



Graunt and Petty

Author(s): M. Greenwood

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GRAUNT AND PETTY.

By M. GREENWOOD.

THE publication of the Marquis of Lansdowne's copious selection from the unprinted papers of his illustrious ancestor * is something of a literary event. The event is particularly interesting to statisticians, although, of course, Lord Lansdowne's selections are not confined to matter only of statistical interest, and his two handsome volumes supplement in all ways Lord Edmund Fitzmaurice's biography and Dr. Hull's edition of the economic works of a man who founded a family and helped to found the Royal Society.

This new material will not, I think, much alter the impression that the previously known facts about Petty have created. The impression, on the mind of the present writer at least, was this. Petty was a man of great natural ability and, in the conduct of the practical affairs of life, displayed much sagacity and determination, qualities which enabled a poor village child to die a great landowner. Great fortunes have been seldom made, even more recently than in the seventeenth century, by fastidiously scrupulous men, and there is plenty of evidence that Petty lost no opportunity of pushing his claims, but no trustworthy evidence that he ever fell below the ethical standard of his time. Intellectually he bore some resemblance to a more famous architect of his own fortune, Henry Brougham. He had the same genuine curiosity, the same—indeed rather more—prescience in matters on the borderland of the purely intellectual and the practical, the same wide but superficial learning, while in worldly wisdom Petty was far superior to Brougham. In these two volumes

* *The Petty Papers*: Some Unpublished Writings of Sir William Petty, edited from the Bowood Papers by the Marquis of Lansdowne. Two volumes, large octavo, xii + 309 pp. and 276 pp. London, 1927 (Constable and Co.), price 52s. 6d. net.

of private jottings there is hardly a topic within the range of intellectual interest of the time upon which Petty did not find something to say, not for the purpose of showing off (a vice of Brougham's), but because he was really interested. Here is Latin verse and prose (both bad, although some of the worst parts may be a consequence of bad eyesight and editorial leniency), a dissertation on algebra which, according to the editor, was well thought of by the author's friends, but would certainly not have seemed to Wallis or Newton worth the trouble of committing to paper, natural history and physiology not up to the standard of Ray or Mayow, clinical observations which do not rise above the level of any intelligent seventeenth-century practitioner, and, last but certainly not least, economical-political notes of much greater interest. All that is of serious value is derived not from the slow, sure movements of a profound and highly-trained intellect, but is the enthusiastic outpouring of a quick, practical intelligence. There are dozens of suggestions for doing something; many of them—for instance, the suggestions for establishing isolation hospitals and a council of health in London—may be fairly regarded as anticipations of what has actually been done since, but there are others which deserve the comment of his descendant upon one: "Petty's calculations in the foregoing paper seem totally unintelligible. He was evidently carried away by his enthusiasm for the great project of 'Transplantation.'" Nowadays not even a sharer of Macaulay's or Thomas Love Peacock's antipathies would deny that Brougham was a great man, if by great we mean one whose intellectual powers and achievements considerably exceeded the average standard of his contemporaries. Tried by that standard Petty was surely a great man; he not only succeeded in his career but gave others, including the king, excellent advice. But, arguing from his acknowledged work, it would hardly seem more likely that Petty was the author of a closely reasoned and critical scientific memoir than that Boole's *Calculus of Finite Differences* was a parergon of the "Learned Friend" which he had persuaded an obscurer person to father. Lord Lansdowne, however, submits evidence which, in his opinion and that of most of his reviewers in the lay press, leaves "no reasonable doubt" that Petty was the author of one of the classics of statistical science, *The Natural and Political Observations on the London Bills of Mortality*, published over the name of John Graunt. Writing in a statistical journal it is unnecessary to dwell at length upon the characteristics of this work, but, to make the discussion of its authorship clear, something must be said.

Graunt's book owes its place in the esteem of statisticians to three principal reasons. The first is, of course, that the writer seeks to

obtain, and does obtain, interesting and important results in a field previously uncultivated, but that may also be said of Petty. The second is more individual, viz. the writer's application in this new field of medical and vital statistics of the critical method which, before him, had hardly been used at all save by the best of the humanists, by a Scaliger or a Casaubon in textual criticism. One notices a caution in weighing evidence and a habit of collating different methods and results not always found in the *Philosophical Transactions* themselves and almost absent from the enthusiastic jottings of Petty. An excellent illustration is afforded by the way in which the author of the *Observations* goes to work when he asks himself whether a new statistical item is really a "new disease" or only a result of the re-sorting of old items. For instance, he finds Rickets for the first time in the Bills of 1634, and at once asks "whether that disease did first appear about that time; or whether a disease, which had been long before, did then first receive its name?" He then asks what *other* casualties named in the Bills before might be most like the Rickets, and concludes, both from the information he received from "Pretenders to know it," and also from the fact that in some years Livergrown, Spleen and Rickets were grouped together, that "Livergrown was the nearest." He then compares the Livergrown of the previous year with the Livergrown plus Rickets of the following year, and concludes that Rickets is really an addition, but he adds the caution, "only this is not to be denied, that when the Rickets grew very numerous (as in the year 1660, viz. 521), then there appeared not above 15 of Livergrown." Whether the author were right in concluding that the Rickets was a new disease is not now of importance, what *is* of importance is to mark the originality of method; it is relevant to note that had William Heberden the Younger, one of the most accomplished physicians of his day, writing more than a century after Graunt's death, really understood that author's method he would not have made a blunder, subsequently exposed by Creighton,* respecting the decline of dysentery.

Another example of careful collation of evidence is in the eleventh chapter, where the author compares the different methods of estimating the population of London. This chapter also makes good the third of the author's titles to veneration, that he forged new tools of research, for it contains the first London life table. This matter is of sufficient historical interest to justify a digression. The author, having concluded from his data that 64 per cent. of the live-born survive to the age of six and that approximately one per

* W. Heberden, Jr., *Observations on the Increase and Decrease of Diseases, particularly the Plague*, London, 1801. Creighton, *History of Epidemics in Britain*, Cambridge, 1894, Vol. II., pp. 747-8.

cent. survive to age 76, asks himself how many will be surviving at decennial intervals. He describes his process in these terms. "We sought six mean proportional numbers between 64, the remainder, living at six years, and the one, which survives 76, and find, that the numbers following are practically near enough to the truth; for men do not die in exact proportions, nor in fractions, from whence arises this Table following." The relevant figures, what we should now call the l_x column, are:—

| Age. | | | | | Surviving. |
|------|-----|-----|-----|-----|------------|
| 6 | ... | ... | ... | ... | 64 (64) |
| 16 | ... | ... | ... | ... | 40 (40) |
| 26 | ... | ... | ... | ... | 25 (25) |
| 36 | ... | ... | ... | ... | 16 (15) |
| 46 | ... | ... | ... | ... | 10 (9) |
| 56 | ... | ... | ... | ... | 6 (6) |
| 66 | ... | ... | ... | ... | 3 (4) |
| 76 | ... | ... | ... | ... | 1 (2) |

In his note on this passage Dr. Hull writes that "this method of constructing a table of mortality suggests Petty's *Discourse of Duplicate Proportion*." Dr. Hull did not show how to obtain the author's table by means of Petty's method, and it is not easy (to judge from the extract printed by Dr. Hull *) to see how this could be done. Petty begins by asserting that there are more people alive between the ages of 16 and 26 than in any other decade, and then announces that "the roots of every number of men's ages under 16 (whose root is 4) compared with the said number 4, doth show the proportion of the likelihood of such men reaching 70 years of age." He also says that it is "5 to 4 that one of 26 years old will die before one of 16; and 6 to 5 that one of 36 will die before one of 26; and 3 to 2 that the same person of 36 shall die before him of 16: and so forward according to the roots of any other year of the declining age compared with a number between 4 and 5, which is the root of 21, the most hopeful of longevity, as the mean between 16 and 26; and is the year of perfection, according to *our law*, and the age for whose life a *lease* is most valuable." It is not (to me, at least) easy to understand how these rules could be applied to reproduce the table of the *Observations*, and I do not understand how that table was really calculated. It may, however, be remarked that the numbers are not ill represented by a geometrical progression with the common ratio 0.62, taking 64 as the first term. The terms of this progression, to the nearest whole number, are shown in brackets above. I do not, however, suggest that this was the author's method. What is,

* *Economic Writings of Sir William Petty*, Cambridge, 1899, Vol. II. p. 622.

however, quite clear is that the author had grasped the fundamental notion of a life table. It is strange, if Petty had made or even realized the importance of this discovery, that neither in his published nor unpublished writings should one find any reference to it. It is particularly strange since what one might call the financial side of the matter, the utility of the instrument in computing the values of annuities and life rents, speedily appealed to men whose financial instincts were certainly not acuter than those of Petty.

In sum, a comparison of the *Observations* with Petty's acknowledged writings puts the whole onus of proof that Graunt was not the author of the book he put his name to upon those who assert it; we are required to believe that Petty not only renounced his right to the credit of having written a masterpiece, but also refrained from the use of new and valuable methods in his other writings. When we further remember that Graunt and Petty were intimate friends, and that there would be nothing inconsistent with the strictest propriety in Petty's both drafting the introductory matter and touching up the manuscript throughout, the onus becomes very heavy.

It does not appear that Lord Lansdowne realizes the nature of the case that he has to meet. His ingenuous remark—in reply to the objection that the style of the *Observations* is unlike that of Petty—"I confess that I cannot perceive this difference, though they are perhaps somewhat better put together than were most of Petty's papers," is perhaps proof enough of this. But his catalogue of parallel passages gives us full measure, brimming over. This catalogue is headed, "Parallel passages in the London *Observations* and Petty's unpublished writings," and arranged in two columns; in the left-hand column we are given page references to the *Observations*, in the right-hand column a subject reference and page references to the present volumes of Petty's papers. The first entry in the catalogue refers us on the left to pp. 320, 385, 394 of the *Observations* (Hull's edition); the right-hand column gives the subject reference, Proportion between Males and Females, and the page references II, 115, 232. On p. 320 (the epistle dedicatory) Graunt mentions as one of his conclusions "that the wasting of Males by wars and colonies do not prejudice the due proportion between them and Females." On pp. 385-6 he challenges the assertion that "there be three women for one man," and asserts the ratio to be 14 to 13; on p. 394 question 2 of the conclusion is, "How many Males and Females?" Let us now take the "parallel" passages of Petty. On p. 115, amongst "Queries concerning the nature of the Natives of Pensilvanea," no. 3 is, "What is the proportion between their males and females?" On p. 232—a series of miscellaneous political observations—there is nothing to the purpose until we come

to the last line but one, where we read, "there be more males than females in nature. Beside, a man is prolific 40 yeares, a woman but 25 or thereabouts; which compensates the losse of men by the Sea, War, Exercises, etc."

Now unless Petty deliberately abstained, even in his private papers, from writing about vital-statistical matters at all, it would be very hard for him to avoid providing parallels such as these, and impossible if the notes were made *after* reading Graunt's book. Several of the alleged parallels do not even reach this level and hardly seem worth citation. For instance, on p. 356 of the *Observations* there is a sensible discussion of the statistics of the French Pox leading the author to conclude that then (as, of course, now) the bills under-stated the mortality from Syphilis. Lord Lansdowne refers us to a parallel passage on p. 261 of his second volume. The parallel is this; that in a list of his writings drawn up on October 6th, 1671, Petty entered a discourse in Latin, *De Arthritide et Lue Venerea* (apparently written in 1646). It is a little difficult to take such a "parallel" as this seriously.

In discussing Graunt and Petty one is tempted to apply Graunt's shop arithmetic to evidence, and I have amused myself by statistical classification of Lord Lansdowne's 41 Parallels. Twenty-one of them seem to me of the last-mentioned kind, viz. parallels which are not parallel at all. Ten are of the class of the example first noted, viz. an agreement which would be inevitable when two men wrote upon the same subjects. There are left ten, where, whether by the use of a particular turn of phrase, such as "ex sponte creatis" or by a reference to some rather out-of-the-way topic, such as the diseases of Metal-Men, or by the provision of an item of information certainly within Petty's knowledge but less likely to be within Graunt's, there is real justification for enquiry. Now not one of these resemblances or, if the reader pleases, identities has any relevance at all to the *method* of investigation which, in my view, distinguishes Graunt from Petty, and no less than six of the ten are to be found either in the Conclusion or the Appendix (the latter indubitably based upon information supplied to Graunt by Petty).* In other words, Lord Lansdowne's evidence from parallels amounts to a confirmation of what was already probable, viz. that Graunt's manuscript was submitted to his friend before publication, no doubt before formal communication to the Royal Society, and touched up by him.

* That my marking is, at least, not too severe is shown by the fact that Mr. Yule classified the parallels independently and marked 26 as "1," 10 as "2," 5 as "3." Only one of his "3's" occurs elsewhere than in the Conclusion or Appendix.

Lord Lansdowne's new witnesses need hardly detain us. That Petty's friend Southwell conceived the relation of Graunt to Petty to be that of "a dwarf mounted on an elephant" is perhaps only evidence that Southwell was not a very good judge of scientific work—this is the Southwell who was greatly impressed by Petty's solution of an equation of the first degree in two variables. Nor is the fact that a Fellow of the Royal Society named Houghton believed Petty to be the author of Graunt's work of any special interest. It is likely that Houghton was in the same case as Evelyn, Southwell, Aubrey and Lord Lansdowne himself; they could not understand how a London tradesman who actually became bankrupt might have produced a masterpiece, but they could easily understand how a graduate of the university of Oxford who knew all the best people and was brimful of ideas might have done so. As Lord Lansdowne says, "Graunt was no doubt, as we are told, possessed of all the virtues—a man of marked integrity, a good friend, an excellent haberdasher—but for the reasons I have given, I cannot believe that he wrote the *London Observations*." A worthy man, no doubt, in his walk of life, a *very* worthy man, but it would surely be a little absurd to suggest that he was actually a scientific investigator of the first rank. A similar psychological motive has sustained most of the seekers for an author of the works of William Shakespeare. Bacon was not perhaps quite one of the best people, but he was more presentable than the Stratford-on-Avon person, while the latest candidate, the Earl of Oxford, fills all the psychological needs and is actually known to have written verses. Arguments of this class—and, however dispassionately intellectual we may pride ourselves on being, arguments of this class *do* greatly influence all of us, one way or the other—cannot be refuted by any intellectual means. Show, as I think can be shown, that Graunt's *Observations* differ as fundamentally from any acknowledged work of Petty's as a good memoir in the *Philosophical Transactions* of our own time differs from a good leading article in *The Times*; show that (1) Petty's stock of exact knowledge was scanty and (2) the exact knowledge displayed by Graunt must have been self-taught, for it formed part of no existing curriculum and was not to be found in any books, and many people will still be unable to believe that the lion's share of the collaboration between a London shopkeeper who died bankrupt and the founder of one of our great families was the former's.
