see the coat of arms on the right).

It is not known what form of schooling JOHN received – he may have attended a *grammar school*, as he had a basic knowledge of Latin and French. At the age of 16, he began an apprenticeship in his father's business. In 1641, he was admitted to the guild as a full member by virtue of his birthright.



In the same year he married MARY SCOTT. The marriage produced eight children, six of whom died in childhood. The two children who survived childhood, JOHN and ANNE ELIZABETH, had no descendants. The son worked for the East India Company and died in Indonesia and the daughter entered a convent in Liège.

JOHN GRAUNT continued his father's business, specialising in corsetry. He was active in the London *City Militia* (a civilian defence force), rising to the rank of Major. He was also involved with the *Draper's Company*. This respected citizen also served as a juror.

Over the years, JOHN GRAUNT met and befriended the physician and scientist WILLIAM PETTY. PETTY, like him, came from a family of cloth merchants, but had chosen a different path in life very early on.

WILLIAM PETTY left his parents' home at the age of 12 and became a ship's cabin boy. At 14 he attended a Jesuit college in Caen (Normandy) and afterwards he became THOMAS HOBBS' personal secretary. Through this he met, among others, RENÉ DESCARTES and MARIN MERSENNE. After completing his medical studies PETTY became Professor of Anatomy at Oxford and of Music at *Gresham College* in London. He joined OLIVER CROMWELL's army as a physician during his Irish campaign and he was commissioned to create a land register of Ireland, for which he was rewarded with large tracts of land. In 1660, he was one of the twelve founding members of the *Royal Society*.





Since at least the 16th century, it had become customary to record baptisms, burials, and marriages in the registers of the respective parishes. After the great plague epidemic of 1603, the Lord Mayor authorised the *Company of Parish Clerks* to compile and – with royal permission – print the reports of deaths and births. These *Bills of Mortality* were broken down by individual parish and contained information about the causes of death. They were offered for sale every Thursday or displayed in well-frequented coffee houses. They not only fuelled rumours and gossip but also served as an early warning system for epidemics. Those who could afford it left vulnerable parts of the city when case numbers rose and only returned when the numbers fell again. This was especially true during the great plague of 1665, when entire districts were even placed under quarantine.

Perhaps it was personal experiences within his family that led JOHN GRAUNT to delve deeply into this data. He later stated that his interest in the systematic study of death records came about rather by chance (*I know not by what accident*). Through discussions with WILLIAM PETTY, the inquisitive businessman became convinced that – despite the sometimes incomplete church registers (especially in poorer communities and among religious minorities) – many new and surprising insights could be gleaned from the available statistical material.

GRAUNT analysed the *Bills of Mortality data* from the period 1629 to 1660, arriving at a total of 229,250 deaths, of which he excluded 16,384 as victims of a plague epidemic. He compiled lengthy lists of other causes of death (a total of 80 different ones) that had been reported by relatives or by female coroners (*searchers*). (These *searchers* were often widows who received a small fee for their work. They generally lacked medical expertise.)

Since the age of the deceased was not recorded in the church records, GRAUNT had to rely on estimates. Based on entries mentioning typical childhood illnesses, he concluded that these deceased were children no older than six. These included causes such as *thrush*, *convulsions*, *rickets*, *teething* and *worms*. Together with *miscarriages* and *chrysomes* (children who died within a month – literally: those who died in their christening gowns), he arrived at a total of 71,124 such deaths. He then added half of the 12,210 deceased individuals for whom *measles*, *smallpox* or *swinepox* were listed as the cause of death. Using these allocations, GRAUNT arrived at a proportion of $77,229/212,866 = 0.363 \approx 36\%$ of deaths in childhood.

He further assumed that, on average, only *one* in 100 people reaches the age of 76. Between these two values, he constructed six intermediate values (*mean proportional numbers*) for 10-year intervals. His comments reveal that GRAUNT meticulously and critically examined the plausibility of the available data.

Age	Survivors	Deaths
0	100	—
6	64	36
16	40	24
26	25	15
36	16	9
46	10	6
56	6	4
66	3	3
76	1	2
86	0	1

This was also evident in his investigations into the actual population of London, which had been claimed to be over one million. He approached this question in three ways: Based on the annual number of approximately 12,000 baptisms and the assumption that women aged 16 to 40 had a child every two years, there had to be about 24,000 women in this age group. He estimated that this represented half of all women, thus arriving at approximately 48,000 women in London. He assumed that an average household consisted of eight people (a spouse and three children, plus lodgers or servants), and from this, he estimated the total population at 384,000. Based on the number of approximately 13,000 deaths annually in London and the assumption that there was a death in three out of every eleven households each year, he concluded that there were 47,667 families and a total population of 381,338. Finally, he used a map of London, estimated the number of houses and people per house, and arrived at a population of approximately 380,160. He added another fifth for the city boroughs outside the map, thus arriving at 460,800 inhabitants – significantly less than one million.

GRAUNT was the first to collect quantitative data on infant mortality and to demonstrate that more boys than girls are usually born, but that males have a higher mortality rate. By comparing this with corresponding data from rural communities, he was able to show that life in London was unhealthy due to high levels of environmental pollution and that living conditions were further deteriorating due to the increasing population of London caused by rural exodus.

In February 1662, 50 copies of GRAUNT's groundbreaking work were distributed to members of the *Royal Society*. A commission was appointed to review the book, and just two weeks later GRAUNT was elected a member. The book became a bestseller, with three editions published by 1665.



The *Great Fire of London* in September 1666 destroyed GRAUNT's home, his business, and other properties. Despite financial support from PETTY, he fell into financial difficulties that ultimately led to bankruptcy.

His conversion to Catholicism also contributed to his downfall, resulting in social isolation, the loss of his offices, and even an indictment. Before the trial could take place, GRAUNT died of jaundice at the young age of 54. PETTY ensured the financial security of his widow and arranged for a further edition of the *Observations*.

Inspired by GRAUNT's work, CHRISTIAAN HUYGENS, whom GRAUNT knew personally, dealt with the mathematical question of life expectancy (*Expectation of life*, 1669), and EDMOND HALLEY developed the first *mortality table* in 1693.



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