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WROCŁAW – THE CRADLE OF THE STATISTICS AND DEMOGRAPHY IN CENTRAL EUROPE

1. Introduction

Wrocław was the cradle of statistics and demography in Central Europe. One can ask the question, who lay in this cradle? It was Caspar Neumann 350 years ago, one of the precursors of the population statistics.

2. Caspar Neumann's life

Caspar Neumann was born shortly before the end of the Thirty Years' War, in the year 1648, in the Silesian town Breslau (Wrocław), where his father was a merchant, and later on tax collector of the town. First he was educated by private tutors. After his father's early death, Neumann first became an apprentice in an apothecary. A year later, when he was 13, he enrolled to the Mary Magdalene grammar school (Gymnasium). First he wanted to study medicine and natural sciences, but then he enrolled to Jena University in October 1667, holding a scholarship from the city of Wrocław to study philosophy and protestant theology, following his



CASPAR NEUMANN



b. 14 September 1648

d. 27 January 1715

father's wish. The mathematician and philosopher Erhard Weigel (1625-1699) was his the most import teacher in Jena. Neumann attended Weigel's lectures in mathematics, astronomy and natural sciences. Thanks to Weigel he got familiar with the ideas of Francis Bacon and Cartesius. Besides the study of theology he attended lectures in philosophy. Another important teacher of Neumann in Jena was the historian and jurist Johann Andreas Bose (1626-1674). He wrote discourses on civics, public peculiarities and public administration. Bose was one of the founders of the branch of the "German Statistics", what we called "University statistics or Staatenkunde". In only 3 years Neumann achieved a "Magister artum liberalium" degree, and a degree in philosophy. He gave lectures on philosophy, rhetoric and homiletics. In accordance with the prevailing taste of the century, his funeral orations, the so called corpse sermons, were particularly taken notice of, and later published as collection in book form. In the year 1669 he gave the funeral oration on the naturalist and physician, Werner Rolfinck (1599-1673), which shows Neumann's keen interest in the natural sciences, and a volume of his orations published in 1678 was much admired. The result of his work at the university of Jena was that Neumann became a representative of German physico-theology. The physico-theology propagated the application of mathematics in theology. We could say that Caspar Neumann was also a representative of the early Enlightenment (*Frühauflärung*) in Germany like Gottfried Wilhelm Leibniz (1646-1716), who was with him nearly in the same time at the university in Jena.

In 1673 he was selected by the Jena theological faculty to go in service on Duke Ernest I the Pious of Sachsen-Gotha-Altenburg. Duke Ernest I appointed Neumann travelling preacher. He was ordained for this purpose in the same year. He was attendant to Crown Prince Christian on a tour through Southern Germany, Switzerland, Southern France and Northern Italy, making as might naturally be supposed the acquaintance of many leading men. On his return the Grand Duke made him Court Chaplain in Altenburg (1677). In 1677 he married Johanna Susanne Adelheid Raab, the daughter of the personal physician (*Hofarzt*) to the Duke, but the Common Council of his native town Breslau longed to see him back again. Out of gratitude to his native town, in 1678 he accepted the call as Deacon of the church of St. Mary Magdalene in Breslau at the age of 30, where he became full Pastor 11 years later. In Breslau died his son and first wife, and in April 1684 he married Christiane Greiff, a merchant's daughter who bore him 11 children, 3 of them died very early. In 1692 he became pastor of the church of St. Elisabeth and in 1697 inspector of all the Breslau evangelical churches, including superintendence of all protestant churches and schools of Breslau, as well as the first theological professorship at both town gymnasia: Mary Magdalene Gymnasium and Elisabeth Gymnasium. In enjoyment of these offices and fully active and successful in his ministry and highly honoured, Neumann died in 1715 in Wrocław, where he is buried in the St. Elisabeth Church. That Neumann took an interest generally

in science is clear from his letters to Henri Justell (1620-1693), fellow of the Royal Society and royal librarian (see “Letters” in Appendix). He is said to use his science and the new discoveries of science as material for his sermons, preferring this to the mysticism so popular in his days. Neumann was a member of the European scientific community, he was in the international network of scientists, he was living as polymath (Polihistor) in the “République des lettres”. He published also in other theological directions. He wrote for his own use a *Kern aller Gebete*, a book as essence of prayer. Before his death this collection had had 22 editions and had been translated into most European languages, also into Polish (1684). He also composed 39 hymns for church use. In 1703 Neumann published a volume with 513 songs as the *Vollkommenes Schlesisches Kirchengesangbuch*, which ran through many editions and was the basis of the hymn books used in Silesia. He enjoyed high public esteem as the editor of a widely used prayerbooks, the author of religious hymns, and as highly estimated Hebrew scholar. In 1706 he was elected by recommendation of president of Academy, Gottfried Wilhelm von Leibniz, to the Academy of Sciences in Berlin. He was a member of historical-oriental class of the Academy. Neumann dealt also with botany, astronomy, meteorology and numismatics, sending a memoir for Berlin Academy in 1713 on the method of applying periods to meteorological observations. This paper is unpublished and missing. He laboured on a edition of the dictionary of German language for the Berlin Academy. In his court-garden grew plants and flowers which are mentioned in the Bible.

3. Statistical and demographical output of Caspar Neumann

Caspar Neumann earned recognition in the field of demography and population statistics. He was one of the first to try to apply strict inductive analysis and exact observation on the phenomena of human life, in close analogy to the methodology of the emerging natural sciences. Being a theologian himself, his ideas had religious roots. Above all he objected to the prevailing opinion of his time that human birth and death were determined by the position of the planets and comets, or governed by magic numbers. His scientific aim was thus primarily finding predictable regularities in the deaths of human beings. For this reason he prepared in the years 1687-1691 elaborately compiled tables on births and funerals in the evangelical parishes of Breslau. In preparing this work he was supported by the physician and friend of him, doctor Gottfried Schultz (1643-1698) and the president of Council of Breslau Johann Sigismund von Haunold (1634-1711), both of whom were interested in these statistical studies. In 1689 Caspar Neumann sent a letter to the polymath and philosopher Gottfried Wilhelm Leibniz, included a memoir *Reflectiones über Leben und Tod bei denen in Breslau Geborenen und Gestorbenen* (*Reflections on Life and Death according to Births and Deaths in Breslau*) and lists of demo-

graphic data. The original letter and the memoir are missing. Neumann had with Leibniz a lively correspondence for some time. Referring to his own studies, Neumann remarked that he did not yet perceive their utility, but expected that “a beautiful commentary on Divine Providence in our life and death” could be made if such statistical data were generally collected. Leibniz was very interested in this field. He wrote on this topic in 1680 and 1682. He wanted to found a General Registration office:

the registry office shall have the goal of making easily accessible to the authorities the essence of the required information [...] in all tables having maximum utility should all information should complete and easy to find. [...] In England there exists the admirable practice of preparing the so called Bills of mortality, which have started to be imitated by the authorities and policy in Paris. These documents show not only the person who has died, but also in what manner from what sickness, just as it is possible to extract from the birth and marriage certificates of an English scribe much useful information about the general circumstances of these events.

In 1682 Leibniz has written a very important contribution entitled *Essay de quelques raisonnemens nouveaux sur la vie humaine et sur le nombre des hommes*.

The Royal Society of London, founded in 1660 for the development of science, was probably informed of Neumann's work by Leibniz. The need for such data had been recognized in England by John Graunt (1620-1674) and Sir William Petty (1623-1687). In a letter of invitation for correspondence the Royal Society's fellow Henri Justell, a Huguenot refugee from France, asked Neumann to send him tables of births and funerals of the city of Breslau. Neumann sent him the tables for the years 1687-1690 in a letter of January 31, 1692. In response, Justell wrote to Neumann a letter dated October 7, 1692, in which Justell admitted that he found the tables very useful, and that they accurately contained everything one could wish to find in them (see: Appendix). At the same time (1692) a correspondence between Leibniz and Justell on Neumann's work also took place. Neumann wrote again to the Royal Society on December 9, 1692, and provided at the same time the data for the year 1691 that again precisely detailed age, sex, causes of death, months etc. (see: Appendix). Justell died on September 25, 1693 in London without having seen the increasing influence of Neumann's demographic data. The letter of Caspar Neumann was read out at the session of the Royal Society in November, 1693. In 1694 Caspar Neumann wrote a letter to the astronomer Edmund Halley (1656-1742), mourning the death of Henri Justell, and attached bills of mortality for 1692 and 1693 for Breslau. This letter was read to the Royal Society on April 4, 1694. The statistical material was committed for further analysis to Edmund Halley, after whom the well-known comet is named. Neumann's scientific attainments consisted in providing the empirical basis of population statistics that was used by Halley for the preparation of the first scientific Life Table. In 1694 Halley's paper was published in volume 17 of the *Philosophical Transactions for the Year 1693* with the title: “An Estimate of the Degree of the Mortality of Mankind, Drawn from Curious Tables of the Births and Funerals of the City of Breslaw; with an

Attempt to Ascertain the Price of Annuities upon Lives". Halley began by referring to Graunt and Petty and pointed out that they themselves had been aware of the defects of their data, namely that the population size was unknown, that the ages of the deceased were unknown, and that the populations of London and Dublin were increasing because of migration. These defects seem to a great extent to be alleviated in the bills of mortality at Breslau, "lately communicated to this Honourable Society by Mr Justell, wherein both the Ages and Sexes of all that die are monthly delivered, and compared with the number of births" which exceeds the number of deaths only to a small extent. The only thing missing is the population size. On pages 597 and 598 Halley wrote:

The City of Breslaw is the capital of the Province of Silesia or as the Germans call it, Schlesia, and is situated on the western bank of the River Oder, anciently called Viadrus; near the confines of Germany and Poland, and very near the latitude of London. It is very far from sea, and as much a Mediterranean Place as can be desired, whence the confluence of strangers is but small, and the manufacture of linen employs chiefly the poor people of the place, as well as of the country round about; whence comes that sort of linen we usually call your Schlesia Linen; which is the chief, if not the only merchandize of the place. For these reason the people of this city seem most proper for a standard; and the rather, for that the births do, a smaller matter, exceed the funerals. The only thing wanting is the number of the whole people, which in some measure I have endeavoured to supply by comparison of the mortality of all ages, which I shall from the said bill trace out with all accuracy possible.

Halley did not present Neumann's data in detail; he gave merely the average yearly numbers without distinguishing between sexes. Halley gave us no information how he had computed his tables. Graetzer [9-11], Böckh [7] and Greenwood [12] give us the answer. He did it 300 years ago as we should do it today. Halley knew that the population of Breslau was **only nearly a stationary population**. In this paper three mortality tables were presented, together with related calculations of the annuities upon lives. Table I contains the first published empirical distribution of deaths according to age – the average yearly number of deaths at Breslau for the period 1687-1691. Table II shows the number of deaths reaching the age referred to in the life table (see: Table I), and Table III the number of living persons reaching this age. Halley considered Neumann's data particularly well suited for this purpose.

Neumann has delivered useful statistical data, and Halley himself wrote in the "Some further consideration on the Breslaw Bills of Mortality":

but at the same time do earnestly desire, that their Learned Author Dr. Newman of Breslaw would please to continue them after the same manner for yet some years further, that soothe casual irregularities and apparent discordance in the Table p. 599 may by a certain number of chances be rectified and ascertained (p. 654).

Halley's mortality tables were prerequisite for the development of modern life insurance on a statistical basis. Neumann was with the aid of Halley a pioneer of statistics, demography and actuarial science. His famous disciples were the philosopher Christian Wolff (1679-1754) and the physician Johann Christian Kundmann (1684-1751).

Table 1. Halley's life table

Age Curt.	Per- sons	Age Curt.	Per- sons	Age Curt.	Per- sons	Age Curt.	Per- sons	Age Curt.	Per- sons	Age Curt.	Per- sons
1	1000	8	680	15	628	22	586	29	539	36	481
2	855	9	670	16	622	23	579	30	531	37	472
3	798	10	661	17	616	24	573	31	523	38	463
4	760	11	653	18	610	25	567	32	515	39	454
5	732	12	646	19	604	26	560	33	507	40	445
6	710	13	640	20	598	27	553	34	499	41	436
7	692	14	634	21	592	28	546	35	490	42	427
Age Curt.	Per- sons	Age Curt.	Per- sons	Age Curt.	Per- sons	Age Curt.	Per- sons	Age Curt.	Per- sons	Age Curt.	Per- sons
43	417	50	346	57	272	64	202	71	131	78	58
44	407	51	335	58	262	65	192	72	120	79	49
45	397	52	324	59	252	66	182	73	109	80	41
46	387	53	313	60	242	67	172	74	98	81	34
47	377	54	302	61	232	68	162	75	88	82	28
48	367	55	292	62	222	69	152	76	78	83	23
49	357	56	282	63	212	70	142	77	68	84	20

Age	Persons
7	5547
14	4584
21	4279
28	3964
35	3604
42	3178
49	2709
56	2194
63	1694
70	1204
77	692
84	253
100	107
34000	
Sum Total	

Source: [15, p. 600].

4. Scientific work of Christian Kundmann

Kundmann was born in Breslau. He was up to 1695 pupil of Magdalene Gymnasium in Breslau and Neumann was a teacher of Kundmann. He studied natural sciences and medicine in Frankfurt am Oder and in Halle/Saale. In 1717, with other Wrocławian physicians, he founded a scientific journal *Sammlung von Natur-, Medizin- sowie auch dazu gehörigen Kunst- und Literaturgeschichten....* In this journal mortality and morbidity data were published and different authors described new

knowledge in field of morbidity. In 1727 Kundmann was elected a member of the Academia Naturae Curiosorum (later called Leopoldina). This Academy was and is the oldest one in Germany, older than the Royal Society in London and Académie des Sciences in Paris. The members of Leopoldina have a dense communication with both. In his most important publication, a book with title *Rariora Naturae & Artis...*, published in 1737, Kundmann wrote about medical statistics with many statistical tables about morbidity and mortality; the title was “Reflexiones über die Kranckheit- und Todten-Listen mit Medicinischen Anmerckungen”. Kundmann used international mortality data and also those from other German towns, and as a first scientist in Central Europe compared all data with each other. He was the first to make interesting comparison between Daniel Gohl’s (1674-1731) Berlin tables and those for Breslau. He compiled statistics on causes of death for different areas and towns. In that time it was very new to do it. Kundmann was influenced by Caspar Neumann, and he was a pioneer in medical statistics.

5. Conclusion

The population data of Caspar Neumann and the medical statistics of Johann Christian Kundmann were used in the demographic history, especially in the 18th and 19th century. That was the reason, why I titled my paper: “Wrocław – The cradle of the statistics and demography in Central Europe”.

Appendix

Letter written to Caspar Neumann Breslau by Henri Justell, Royal Society London on 7th October, 1692, original language: French.

Sir, I have received your letter of last January, 1692. Your death registers are very well done, they are very accurate and all that one could wish is to be found in them. When the Royal Society meets again I will bring them before it; Englishmen have neither time nor patience enough to arrange theirs in such a way. The number of deaths seems to me small for a town like Breslau, for Protestants as well as Papists are included. You have in all not more than 2,680 in a year. The number of deaths in London usually comes to more than 23,000. In Paris to 19,000. In Amsterdam to 6,600 and in Hamburg to 1,500. Either the German towns must be small, or deaths must be less frequent there than in other places. The tract on Comets, of which you have sent me the title, must be interesting, but the objections which can be made to it are considerable. A famous mathematician and astronomer Mon. Petit, who is now dead, has written a tract on Comets before this author, in which he tried to show that there were stars which could be seen from time to time, but their tails are doubtful. The transactions or Acta of the Royal Society are no

longer printed. They must be distinguished from those that are printed at Oxford, where only the principal works are printed, and it is of these, I think, that he speaks in his writings. A book called *Chronicon Saxonicon* in Saxon and in Latin, with notes on the history of England, has just appeared on sale at Oxford. Mons. Wotton is at work on the church history of this Island. The weather up till now had been so bad that no observations could be taken with the 150 foot telescope which Mons. Huygens has presented to the Royal Society: it is used without a "tubis". I am expecting a magnet which has just been dug up from a mine, with a description of the condition they were in before being dug up. I will send you news of it as soon as I get it. They are imbedded in some yellow material. Perhaps You may not have heard of a tract on agriculture written by old Mons. de la Quintinie, who was in Charge of the herbal gardens of the King of France, in which are beautiful descriptions of arboriculture. There are many rare growths from the West Indies and some from India. I do not expect that there is anyone in Breslau who has such plants or would pleasure in them. We have other conveniences and better and more useful inventions. I understand there are fine police regulations in Your town, which have appeared in print. I hear the same of many German towns, that they are most useful. Father Marracci, father confessor of the late Pope Innocent, has written a commentary on the Alcoran. He has read for the purpose all the Arabic commentaries upon it. His intention is to get a grasp of the correct "sensus" or meaning of the book, for Christians have never rightly understood it. Father Bonani has published a new work entitled: *Observationes circa viventia, quae in rebus non viventibus reperiuntur*, Romae, 1691; this is a difficult subject, which will not go undisputed. I have been told of a new kind of telescope, which should work better than the ordinary ones.

I remain, Yours etc.

Justell

Letter written to Henri Justell, Royal Society London by Caspar Neumann on 9th December 1692, Repository GB 117 The Royal Society RefNo. EL/N1/73, concerning literary notices, attaches bills of mortality for 1691 for Breslau, read to the Royal Society on 22nd November 1693, original language: Latin.

Dear Sir, I have received your letter sent to me in October of the present year, and I am extremely glad that the registers of births and deaths of my native town have gained your approval, and that they are even to be brought before the Royal Society; I could scarcely hope for a greater honour for my insignificant communication. Encouraged by your great kindness I have made considerable additions to my notes on the past year at the end of my lists. I am only surprised that our Breslau should exceed Hamburg in the number of inhabitants. It will probably come right, or at least approximately so, if we add the number of deaths of Catholics to

ours. At the earliest opportunity I shall send You Nikolaus Henel's *Silesiographia* and *Breslographia*. This book, published at the beginning of the present century, is almost the only one that is widely read of all that have been written on our history. We hardly dare whisper to one another about what is happening in Breslau today. If you can imagine the fortifications increased You will get a picture of our town from the geographical map of Schlesien (Silisia), which was issued in Holland by Jansson-Wäsberghe, Moses Pitt and Stephen Swart and dedicated to the Englishman, Mr. George Cartwright. I have had a stone pillar erected to observe the declension of the magnet-needle on which I have hardly ever been able to record the moon-line at the time of the summer solstice on account of the rainy weather. Now I am busy preparing instruments for the first observations at the time of the winter solstice. Huyghens "tubus sine tubo" I at first took to be merely a speculation of practically no value; now I am amazed by the invention. I am sending with it some small balls like those washed up by the Oder in the village of Koppen near Brieg, balls such as one usually finds towards the end of winter, after the ice has melted, enclosed in mysterious wrappings. They are a kind of Pyrites or Marcasitae, and when exposed to the air are resolved into their constituent parts. The Doctors boys prepare from them, by a process of washing, vitriol and a "Liquor vitriolicus" like the "Liquor Minerae Martis Solaris or Hassiacae".

They were discovered by chance a few years ago, only there was a doubt whether they were identical with the round lumpy "Pyrites" (German: Hodenkies) which had already been named by the old Schlesian (Silesian) naturalist Schwenkfeld. A German translation of the book of Herr Quintinie has been announced in a recent catalogue from Leipzig and I am awaiting it eagerly. You are mistaken if you imagine that horticulture is neglected in Breslau. Even among our merchants there are some who spend considerable sums on plants. Among those recently introduced which I saw last summer are the *Nux Malabarica* and the *Nerion* with sweet-scented flowers. I myself am a great lover of plants. I have no garden, certainly for the number of inhabitants in the town leaves no room for gardens, but the little court-yard of my house was turned into a garden by my predecessors. Here I have to force my plants to do violence to Nature. I take a special delight in research among biblical plants, which have been everywhere neglected and about which little is known. I am having your leaves and stems copied on paper, by an artifice perhaps not unknown to you, in imitation of copper-plate engraving. I am in possession of the "mustard" mentioned in the Bible, which Wedel, Professor of Medicine, has described in a special treatise. The seed is in form like that of "basil". The plant has no special peculiarity beyond its great fertility. I also had some *Cali* or *Alkali* from Italy, and learnt from Bochart that it is the same plant which is called "*fimur columbinus*" in 2nd Kings, VI, 25. I am quite ready to believe that England is rich in rare plants and if I knew of any gardener I would get him to send me some of the rarer seeds through "Johann de la Chambre", which at my own expense could easily be brought by way of Hamburg. But that is by the way. I had already

heard something about Marracci's notes on the Alcoran, but recently when Herr Schurzfleiss, Professor of History in Wittenberg, visited me on his return from Italy, he and his companion, who had been studying Arabic in Rome, told me that they had neither seen nor heard anything of these notes. Whoever they may be, there are certainly some Germans working at the publishing of this book. Hinkelmann in Hamburg has promised an edition. That of Johann Andreas Danz, Professor in Jena, is ready for print with notes by two men famed in oriental languages, namely Jobs Ludolf and Andreas Müller. You will be astonished to hear that here in Breslau a member of our community, Andreas Acoluth, is labouring with a translation of the Koran with the help of a Persian translation. For my part, I am of the same opinion on the matter as the Librarian at Vienna, namely I should like to see the Koran provided with a verbatim translation and also a generally intelligible translation.

But now, dear Sir, you must forgive my clumsy pen its all too great garrulity. With the best wishes for your prosperity, I remain, the most admirer of your great name,

Caspar Neumann

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WROCŁAW – KOLEBKA STATYSTYKI I DEMOGRAFII W EUROPIE ŚRODKOWEJ

Streszczenie

W artykule jest odpowiedź na pytanie, dlaczego właśnie Wrocław stał się centrum badań statystycznych i demograficznych w końcu XVII w. Teolog Caspar Neumann (1648-1715) i fizyk Johann Christian Kundmann (1684-1751) pracowali we Wrocławiu na polu statystyk dotyczących śmiertelności. Dane Caspara Neumanna dotyczące urodzeń i pogrzebów we Wrocławiu zostały wykorzystane przez Edmunda Halleya (1656-1742) z Londynu (Oksfordu) w przygotowaniu pierwszych naukowych tablic trwania życia. Demograficzne badania Neumanna wiązały się z publikacjami założycieli „arytmetyki politycznej” w Anglii: Graunta i Petty’ego. Uczeń Neumanna Kundmann był jednym z pionierów porównawczej statystyki medycznej w Niemczech i Europie. Analiza przyczyn śmiertelności i zachorowalności dokonana przez Kundmanna ukierunkowała wiele dalszych badań.

Słowa kluczowe: arytmetyka polityczna, śmiertelność, tablice trwania życia, Caspar Neumann, Johann Christian Kundmann.