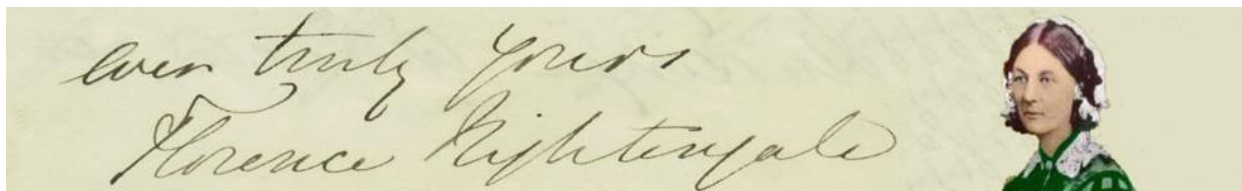


Projekt 2.5 I krig med Florence Nightingale – et delvist engelsksproget projekt til samarbejde med historie og engelsk



"To understand God's thoughts we must study statistics, for these are the measure of His purpose".

Florence Nightingale

(Det nationale arkiv med alle dokumenter og materialer af og om Florence Nightingale findes på University of Guelph og er frit tilgængelig på følgende adresse: <http://www.uoguelph.ca/~cwfn/>)

Nightingale's coxcombs

In 'Nightingale's Coxcombs' we displayed a pair of coxcombs drawn by Nightingale, and an animated reproduction of this pair of coxcombs. The categories of these coxcombs were the months of the year. There are twelve months in the year, so the angle of each sector is, in degrees,

$$\frac{360}{12} = 30 .$$

The data represented by the coxcombs are deaths each month for British soldiers in the Crimean War. Let us consider exactly the mathematics that Nightingale used in order to calculate the data for deaths by diseases (the blue portion of the graph). Suppose that on average during a particular month there were S soldiers, and D of these soldiers died of diseases during that month. Nightingale considered the proportion of soldiers who died of diseases; that is, she considered the quantity D/S . Next, she wished to express this quantity as a figure out of 1000, so she multiplied it by 1000, to obtain $N=1000D/S$. Thus, in that month, N out of every 1000 soldiers died of diseases. Finally, Nightingale multiplied N by 12 to indicate how many soldiers would have died from diseases throughout the whole year had the circumstances of that month been replicated throughout the year. She described the final quantity that she obtained as the 'annual rate of mortality per 1000 in each month'. As we have seen, it is given by the formula

$$\frac{12000D}{S} .$$

This is the value of the area of the blue sector for the particular month that we are considering. Of course, area depends on the unit of measurement, so Nightingale will have scaled all her values appropriately. Since coxcombs do not have scales, Nightingale need not have multiplied D/S by 12000 in order to plot the coxcombs. The bar chart in our reproduction of Nightingale's work records 'monthly mortality per 1000'; that is, the quantity $N=1000D/S$.

The figures used to produce the 'Diagram of the Causes of Mortality in the Army in the East' are shown in the following table. The table was taken from 'A contribution to the sanitary history of the British army during the late war with Russia', by Florence Nightingale, 1859, and it was provided to us courtesy of Hugh Small. Note that the second column represents S , the third column represent D , and the sixth column represents $12000D/S$.

Projekter: Kapitel 2. Projekt 2.5 I krig med Florence Nightingale
– et delvist engelsksproget projekt til samarbejde med historie og engelsk

The figures used to produce the 'Diagram of the Causes of Mortality in the Army in the East' are shown in the following table. The table was taken from 'A contribution to the sanitary history of the British army during the late war with Russia', by Florence Nightingale, 1859, and it was provided to us courtesy of Hugh Small. Note that the second column represents S, the third column represent D, and the sixth column represents 12000D/S.

Table showing the Estimated Average Monthly Strength of the Army; and the deaths and Annual Rate of Mortality per 1000 in each month, from April 1854, to March 1856 (inclusive), in the Hospitals of the Army in the East							
Estimated Average Monthly Strength of the Army		Deaths			Annual rate of mortality per 1000		
Month	Average size of army	Zymotic diseases	Wounds & injuries	All other causes	Zymotic diseases	Wounds & injuries	All other causes
Apr 1854	8571	1	0	5	1.4	0	7.0
May 1854	23333	12	0	9	6.2	0	4.6
Jun 1854	28333	11	0	6	4.7	0	2.5
Jul 1854	28722	359	0	23	150.0	0	9.6
Aug 1854	30246	828	1	30	328.5	0.4	11.9
Sep 1854	30290	788	81	70	312.2	32.1	27.7
Oct 1854	30643	503	132	128	197.0	51.7	50.1
Nov 1854	29736	844	287	106	340.6	115.8	42.8
Dec 1854	32779	1725	114	131	631.5	41.7	48.0
Jan 1855	32393	2761	83	324	1022.8	30.7	120.0
Feb 1855	30919	2120	42	361	822.8	16.3	140.1
Mar 1855	30107	1205	32	172	480.3	12.8	68.6
Apr 1855	32252	477	48	57	177.5	17.9	21.2
May 1855	35473	508	49	37	171.8	16.6	12.5
Jun 1855	38863	802	209	31	247.6	64.5	9.6
Jul 1855	42647	382	134	33	107.5	37.7	9.3
Aug_1855	44614	483	164	25	129.9	44.1	6.7
Sep 1855	47751	189	276	20	47.5	69.4	5.0
Oct 1855	46852	128	53	18	32.8	13.6	4.6
Nov 1855	37853	178	33	32	56.4	10.5	10.1
Dec 1855	43217	91	18	28	25.3	5.0	7.8
Jan 1856	44212	42	2	48	11.4	0.5	13.0
Feb 1856	43485	24	0	19	6.6	0	5.2
Mar 1856	46140	15	0	35	3.9	0	9.1

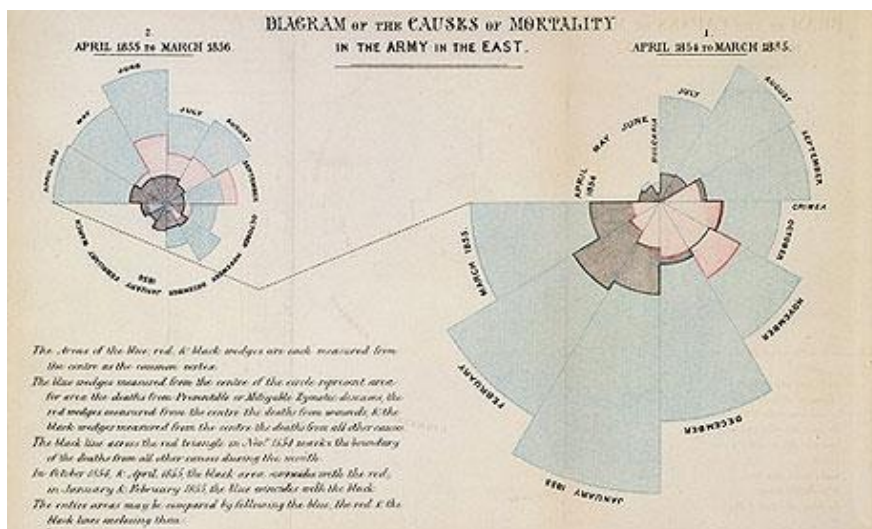
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– et delvist engelsksproget projekt til samarbejde med historie og engelsk



Posted by Simon Rogers Friday 13 August 2010 09.00 BST guardian.co.uk

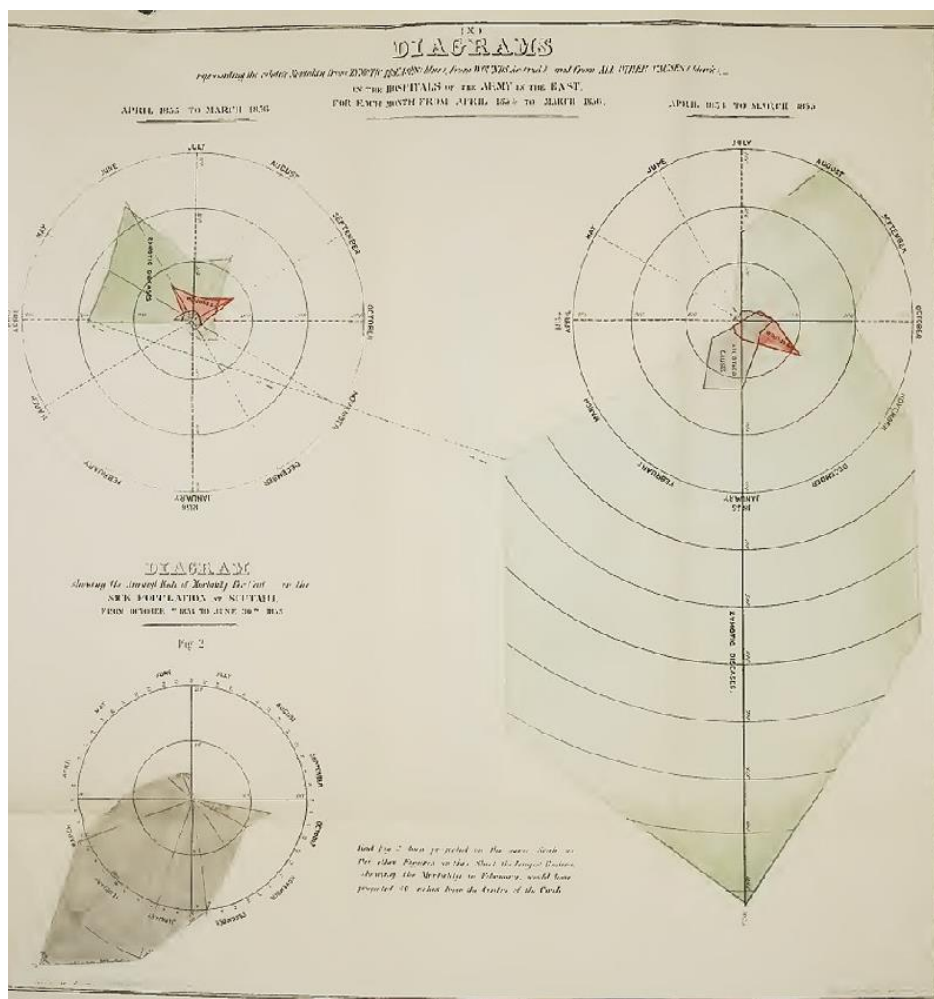
Florence Nightingale, datajournalist: Information has always been beautiful

Florence Nightingale was a master in visualising statistics - see how she did it



Florence Nightingale's 'coxcomb' diagram on mortality in the army.

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– et delvist engelsksproget projekt til samarbejde med historie og engelsk



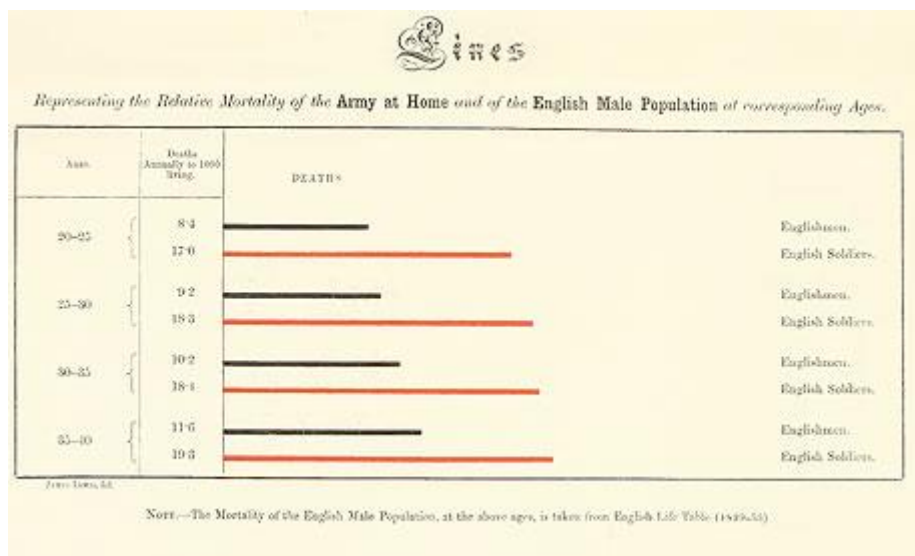
Florence Nightingale and statistics - it turns out the two are intimately connected. Graphics are terribly trendy at the moment - and as data floods onto the web, this is a trend we heartily applaud, here at the datablog. But sometimes it's good to know that it's not entirely new.

We all have an image of Nightingale - who died 100 years ago today - as a nurse, lady with the lamp, medical reformer and campaigner for soldiers' health. But she was also a datajournalist.

After the disasters of the Crimean war, Florence Nightingale returned to become a passionate campaigner for improvements in the health of the British army.

She developed the visual presentation of information, including the pie chart, first developed by William Playfair in 1801. Nightingale also used statistical graphics in reports to Parliament, realising this was the most effective way of bringing data to life.

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– et delvist engelsksproget projekt til samarbejde med historie og engelsk



Florence Nightingale bar chart showing the differences between British soldiers and the general population

The key report is this one, (with thanks to American Libraries). Mortality of the British Army, published in 1858, was packed with diagrams and tables of data.

The most famous is that at the top of this page - her 'Coxcomb'. We still use this device today.

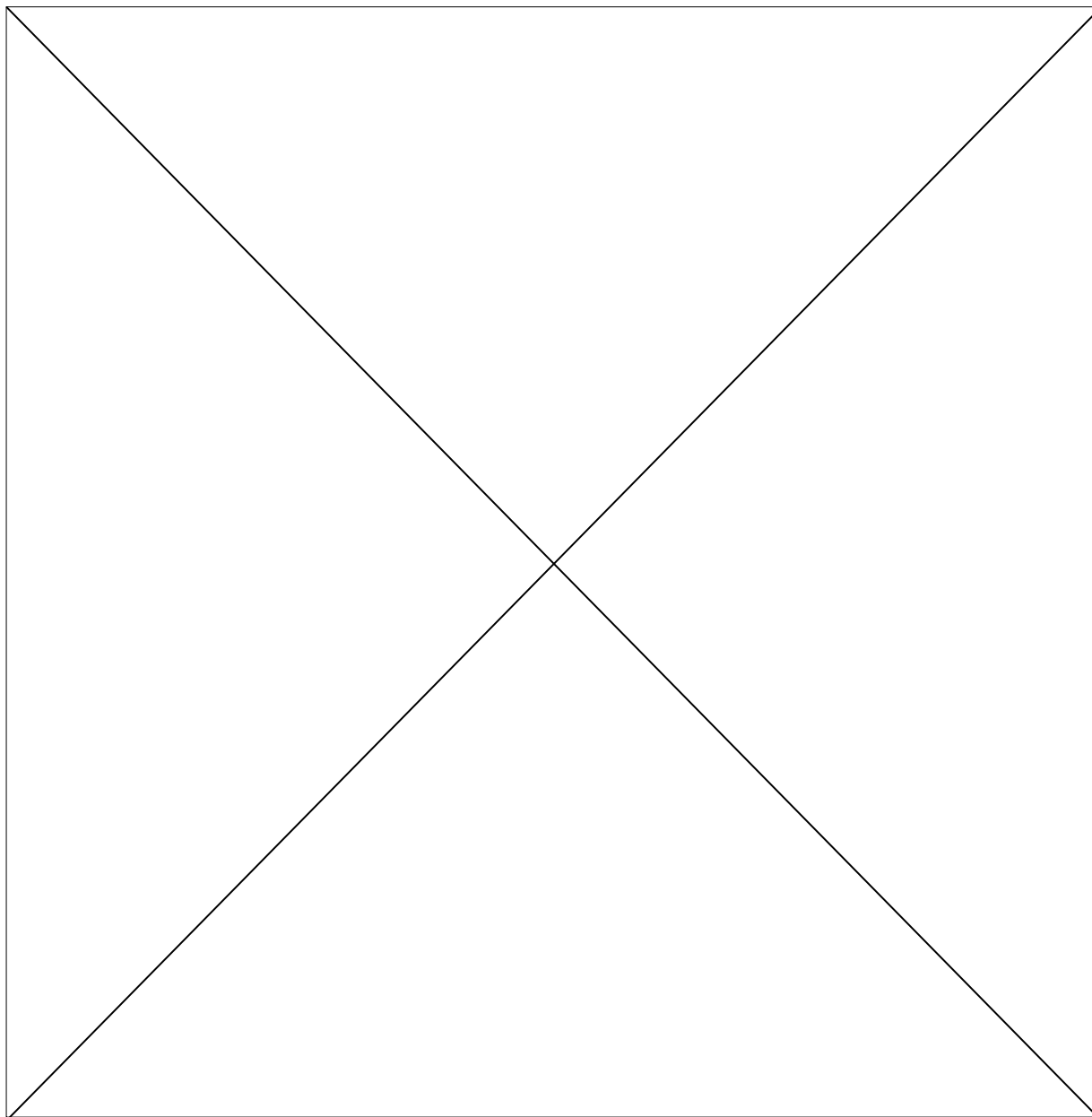
She produced two versions of this - including the one you get by clicking on the image at the top of the page. There's a great paper on it by Hugh Small here where he explains how it works:

The circle on the right has 12 sectors going clockwise representing the first 12 months of the war. The circle on the left is the second 12 months. The superimposed dark shapes show the monthly death rates. The diagram illustrates how the Sanitary Commission, sent out in the middle of the war, dramatically reduced the death rate. The length of the radial line in each month is proportional to the death rate, but both the text and the appearance imply that it is the shaded area that is proportional to the death rate, rather than the length of the radial lines. Florence recognised this error and inserted an erratum slip, but then replaced this diagram in later documents (nos. 3, 4, and 5 listed above) with what I will call the "wedges" diagram.

There's an interactive version of it below from understandinguncertainty.org which gives you an idea of how it works. It's slightly too big for our pages, so click on full screen.

Se: <http://www.guardian.co.uk/news/datablog/2010/aug/13/florence-nightingale-graphics>

Projekter: Kapitel 2. Projekt 2.5 I krig med Florence Nightingale
– et delvist engelsksproget projekt til samarbejde med historie og engelsk



National Statistician, Jil Matheson of the Office for National Statistics, recognises her influence. She says she was inspired by Nightingale to get involved in statistics: *"Florence is an inspirational figure for many women in particular, the 'lady with the lamp' was also a lady with powerful ideas with the commitment and passion to put them into practice. As a consequence, she made a lasting and important impact in the fields of both medicine and statistics."*

kilder. Artiklen fra:

<http://www.guardian.co.uk/news/datablog/2010/aug/13/florence-nightingale-graphics>

Samlede værker, findes på adressen: <http://www.uoguelph.ca/~cwf/n/>

Dialogen:

The Dialogue

We next present an imaginary dialogue between ourselves (I = Interviewer) and Florence Nightingale (FN), imagining that she has travelled in time to meet us. Words taken from FN's own writings are in italics. Where necessary, we have changed the tense, from *is* to *was*, etc. The Appendix has a full list of references.

I: Miss Nightingale, thank you for taking the trouble to “time travel” and join us. We would like to raise with you some issues relating to statistics, public health and the hospital system that are as important now as they were in your time. We are particularly keen to talk about the use of data-based evidence in decision-making.

FN: Thank you for inviting me. It is a pleasure to talk with you about these issues - subjects about which I feel passionately.

I: You are famous for your work as leader of a group of nurses who went to work in the Crimea in 1854, in the hospital at Scutari. You were held in high esteem by both English soldiers and the English populace. The poet Henry Wadsworth Longfellow praised you in his poem “Santa Filomena”, referring to you as “a lady with a lamp”. What were your feelings when you returned to England?

FN: I am grateful that you did not embarrass me by reading through Longfellow's poem. From the way that he writes, you might think that the horror that was Scutari became, after I arrived there, sweetness and light. It was not like that. But you asked about my feelings on returning to England. The excitement quickly wore off, as I became involved in preparations for a promised Royal Commission into the conditions in the army. This forced me to look back over events in the Crimea with a critical eye.

I: What did you find, then?

FN: I learned that it was only at Scutari, not at the other hospitals in the Crimea, that the death rate was an appalling 43% during that first winter. Even *in the hospital tents of the Crimea, although the sick were almost without shelter, without blankets, without proper food or medicines, the mortality was not above one half what it was at Scutari. ... The subject is almost too painful to dwell on, especially as we must take it for granted that the administration of the period acted according to the best of its judgement. Only let the warning be taken. And let us not reproduce, even on a small scale, the same structural defects of mismanagement which led to such terrible loss of life.* Source

I: How did you come to this conclusion? What were the structural defects of which you speak?

FN: In reaching this conclusion, I had extensive help from Dr Farr, who was in charge of statistics at the Registrar-General's office. Explanations that I considered included poor food and living conditions, overwork, poor hygiene, and so on. In the end, I decided that Dr Farr's explanation was correct, that the appalling sanitation and overcrowding at Scutari during the first winter, when sewers were blocked and dead bodies were left lying around on the site, was the reason for the high mortality. Dr Farr knew what data to look for, and how to interpret them. This was the start of my serious education in statistics.

I: What did you do with that information?

FN: The Government promised to set up a Royal Commission that would investigate health in the army. When nothing seemed to be happening, I threatened that unless they proceeded with the Royal Commission, I would release my figures to the public. When the commission did start its work, I provided it with an 800-page book that had very detailed facts and figures. In the end, though, the Royal Commission

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– et delvist engelsksproget projekt til samarbejde med historie og engelsk

suppressed key information from my report. The data were, so to speak, too explosive. Still, I was determined to get the information out. I sent copies to key people up and down the country.

I: One of the people who received a copy of the report was the journalist Harriet Martineau. Why did you send the information to her?

FN: I knew that Miss Martineau would make good use of it. She wrote to ask permission to publicise the information. I wrote back to say: *"I shall be very grateful if you will make use of my report in the way you mention. All such help is most valuable to us. ... I hope that I can in this way secure some hold upon the minds of those who hold in their hands the remedies that we are seeking. I hope that they will hear our crying for relief from sufferings so pressing."* Eventually, Miss Martineau wrote a book called *England and her Soldiers*. I myself bought fifty copies, and donated them to lending libraries. Source

I: After coming back from the Crimea, you expended great energy battling with the British military establishment. I believe you once said that the British War Office *deserved a Victoria Cross for its cool intrepidity in the face of the facts*. Is that really what you said? Source

FN: That is a long time ago and I have trouble remembering back that far, although it certainly expresses what I thought. You would have thought the army top brass would have been desperate to make improvements. Instead they resisted me at every turn. But I was able to make improvements, and the Sanitary Commissioners who arrived in March 1855 made huge improvements in the conditions.

I: But your interest in statistics went much further than trying to find the real causes for the high mortality at Scutari. It seems a big step from nursing in the Crimea to your work in army and hospital reform, in public health, and in statistics.

FN: I had begun to see that good quality data, properly interpreted, can be a power for good in all areas of medicine and health. I collected as much evidence on hospitals and public health as I could to form the basis of my knowledge. I devoured published works on statistics and *however exhausted I might be, the sight of long columns of numbers was perfectly reviving to me*. Source

I: What did you learn about mortality in army barracks?

FN: I learned that the mortality rates in army barracks in England were not much better than they'd been in the Crimea. 20-30 year old soldiers in army barracks in England were about twice as likely to die as 20-30 year olds in the general population - 18 per thousand per year among soldiers, against 9 per thousand per year among those who were fortunate enough not to be conscripted. My bar chart makes the situation clear. It was a scandalous state of affairs.

I: You clearly like to quote figures to back up your case. Is it really necessary to go into so much detail?

FN: It certainly is. I could have complained about unsanitary conditions in the hospital in Scutari, or in army barracks in England, till I was blue in the face. But when I used the data to point out that the bad sanitary and medical conditions in the Crimea had probably led to 9000 unnecessary deaths, the politicians had to sit up and take notice, and do something about the appalling health conditions in the army. Even so, I had to browbeat them to get anything done.

I: You achieved a great deal. Was it time to relax a little?

FN: Not at all. We needed proper nursing training. We needed uniform and accurate statistics that could be the basis for reform in public hospitals. There was a desperate need for huge improvements to public health.

I: Perhaps you would tell us about your work on hospital reform.

Projekter: Kapitel 2. Projekt 2.5 I krig med Florence Nightingale
– et delvist engelsksproget projekt til samarbejde med historie og engelsk

FN: My book - *Notes on Hospitals* - described the reforms that were needed. *It may seem a strange principle to enunciate as the very first requirement in a hospital that it should do the sick no harm. It was quite necessary, nevertheless, to lay down such a principle, because the actual mortality in hospitals, especially in those of the large crowded cities, was very much higher than any calculation founded on the same class of diseases among patients treated out of hospital would lead us to expect.* Source

I: You devoted a whole chapter, 21 pages, to the collection of statistical information. Why was that so important?

FN: I made *an urgent appeal for adopting [my own] ... or some uniform system of publishing the statistical records of hospitals. There was a growing conviction that in all hospitals ... there was a great and unnecessary waste of life ... In attempting to arrive at the truth, I ... applied everywhere for information, but in scarcely an instance have I been able to obtain hospital records fit for any purposes of comparison.* Source

I: The use of such information requires care. What are some of the issues?

FN: *In comparing the deaths of one hospital with those of another, any statistics are justly considered absolutely valueless which do not give the ages, the sexes and the diseases of all the cases. ... There can be no comparison between old men with dropsies and young women with consumptions.* Source

I: Hospital records are still a problem - we are still searching for that uniform system that you mention, despite the energy you poured into the search.

FN: That is disappointing. As I wrote in my book, data are needed that will *enable us to ascertain ... what diseases and ages press most heavily upon the resources of particular hospitals. For example, it was found that a very large proportion of the resources of one particular hospital was swallowed up by one preventable disease, - rheumatism.* Source

I: Eight years later you wrote another book, *Notes on Lying-In Institutions*, on childbirth facilities. This makes many different statistical comparisons - between childbirth at home and childbirth in an institution, between different institutions, and between different countries.

FN: There were large deficiencies in the statistical data. Predominately, it was the wealthy whose children were delivered at home, while the destitute poor were delivered in childbirth facilities. Reliable data are terribly important for *ascertaining whether any particular cause of death predominates in lying-in [childbirth] institutions; and, if so, why so? But, with all their defects, midwifery statistics pointed to one truth; namely that there was a large amount of preventable mortality in midwifery practice, and that, as a general rule, the mortality was far, far greater in lying-in hospitals than among women lying-in at home.* Source

I: You are saying that childbirth wards could be dangerous places.

FN: Overall, the data indicated a mortality rate of 4.7 per thousand for women delivered at home, against 34 per thousand for women delivered in hospitals. *For every two women who would die if delivered at home, fifteen must die if delivered in lying-in hospitals. ... The evidence was entirely in favour of home delivery, and of making better provision ... for this arrangement among the destitute poor.* Source

I: I'm sure you'd be delighted to know that even now modern authors are citing your work and employing techniques very similar to your ones for comparing death rates between hospitals. Perhaps you would comment a bit more on about the way that you used statistical data?

FN: You can see the power of careful, accurate, statistical information from the way that I used them in my pleas to Government to improve the conditions of ordinary soldiers and of ordinary people. *I collected my figures with a purpose in mind, with the idea that they could be used to argue for change. Of what use are*

Projekter: Kapitel 2. Projekt 2.5 I krig med Florence Nightingale
– et delvist engelsksproget projekt til samarbejde med historie og engelsk

statistics if we do not know what to make of them? What we wanted at that time was not so much an accumulation of facts, as to teach the men who are to govern the country the use of statistical facts. Source

I: You clearly had a huge energy and enthusiasm for the use of statistical information.

FN: *For me, as I wrote to the Belgian statistician Quetelet, "this passionate study is not at all based upon love of science, which I can hardly claim. I have seen so much of the sufferings and the miseries of humanity, of . . . the stupidity of our political system, of the dark blindness of those who guide our body social that . . . frequently it comes to me like a flash of light across my spirit that the only study worthy of the name is that whose principles you have so clearly put forward."* Source

I: I believe you thought a lot of Quetelet.

FN: Yes indeed. . . *I cannot say how the death of Quetelet, this old friend of mine, touched me. He was the founder of the most important science in the world: ... he did not live to see it perceptibly influence in any practical manner statesmanship or government.* Source From corresponding with Quetelet and reading his book I gained real insight into the difference between good and bad statistical arguments. The first two words of the title of his book translate, in English, as *Social Physics*. You can't say whether or not a hospital is doing its job properly based on haphazardly collected evidence of occasional deaths or mishaps. One needs to get together data that is as complete as possible, so that one can see the outcome for the tens of thousands of people who may go through in a year. It is then that you see the regularities that Quetelet talked about.

I: And what about presentation of statistical information? How did you go about presenting it in a way that could press your case?

FN: I used diagrams and tables to present my evidence. I believe you have examples of my diagrams at hand.

I: Yes, your graphical presentations were great innovations at the time - you are to be congratulated, Miss Nightingale, for coming up with such elegant yet powerful graphs.

FN: Many people will try to tell you that statistics are impenetrable and cloud the issue rather than enlightening it. I beg to differ - and use my diagrams as an example. *I want everyone to understand - no hiding behind the supposed incomprehensibility of statistics. The figures must be as clear as a picture - they must tell a story as clearly as does a picture of the Crucifixion.* Source At a superficial level, I was agitating for reform in Army administration. But on a deeper level, I truly felt I was acting as an agent of God, revealing his character in a particular sphere. *The true foundation of theology is to ascertain the character of God. It is by the aid of such diagrams in particular, and Statistics in general that law in the social sphere can be ascertained and codified, and certain aspects of the character of God thereby revealed. The study of statistics is thus a religious service.* Source

I: If only all graphic designers and newspaper editors could take a hand in advancing Quetelet's and your desires! I'd be so grateful if you could turn your attention now to talk about the use of evidence in nursing and medicine.

FN: Ah, evidence! Evidence is the most important tool we have for decision-making. *We ... do not consider the human mind capable of receiving what, strictly speaking, can be called proof. Evidence, which we have means to strengthen for or against a proposition, is our proper means for attaining truth.* Source

I: That can't always be easy! Did you ever strike any difficulties with getting a grip on the evidence?

FN: Well yes it wasn't all plain sailing. I did not always have the right statistics at hand to use in comparisons. In a report as Registrar-General, Farr gave deaths per hundred beds per annum for the principal hospitals of England. In the third edition of *Notes on Hospitals*, I quoted these figures, followed

Projekter: Kapitel 2. Projekt 2.5 I krig med Florence Nightingale
– et delvist engelsksproget projekt til samarbejde med historie og engelsk

Farr in calling them “mortality percent”, and used them to compare hospitals in country towns with hospitals in London and large provincial towns. This caused a huge controversy. It was misleading to call these figures “mortality percent”. I well understood that such statistical comparisons need to allow for the different severities of the cases treated at the different hospitals, but did not consider this a plausible explanation of rate differences of a factor of more than two.

I: What then is the right way to make comparisons between hospitals?

FN: *The proportion of recoveries, the proportion of deaths, and the average time in hospital, must all be taken into account in discussions of this nature, as well as the character of the cases and the proportion of different ages among the sick. For me, this experience emphasised the great importance of correct hospital statistics as an essential element in hospital administration.* Source

I: You know, statistical thinking may be having more of an impact on medical practice and public health nowadays though the concept of evidence-based approaches, but debate continues as to how to go about it. Your ideas have had a large impact on public health planning. Thank you, Miss Nightingale. Evidence-based approaches are surely the way of the future!

FN: *Too kind, too kind.* Source

(Kilde: <http://www.amstat.org/publications/jse/v12n1/maindonald.html>)

Her kan man finde kilderne til de forskellige udsagn der tillægges Florence Nightingale.

Du kan finde kilderne samlet [her](#).