The Good Samaritan: How Statistical Graphics Helped to Save Lives

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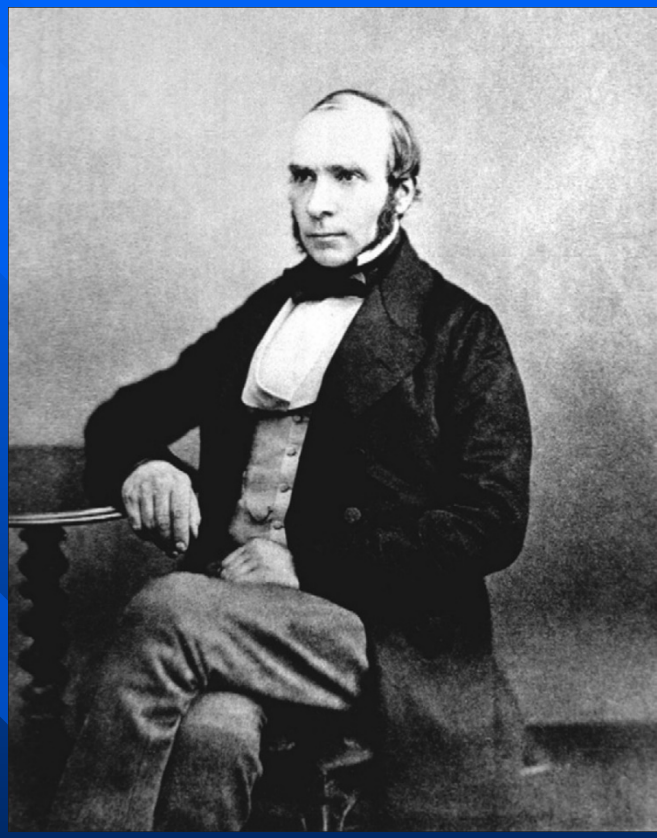
Contents

- Highlights of Graphics That Helped to Save Lives
  - John Snow's Cholera Map and Beyond
  - Florence Nightingale's Coxcomb Charts and Beyond
- John Snow and Florence Nightingale in 2020
- Conclusions

John Snow

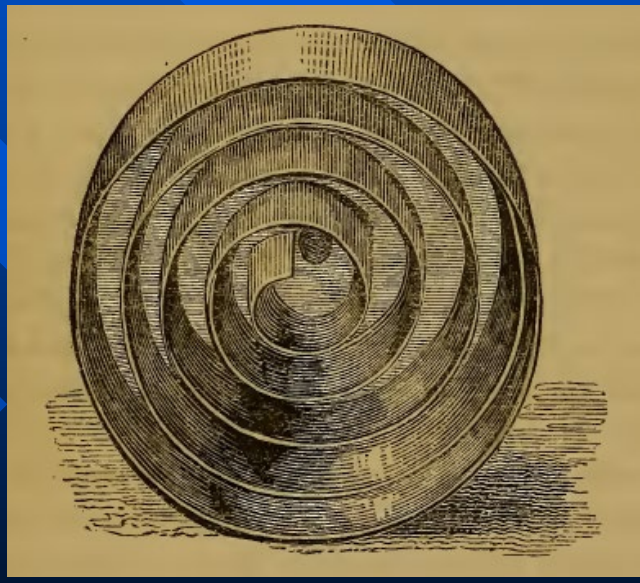
- Born: March 15, 1813, York, Yorkshire, England
- Died: June 16, 1858, London
- British anesthesiologist who administered chloroform to Queen Victoria when she gave birth in 1853 and 1857
- "Father of contemporary epidemiology"
- Best known for his work related to the 1854 London Cholera outbreak (The Broad Street Pump) and the "Grand Experiment"



John Snow: Pioneering Work as Anesthesiologist

Snow (1858), Illustration 1.
Chloroform inhaler.

Snow (1858), Illustration 2.
Ether inhaler.



John Snow: The Broad Street Pump (1)

- Third major cholera epidemic in England in 1853-1855
- London outbreak started on August 19, 1854, and lasted about 6 weeks
- Resulted in more than 600 deaths
- Snow reasoned that cholera was caused by a microbe-like agent (or germs) and not by bad air (or "miasma") from decayed organic matter, a debate that only was concluded in the 1880s
- Snow's hypotheses: Cholera transmitted from person to person via a fecal-oral route & drinking water of Broad Street pump was the cause of the outbreak
- Snow used skilled reasoning, data, and maps to convince the Board of the Guardians to remove handle of the Broad Street pump
- Only about 50 more fatal attacks thereafter

John Snow: The Broad Street Pump (2)

Snow (1855), Map 1.
Showing the deaths from cholera in Broad Street, Golden Square, and the neighbourhood, from 19th August to 30th September 1854. A black mark or bar for each death is placed in the situation of the house in which the fatal attack took place. The situation of the Broad Street Pump is also indicated, as well as that of all the surrounding Pumps to which the public had access.

John Snow: The Broad Street Pump (3)

Snow (1855), Map 1 (Zoom). Showing the deaths from cholera in Broad Street, Golden Square, and the neighbourhood, from 19th August to 30th September 1854. A black mark or bar for each death is placed in the situation of the house in which the fatal attack took place. The situation of the Broad Street Pump is also indicated, as well as that of all the surrounding Pumps to which the public had access.

John Snow: The Grand Experiment (1)

- Observational study called the "Grand Experiment" (1854)
- Comparison of London neighborhoods, receiving water from two different companies:
  - Lambeth Waterworks Company used water from the upper River Thames, located away from urban pollution
  - Southwark-Vauxhall Company used water from inlets in the center of London, where contamination with sewage was common
- Snow tried to show harmful effect of contaminated water in similar populations in a neighborhood that obtained water from both companies
- Snow suggested intervention strategies to control the outbreak of cholera due to contaminated water

John Snow: The Grand Experiment (2)

Snow (1855), Map 2. Showing the boundaries of the Registrar- General's districts on the south side of the Thames in London, and also the water supply of those districts.

John Snow: Controversies and Mistakes (1)

American Journal of Epidemiology

Vol. 159, No. 4
Printed in U.S.A.

LETTER TO THE EDITOR

RE: ON JOHN SNOW'S UNQUESTIONED LONG DIVISION

Fernando M. Carvalho[1], Fabiana Lima[1], and David Kriebel[2]
[1] *Preventive Medicine Department, Federal University of Bahia, Av. Reitor Miguel Calmon, s/n Vale do Canela, Salvador, Bahia, Brasil CEP 40.420-060*
[2] *Department of Work Environment, University of Massachusetts, Lowell, MA 01854*

Recently, during an epidemiology lecture for undergraduates, one student noticed that there's a mistake in John Snow's calculation of the death rate of cholera for the "rest of London" in the 1854 epidemic described in *On the Mode of Communication of Cholera* (1). The correct rate, derived by dividing 1,422 deaths by 256,423 houses, should be 55 instead of 59 deaths in each of 10,000 houses, as presented in Snow's table IX, reprinted below as table 1.

(1422 / 256 423) * 10 000 =
55.4552438744

435). As a learning tool, we encourage our fellow teachers of epidemiology to continue to use Snow's important book, but even heroes make mistakes, and errors in long division should not be passed along to our students.

John Snow: Controversies and Mistakes (2)

John Snow

Physician, epidemiologist, and anaesthetist. Born in York, UK, on March 15, 1813, he died in London on June 16, 1858, aged 45 years.

The Lancet wishes to correct, after an unduly prolonged period of reflection, an impression that it may have given in its obituary of Dr John Snow on June 26, 1858. The obituary briefly stated:

> "Dr John Snow: This well-known physician died at noon, on the 16th instant, at his house in Sackville Street, from an attack of apoplexy. His researches on chloroform and other anaesthetics were appreciated by the profession."

The journal accepts that some readers may wrongly have inferred that *The Lancet* failed to recognise Dr Snow's remarkable achievements in the field of epidemiology and, in particular, his visionary work in deducing the mode of transmission of epidemic cholera. The Editor would also like to add that comments such as "In riding his hobby very hard, he has fallen down through a gully-hole and has never since been able to get out again" and "Has he any facts to show in proof? No!", published in an Editorial on Dr Snow's theories in 1855, were perhaps somewhat overly negative in tone.

Even allowing for *Lancet* founding Editor Thomas Wakley's surprising contempt for Snow, the obituary was extraordinary in its brevity and its failure

even to mention cholera. The excoriating Editorial 3 years earlier had been provoked by Snow's support for what were known as the "nuisance traders". Snow told Members of Parliament that the foul smells from processes such as tanning and soap boiling were not capable of producing acute fever or epidemic disease in an individual. Wakley, incensed at what he saw as an attempt to block important public health reforms, accused Snow of unscientific thinking.

The following year, *The Lancet* published Snow's paper "On the Supposed Influence of Offensive Trades on Mortality", which used the Registrar-General's *Weekly Returns of Deaths in London* to argue that workers in the nuisance trades suffered no more ill health than those in other occupations. Wakley followed this, however, with an Editorial that stated there was no doubt that the noxious gases and vapours of the capital's air exerted "a most efficient and malignant influence in the causation and aggravation of disease".

Wakley may have been the most outspoken of Snow's critics but his views were shared by most medical men at the time: miasma, or the stench from decaying vegetable and animal matter, was widely held responsible for epidemic disease. Snow's *On the Mode of Communication of Cholera*, first published in 1849, set out the then radical idea that cholera was a disorder of the digestive system not the blood; and that it was contagious and spread through the oral-faecal route, largely through contaminated drinking water.

John Snow: Controversies and Mistakes (3)

John Snow, hero of cholera: RIP

1736 CMAJ • JUNE 17, 2008 • 178(13)

Dr. John Snow is not the first man to be honoured for valorous acts he never accomplished, nor is he the first to have honest, partially successful work transformed into a miraculous success. On the 200th anniversary of Snow's death it is time to acknowledge the glorious failure to accept that Snow's cholera studies were not good enough.

The problem is not Snow, but the mythology that has grown around him, the fable of the heroic researcher who single-handedly "proved" cholera was waterborne. He did not. Here is the myth broken down into its components.

The myth of Snow is not a harmless fable. It ignores the fact that what we call John Snow's cholera studies were not the work of a lone individual; this denies the community of science while promoting the myth of the brilliant, solitary researcher.

Yes, cholera *is* waterborne but science is not about being "right." It is about convincing others of the rightness of an argument and that Snow did not do. Ignoring that does violence to the idea of juried research, and of the community of science that Snow passionately participated in.

Let John Snow rest in peace. Let the myth die, too. It is not a fable we need today.

Tom Koch PhD
Bioethicist
Vancouver, BC

John Snow: Modern Day R Graphs (1)

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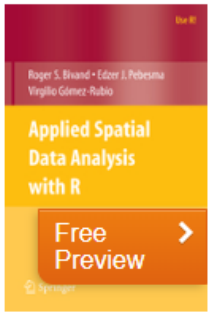

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John Snow: Modern Day R Graphs (2)

4.4.1 Broad Street Cholera Data

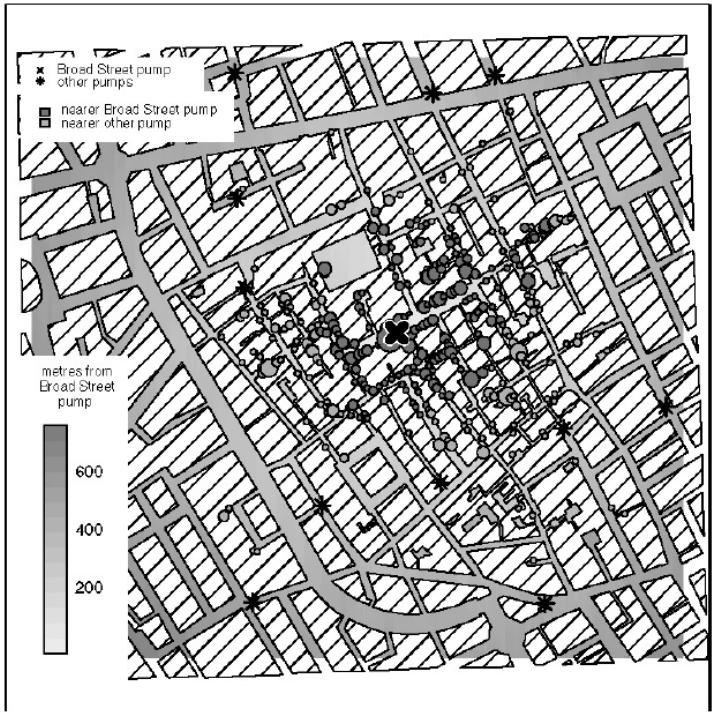

Fig. 4.7. The 1854 London cholera outbreak near Golden Square

Data Sets Used

- Broad Street cholera mortalities: original files provided by Jim Detwiler, who had collated them for David O'Sullivan for use on the cover of O'Sullivan and Unwin (2003), based on earlier work by Waldo Tobler and others; this version is available as a compressed archive of a GRASS location in file `snow_location.tgz`, and a collection of GeoTiff and shapefiles exported from this location in file `snow_files.zip` on the book website.

John Snow: Modern Day R Graphs (3)

Snow: John Snow's Map and Dat

rdrr.io/cran/HistData/man/Snow.html

rdrr.io | Find an R package | R language docs | Run R in your browser | R Notebooks | packages, doc text, code...

HistData
Data Sets from the History of Statistics and Data Visualization
Package index

Search the HistData package

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- Package overview
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- Duplicate and Missing Cases in Snow.deaths"

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- **Arbuthnot:** Arbuthnot's data on male and fem
- **Armada:** La Felicisima Armada
- **Bowley:** Bowley's data on values of British an
- **Cavendish:** Cavendish's Determinations of th
- **ChestSizes:** Chest measurements of 5738 Sc
- **Cholera:** William Farr's Data on Cholera in Lo
- **CushnyPeebles:** Cushny-Peebles Data: Sopi
- **Dactyl:** Edgeworth's counts of dactyls in Virgil
- **DrinksWages:** Elderton and Pearson's (1910)
- **EdgeworthDeaths:** Edgeworth's Data on Dea
- **Fingerprints:** Waite's data on Patterns in Fing
- **Galton:** Galton's data on the heights of parent
- **GaltonFamilies:** Galton's data on the heights
- **Guerry:** Data from A.-M. Guerry, "Essay on th
- **HalleyLifeTable:** Halley's Life Table
- **HistData-package:** Data sets from the Histor
- **Jevons:** W. Stanley Jevons' data on numerica
- **Langren:** van Langren's Data on Longitude D
- **Macdonell:** Macdonell's Data on Height and F
- **Michelson:** Michelson's Determinations of the
- **Minard:** Data from Minard's famous graphic m
- **Nightingale:** Florence Nightingale's data on d

Home / CRAN / HistData / **Snow: John Snow's Map and Data on the 1854 London Cholera Outbreak**

Snow: John Snow's Map and Data on the 1854 London Cholera Outbreak

In HistData: Data Sets from the History of Statistics and Data Visualization

Description | Usage | Format | Details | Source | References | See Also | Examples

Description

The `Snow` data consists of the relevant 1854 London streets, the location of 578 deaths from cholera, and the position of 13 water pumps (wells) that can be used to re-create John Snow's map showing deaths from cholera in the area surrounding Broad Street, London in the 1854 outbreak. Another data frame provides boundaries of a tesselation of the map into Thiessen (Voronoi) regions which include all cholera deaths nearer to a given pump than to any other.

The apocryphal story of the significance of Snow's map is that, by closing the Broad Street pump (by removing its handle), Dr. Snow stopped the epidemic, and demonstrated that cholera is a water borne disease. The method of contagion of cholera was not previously understood. Snow's map is the most famous and classical example in the field of medical cartography, even if it didn't happen exactly this way. (the apocryphal part is that the epidemic ended when the pump handle was removed.) At any rate, the map, together with various statistical annotations, is compelling because it points to the Broad Street pump as the source of the outbreak.

Usage

```
data(Snow.deaths)
data(Snow.pumps)
data(Snow.streets)
data(Snow.polygons)
data(Snow.dates)
```

Format

`Snow.deaths` : A data frame with 578 observations on the following 3 variables, giving the address of a person who died from cholera. When many points are associated with a single street address, they are "stacked" in a line away from the street so that they are more easily visualized. This is how they are displayed on John Snow's original map. The dates of the deaths are not individually recorded in this data set.

`case`
Sequential case number, in some arbitrary, randomized order

`x`
x coordinate

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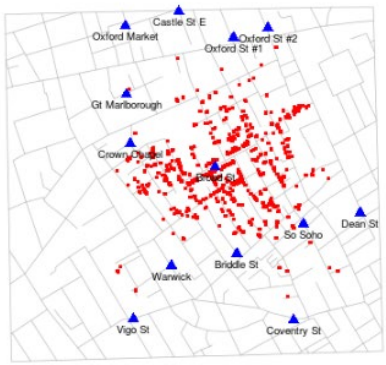
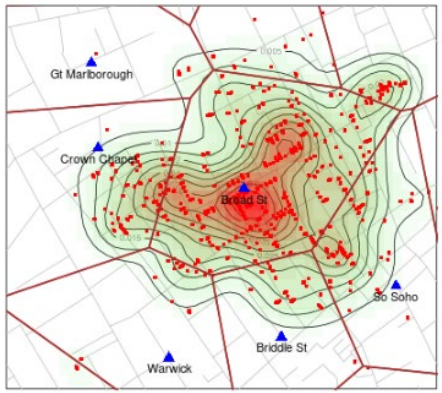
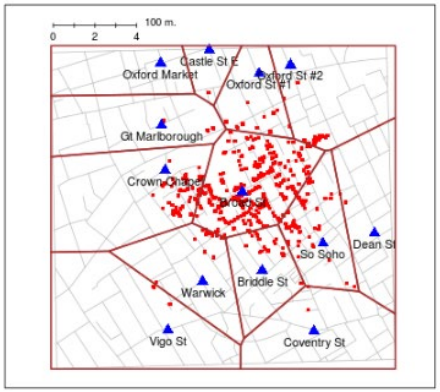
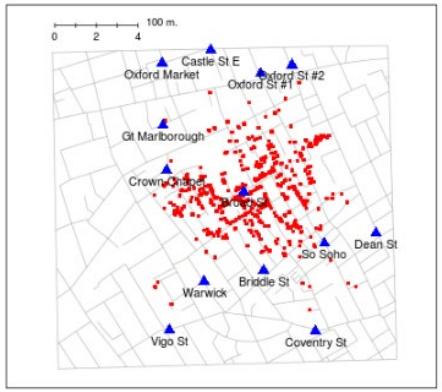
https://rdrr.io/snippets/

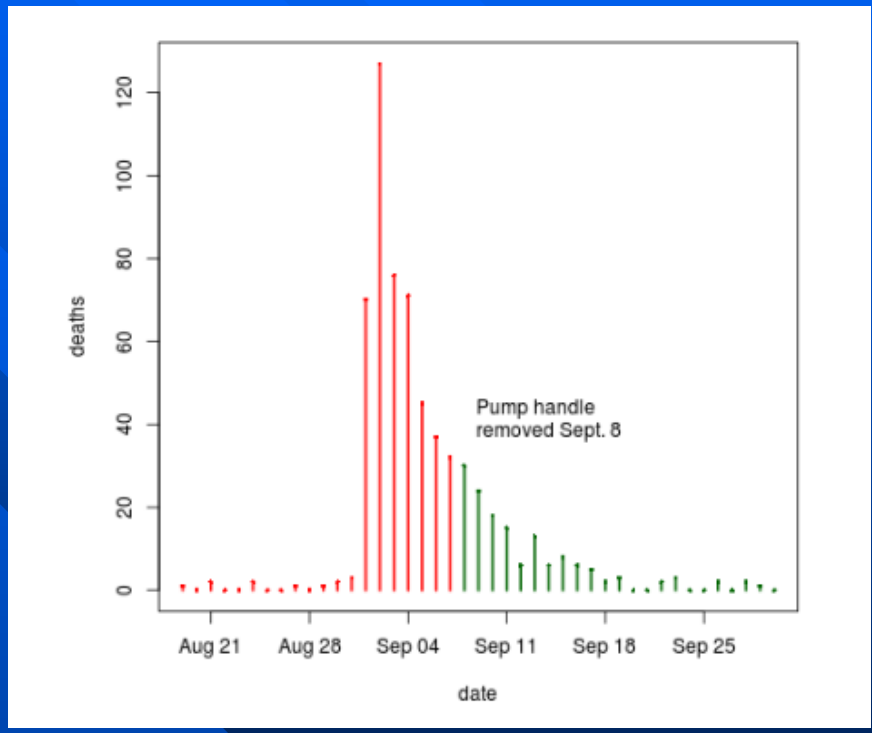
John Snow: Modern Day R Graphs (4)





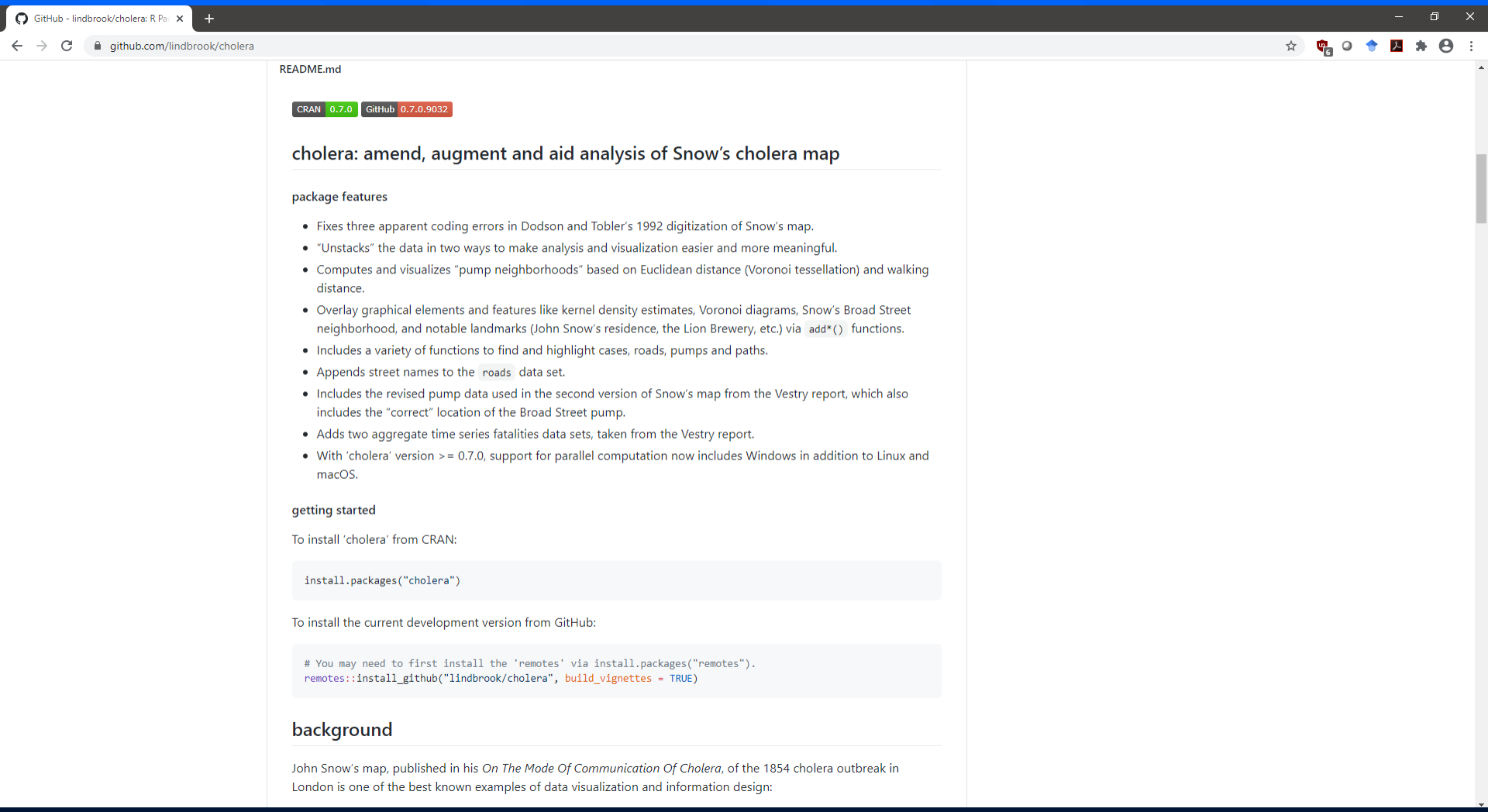






https://rdrr.io/cran/HistData/man/Snow.html

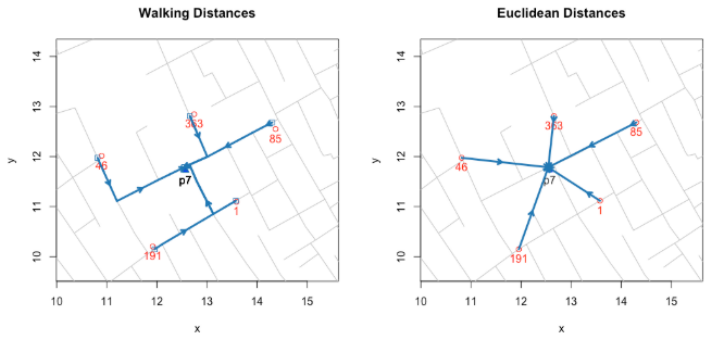
John Snow: Modern Day R Graphs (5)



John Snow: Modern Day R Graphs (6)

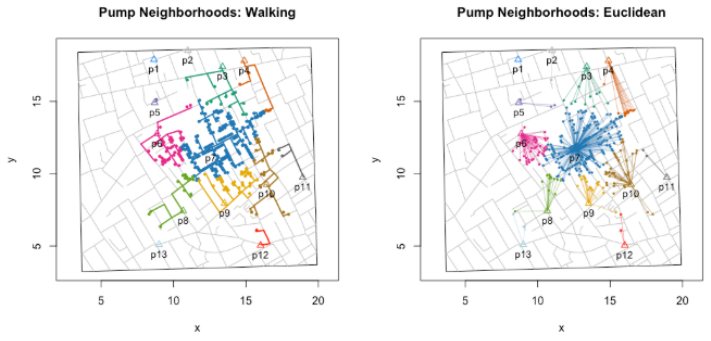
```
streetNameLocator(zoom = 1, cases = NULL, highlight = FALSE, add.subtitle = FALSE, add.title = FALSE)
title(main = "Walking Distances")
invisible(lapply(c(1, 191, 46, 363, 85), addWalkingPath))

streetNameLocator(zoom = 1, cases = NULL, highlight = FALSE, add.subtitle = FALSE, add.title = FALSE)
title(main = "Euclidean Distances")
invisible(lapply(c(1, 191, 46, 363, 85), addEuclideanPath))
```

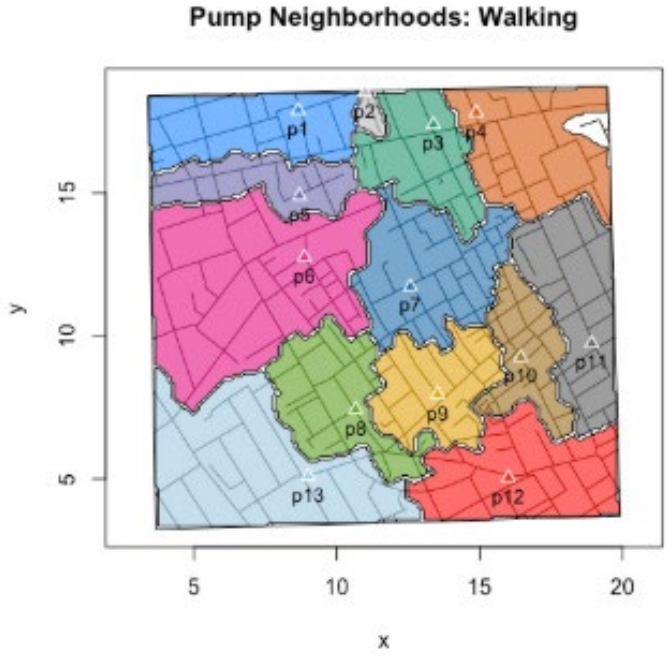


To build a neighborhood, we apply this algorithm to each location or "address" with at least one observed fatality. This builds the "observed" neighborhood:

```
plot(neighborhoodWalking())
plot(neighborhoodEuclidean())
```

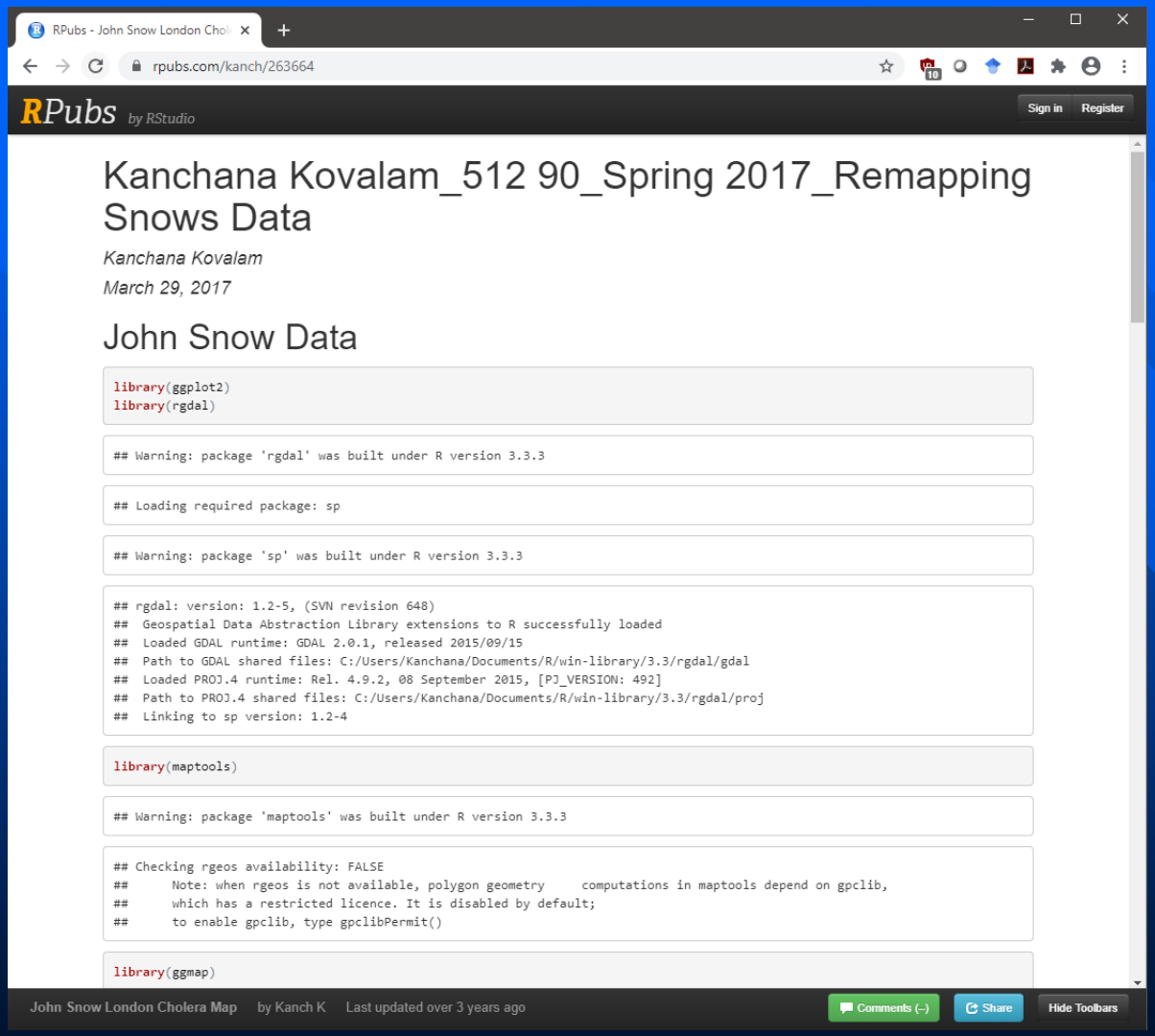



```
plot(neighborhoodWalking(case.set = "expected"), "area.polygons")
```



https://github.com/lindbrook/cholera

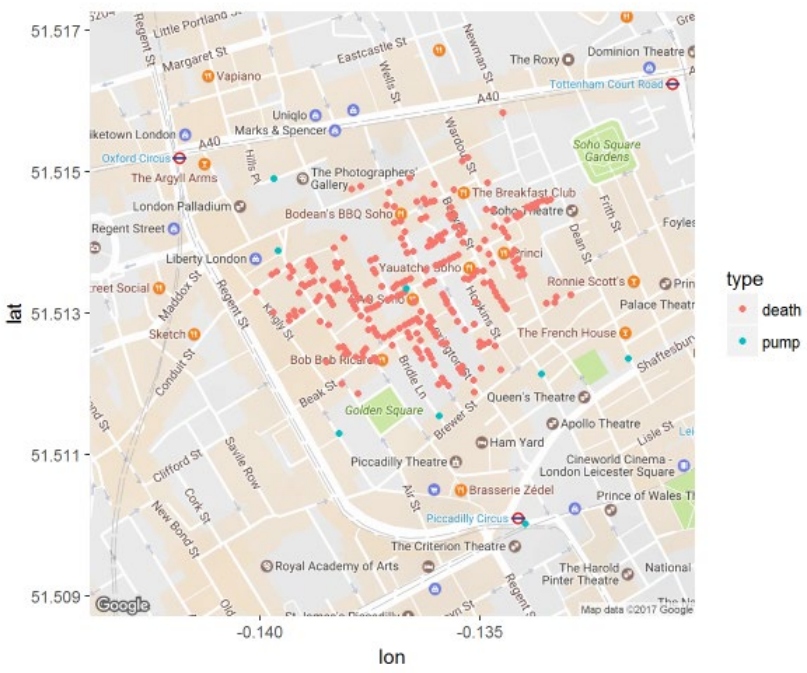
John Snow: Modern Day R Graphs (7)



John Snow: Modern Day R Graphs (8)

```
## Plotting John Snow Dataset on London map:
##-----------------------------------

London + geom_point(mapping = aes(x=coords.x1, y=coords.x2, col=type),data=tmp)
```




```
## Plotting the heat-map for the deaths due to cholera:
##------------------------------------------------------------------
snow.plot3 <- snow.plot2 + stat_density2d(data = tmp[tmp$type == "death", ], aes(x = coords.x1, y = coords.x2,
fill = ..level.., alpha = ..level..), size = 0.01, bins = 10, geom = "polygon") + scale_fill_gradient(low = "blue",
high = "red", guide = FALSE) + scale_alpha(range = c(0, 0.5), guide = FALSE)
snow.plot3
```

https://rpubs.com/kanch/263664

John Snow: Contemporary Analyses (1)

Public Health (2004) 118, 387-394

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John Snow, William Farr and the 1849 outbreak of cholera that affected London: a reworking of the data highlights the importance of the water supply

P. Bingham[a,*], N.Q. Verlander[b], M.J. Cheal[a]

[a]*Isle of Wight Primary Care Trust, Whitecroft, Sandy Lane, Newport, I.O.W PO30 3ED, UK*
[b]*PHLS Statistics Unit, Colindale, UK*

Received 11 August 2003; received in revised form 8 January 2004; accepted 24 May 2004

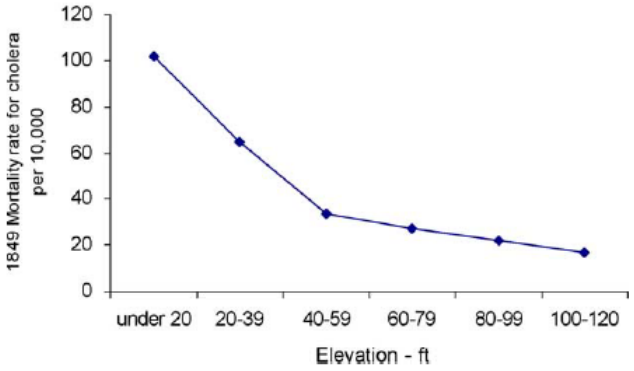


Figure 1 Death from cholera vs. elevation.

Table 1 Deaths from cholera in London, registered from 23 September 1848 to 25 August 1849.

Sectors of London	Population in 1841	Deaths from cholera	Death rate per 1000 inhabitants
West	300,711	533	1.77
North	375,971	415	1.10
Central	373,605	920	2.46
East	392,444	1597	4.07
South	502,548	4001	7.96
Total	1,945,279	7466	3.84

Snow J. *On the Mode of the Communication of Cholera.* London: John Churchill; 1849.

Table 6 Odds ratios, 95% confidence limits (CL) and *P* values for logistic regression model.

Explanatory variable	Low 95% CL	Odds ratio	High 95% CL	*P*
Constant	6.006×10^{-4}	0.002626	0.01149	-
Water from Thames between Battersea Bridge and Waterloo Bridge[a]		1.00		<0.001
Water from New River and Rivers Lea and Ravensbourne	0.44	0.59	0.79	
Water from Thames between Kew and Hammersmith	0.22	0.40	0.72	
Increase in elevation above high water (10 feet)	0.85	0.91	0.98	<0.01
Decrease in poor rate (£/100)	0.87	0.91	0.96	<0.001
Average annual death rate 1838-1844	1.00	1.00	1.01	0.48
Persons per inhabited house	0.89	1.03	1.19	0.71
Persons per acre	1.00	1.00	1.00	0.67
Average house value per person (£)	1.00	1.00	1.00	0.35
Average house value within district (£)	1.00	1.00	1.00	0.79

[a] Baseline.

John Snow: Contemporary Analyses (2)

Social Science & Medicine 69 (2009) 1246–1251

Contents lists available at ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Short report

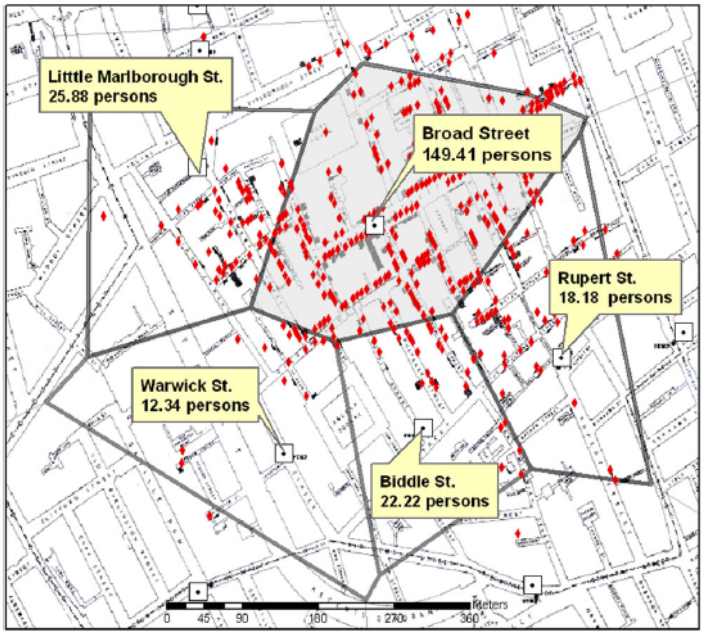
Crediting his critics' concerns: Remaking John Snow's map of Broad Street cholera, 1854

Tom Koch*, Kenneth Denike

University British Columbia, Vancouver, BC, Canada

Remaking Snow's 1855 Map

Cholera Mortality per 1,000 persons



Cholera Mortaliy per 1,00 persons for central pump catchments.

A Dirichlet tesselation was used to create pump service areas in the area most affected by the 1854 cholera outbreak. Often called Thiessen polygons in a Voronoi network, each service area includes all cholera deaths nearer to it than any other public water source.

Mortality per 1000 persons is calculated by dividing the reported deaths in each service area by the number of houses on streets in that segment and multiplying that number by 10 persons per house.

Fig. 2. Mortality per 1000 persons was calculated for the central water service catchments by taking the number of deaths per area, dividing by the number of houses on street segments in each area, and multiplying by an estimated 10 persons per house.

John Snow: Contemporary Analyses (3)

Shiode *et al. International Journal of Health Geographics* (2015) 14:21
DOI 10.1186/s12942-015-0011-y

INTERNATIONAL JOURNAL OF HEALTH GEOGRAPHICS

RESEARCH **Open Access**

The mortality rates and the space-time patterns of John Snow's cholera epidemic map

Narushige Shiode[1*†], Shino Shiode[2†], Elodie Rod-Thatcher[2†], Sanjay Rana[2] and Peter Vinten-Johansen[3]

Shiode *et al. Int J Health Geogr (2015) 14:34*
DOI 10.1186/s12942-015-0016-6

INTERNATIONAL JOURNAL OF HEALTH GEOGRAPHICS

ERRATUM **Open Access**

Erratum to: The mortality rates and the space–time patterns of John Snow's cholera epidemic map

Narushige Shiode[1*], Shino Shiode[2], Elodie Rod-Thatcher[2], Sanjay Rana[2] and Peter Vinten-Johansen[3]

Fig. 1 Estimated residential population in each house at the time of the cholera outbreak

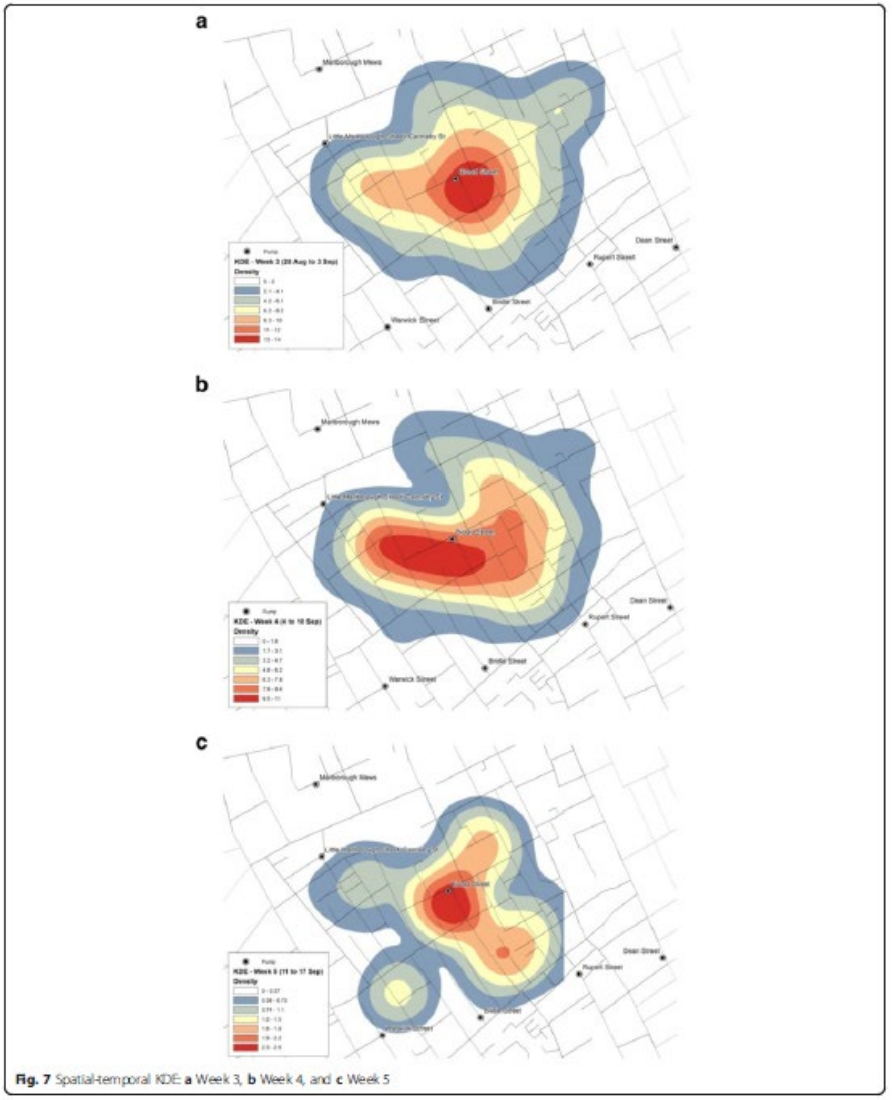


Fig. 7 Spatial-temporal KDE: **a** Week 3, **b** Week 4, and **c** Week 5

John Snow: Contemporary Analyses (4)

BRAZ J INFECT DIS 2017;21(1):112–115

The Brazilian Journal of
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Brief communication

Snow's case revisited: new tool in geographic profiling of epidemiology

Alessio Papini[a,*], *Ugo Santosuosso*[b]

[a] University of Florence, Department of Biology, Firenze, Italy
[b] University of Florence, Department of Clinical and Experimental Medicine, Firenze, Italy

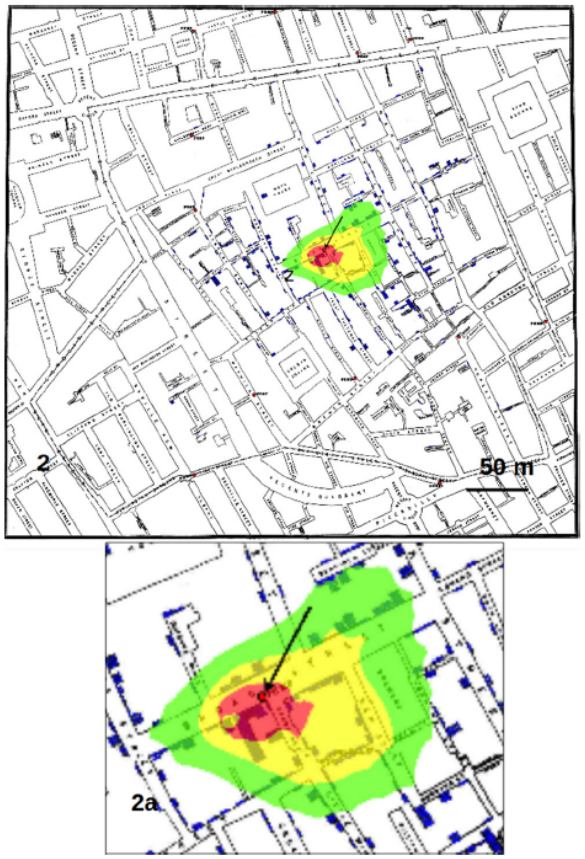


Fig. 2 – GP analysis with weights assigned to each point of the map on the basis of the number of cholera cases. The red area (that with highest probability to find the infection source) is only about 30 m in diameter and it comprises the famous pump of Broad Street.

John Snow: Contemporary Analyses (5)

ELSEVIER

Social Science & Medicine 63 (2006) 271–283

SOCIAL SCIENCE & MEDICINE

www.elsevier.com/locate/socscimed

Rethinking John Snow's South London study: A Bayesian evaluation and recalculation

Thomas Koch*, Kenneth Denike

University British Columbia, Vancouver BC, Canada V6K 2SI

Available online 7 February 2006

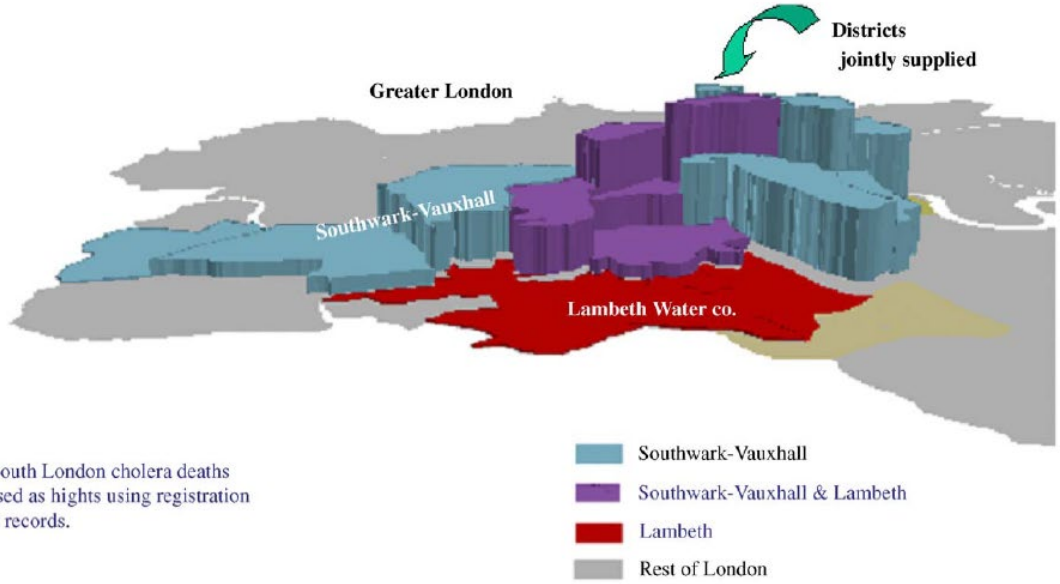


Fig. 8. This map has added mortality per 10,000 persons for all registration districts added to the water supply areas mapped by Snow in the South London study area. Map by authors.

References: John Snow and Cholera

- Bynum, W. F. (2013) "In Retrospect: On the Mode of Communication of Cholera: W.F. Bynum Reassesses the Work of John Snow, the Victorian 'Cholera Cartographer'." *Nature* **495**(7440), 169-170, https://www.nature.com/articles/495169a
- Frerichs, R. (2009, 2020) "John Snow", Encyclopedia Britannica, https://www.britannica.com/biography/John-Snow-British-physician
- Hempel, S. (2013) "Obituary: John Snow", The Lancet **381**(9874), 1269-1270, https://www.sciencedirect.com/science/article/pii/S0140673613608302
- Paneth, N. (2004). "Assessing the Contributions of John Snow to Epidemiology: 150 Years after Removal of the Broad Street Pump Handle", Epidemiology 15(5), 514-516, https://www.jstor.org/stable/20485943
- Ramsay, M.A.E. (2006). "John Snow, MD: Anaesthetist to the Queen of England and Pioneer Epidemiologist", *Baylor University Medical Center Proceedings,* **19** (1): 24–28, https://doi.org/10.1080/08998280.2006.11928120

References: Selected Work by John Snow

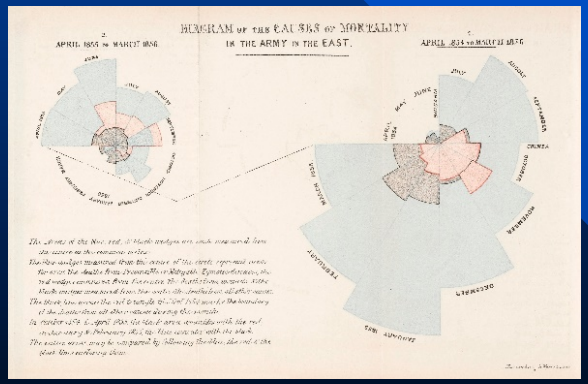
- Snow, J. (1847). On the Inhalation of the Vapour of Ether in Surgical Operations, London: John Churchill, https://www.ph.ucla.edu/epi/snow/oninhalationvapourether.pdf
- Snow, J. (1849). On the Mode of Communication of Cholera, London: John Churchill, https://collections.nlm.nih.gov/ext/cholera/PDF/0050707.pdf
- Snow, J. (1854). The Cholera Near Golden-Square, and at Deptford. *The Medical Times and Gazette*. 2nd series. **9**: 321–322, https://babel.hathitrust.org/cgi/pt?id=hvd.32044103087938&view=1up&seq=331
- Snow, J. (1855). On the Mode of Communication of Cholera (Second Edition), London: John Churchill, https://archive.org/stream/b28985266#page/n3/mode/2up
- Snow, J. (1858). On Chloroform and Other Anaesthetics and Their Action and Administration, London: John Churchill, https://archive.org/details/onchloroformothe1858snow/mode/2up

John Snow: Modern-Day Web Sites

- The John Snow Society, http://www.johnsnowsociety.org/
- John Snow – A Historical Giant in Epidemiology, https://www.ph.ucla.edu/epi/snow.html
- The John Snow Archive and Research Companion, https://johnsnow.matrix.msu.edu/
- John Snow, https://en.wikipedia.org/wiki/John_Snow

Florence Nightingale

- Born: May 12, 1820, Florence, Italy
- Died: August 13, 1910, London
- British data scientist, statistician, and social crusader
- “Mother of modern nursing”
- Best known to statisticians for her work as a data visualization story teller and her innovative graphics, such as the rose diagram



Florence Nightingale at the JSM (1)

Abstract Details

Activity Number:	466 - Contemporary Statistical Graphics: Methods and Applications
Type:	Contributed
Date/Time:	Thursday, August 6, 2020 : 10:00 AM to 2:00 PM
Sponsor:	Social Statistics Section
Abstract #312933	
Title:	Florence Nightingale: How She Used, Managed and Explained Data for the Public Good
Author(s):	Noel-Ann Bradshaw*
Companies:	London Metropolitan University
Keywords:	Nightingale; Mortality rate; Sanitary conditions; Data management; Data visualization; Working class

Abstract:

Florence Nightingale is well known in Statistical and Mathematical circles for her general contribution to statistics and her visualisation of data using polar area diagrams. Born 200 years ago this year, the details of her work are less well known. Nightingale's understanding of data and statistics contributed greatly to reducing the mortality rate in the British army and improving the health and sanitary conditions for the working classes in many parts of the UK and India. She was involved in discussions on the best way to employ data to measure nursing efficiency, and provided advice to life insurance societies on sample sizes. Citing quotations from her written reports, pamphlets and correspondence, this paper demonstrates the extent of her knowledge on the correct usage, management and storage of data, highlighting many issues that are still applicable today. It also provides examples of the calculations that she corrected, displaying the extent of her general frustration with Victorian officials' misuse of numbers.

https://ww2.amstat.org/meetings/jsm/2020/onlineprogram/AbstractDetails.cfm?abstractid=312933

Florence Nightingale at the JSM (2)

Abstract Details

Activity Number:	552 - Florence Nightingale 200th Anniversary
Type:	Topic Contributed
Date/Time:	Thursday, August 6, 2020 : 1:00 PM to 2:50 PM
Sponsor:	Committee on Women in Statistics
Abstract #314402	
Title:	Celebrating Florence Nightingale's Bicentenary
Author(s):	Wendy Martinez* and Stephanie C Hicks* and Emily Dodwell* and Monica Jackson* and Ji-Hyun Lee*
Companies:	American University and Bureau of Labor Statistics and Data Science & AI Research, AT&T Labs and Johns Hopkins Bloomberg School of Public Health and University of Florida Health Cancer Center
Keywords:	
Abstract:	This panel celebrates Florence Nightingale's bicentenary. Florence Nightingale was a passionate advocate for using statistics to improve public health and a champion for women in the workforce. She understood the need for data visualizations and statistics to ensure the public good. The panelists will share their stories and discuss the challenges and opportunities for continuing to honor her legacy.

https://ww2.amstat.org/meetings/jsm/2020/onlineprogram/AbstractDetails.cfm?abstractid=314402

Florence Nightingale: Her Voice

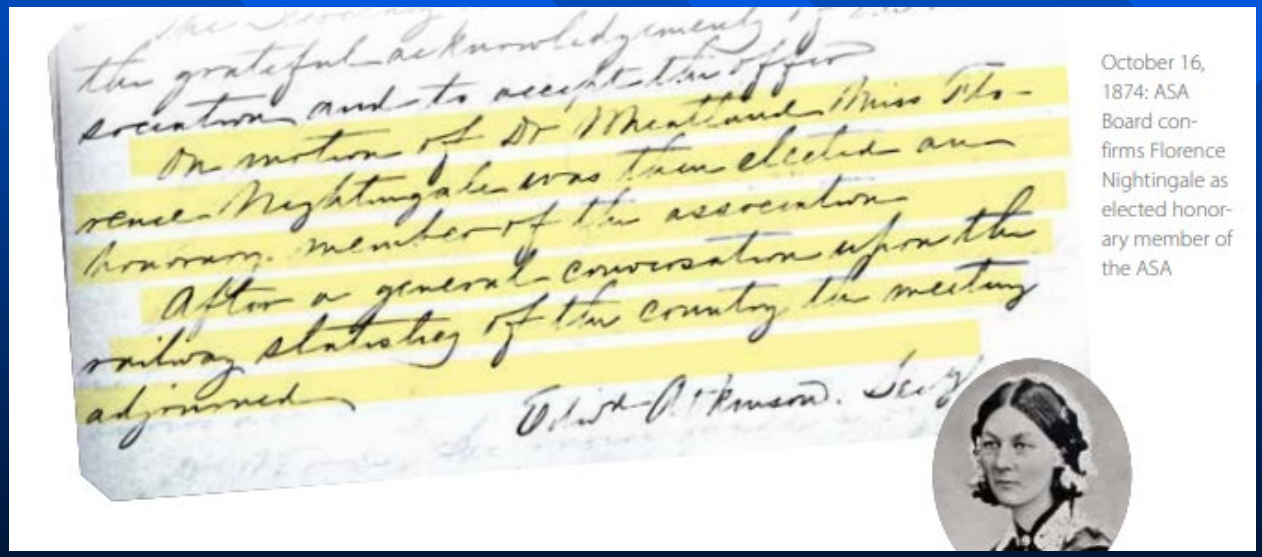
"When I am no longer even a memory, just a name, I hope my voice may perpetuate the great work of my life. God bless my dear old comrades of Balaclava and bring them safe to shore."

Florence Nightingale (July 30, 1890)

https://www.youtube.com/watch?v=ax3B4gRQNU4

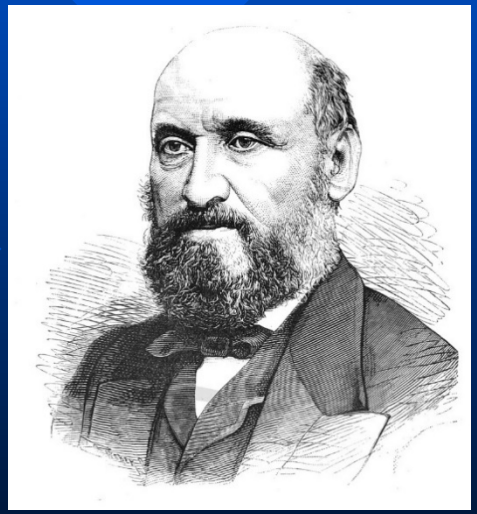
Florence Nightingale: Lifetime Highlights

- Florence was the first female member of the Royal Statistical Society
- She was made an honorary member of the American Statistical Association
- Florence had a friendship with Ada Lovelace (1815 – 1852):
  - History of computer science
  - Considered first computer programmer
- Florence was labeled as the "Passionate Statistician" and more

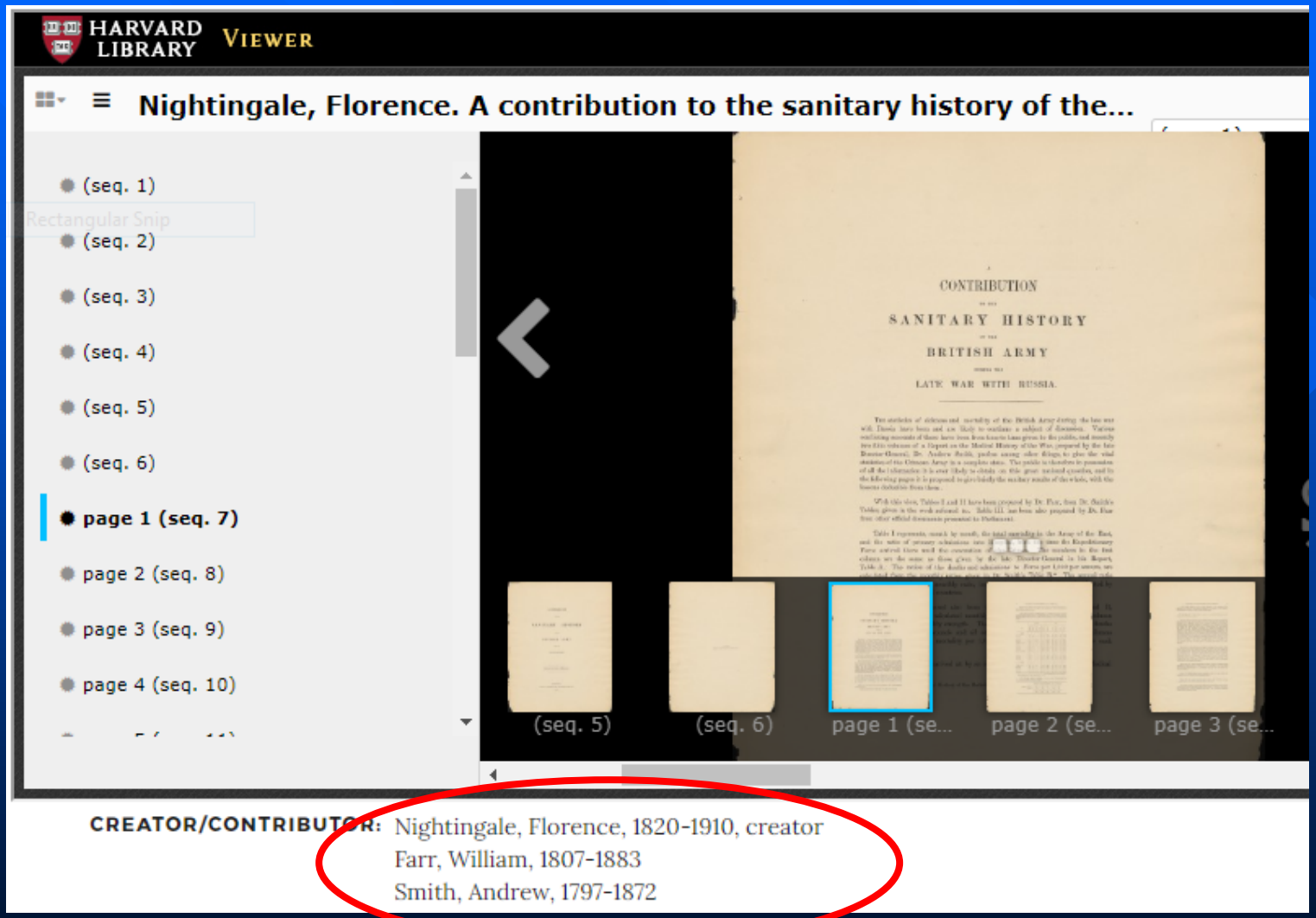


Florence Nightingale: And William Farr (1)

- Florence Nightingale worked with William Farr (1807 to 1883) from whom she learned much about statistics
- William Farr was a statistician and epidemiologist who worked at the British statistical services unit – called the General Register Office
- William Farr was a contributor to the document "A contribution to the sanitary history of the British army during the late war with Russia"
- Florence returned from the Crimean war front in 1856
- At that time, she influenced the creation of a Royal Commission on the Health of the Army
- William Farr was one of the Commissioners



Florence Nightingale: And William Farr (2)

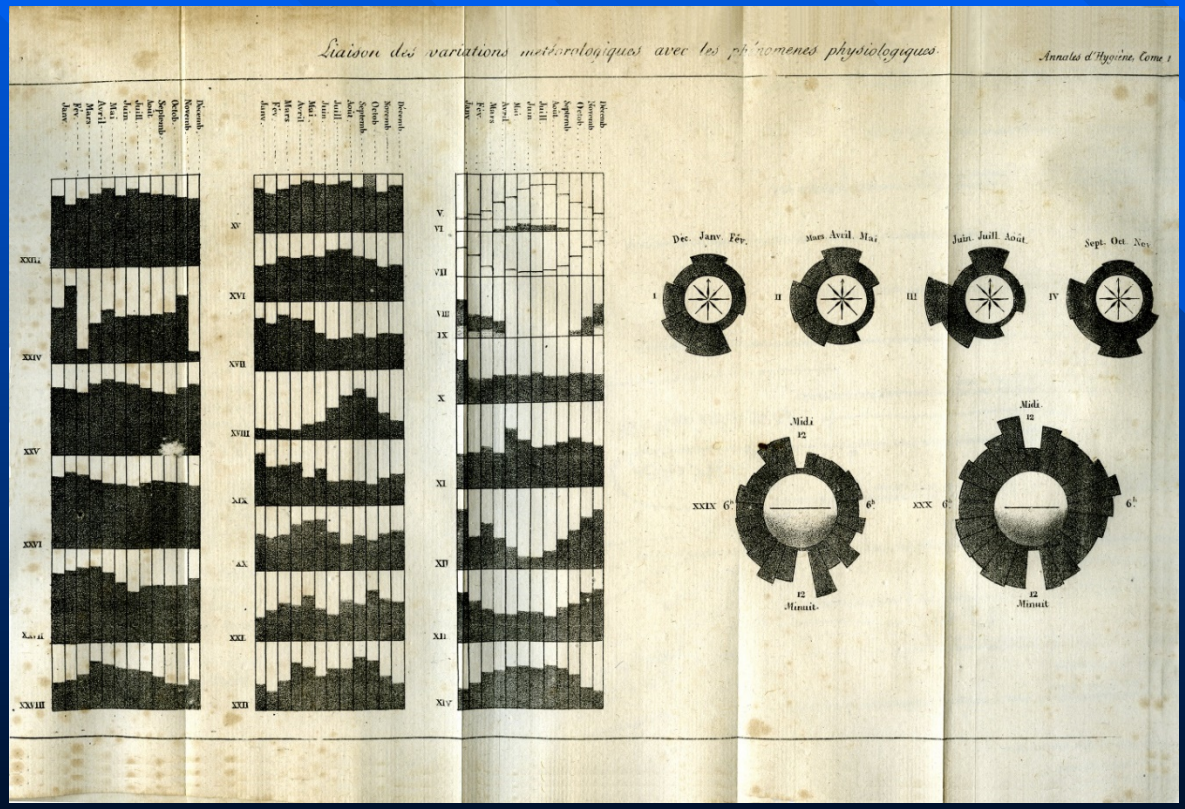


Florence Nightingale: And William Farr (3)

CREATOR/CONTRIBUTOR:	Nightingale, Florence, 1820-1910, creator Farr, William, 1807-1883 Smith, Andrew, 1797-1872 John W. Parker and Son, publishers. Harrison and Sons (Printers), publishers.
CREATION DATE:	1859
PLACE OF ORIGIN:	England London
PUBLISHER:	John W. Parker and Son
EXTENT:	16 pages, [3] leaves of plates : illustrations (some color) ; 43 cm.
LANGUAGE:	English
GENRE:	bibliography text Statistics

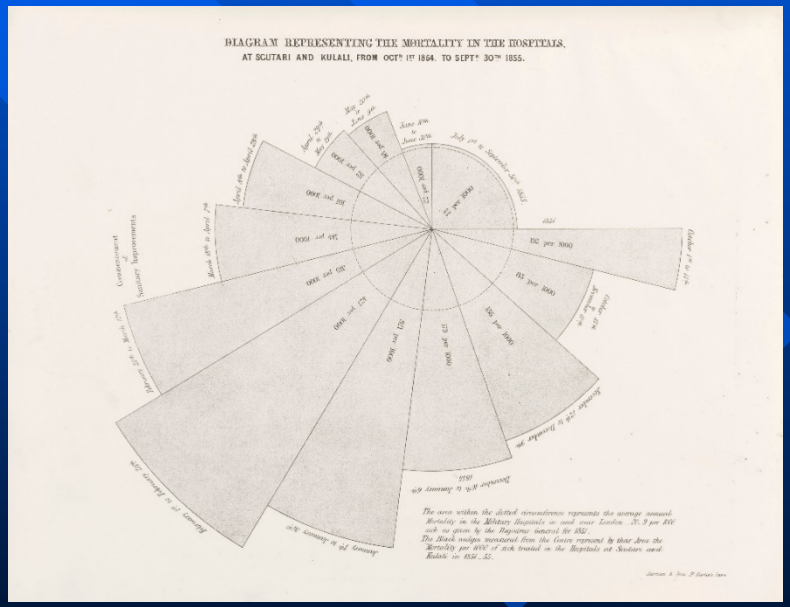
Florence Nightingale: Rose Diagram

- Precursor was polar diagrams by André-Michel Guerry (1802-1866)
- Published in 1829 (source: http://euclid.psych.yorku.ca/SCS/Gallery/milestone/sec5.html)



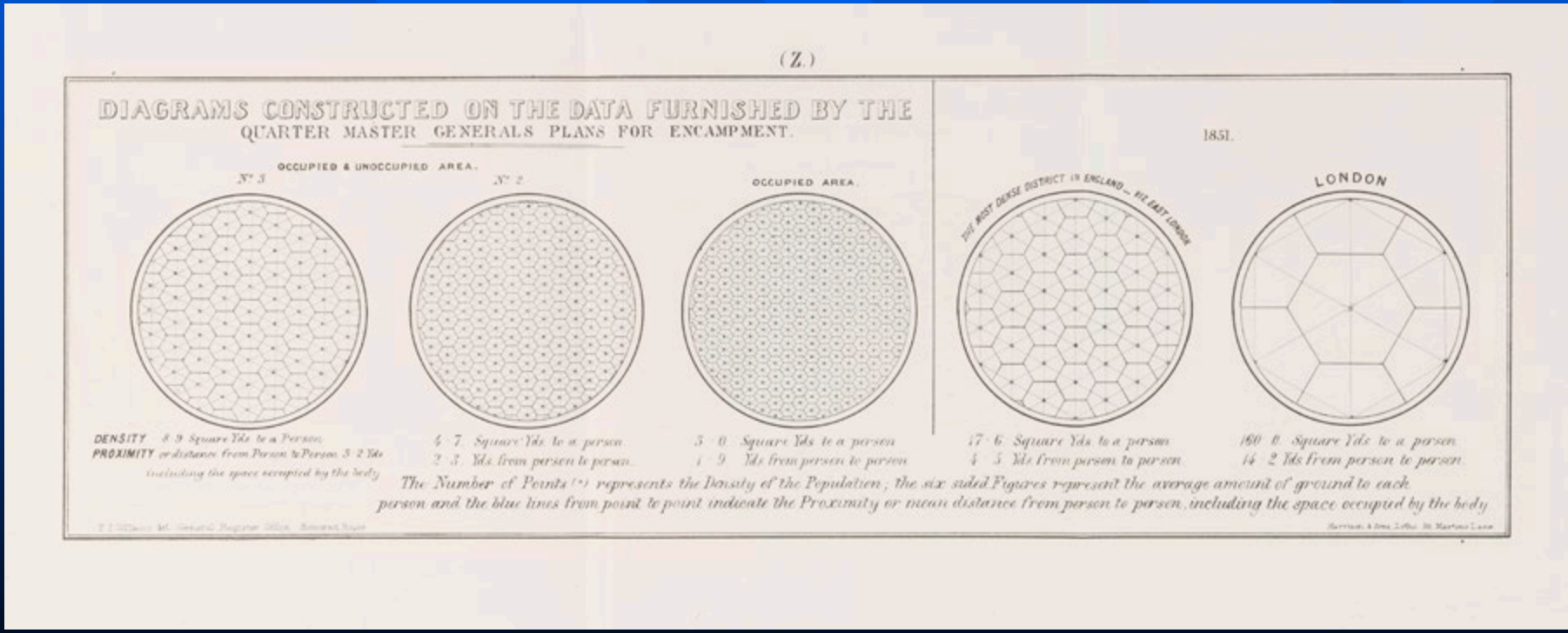
Florence Nightingale: Rose Diagram

- Florence Nightingale made many visualizations, but she is best known for the rose diagram
- These can be described as polar area charts with areas proportional to the variable of interest
- She used the term “coxcomb” to refer to the group of visuals

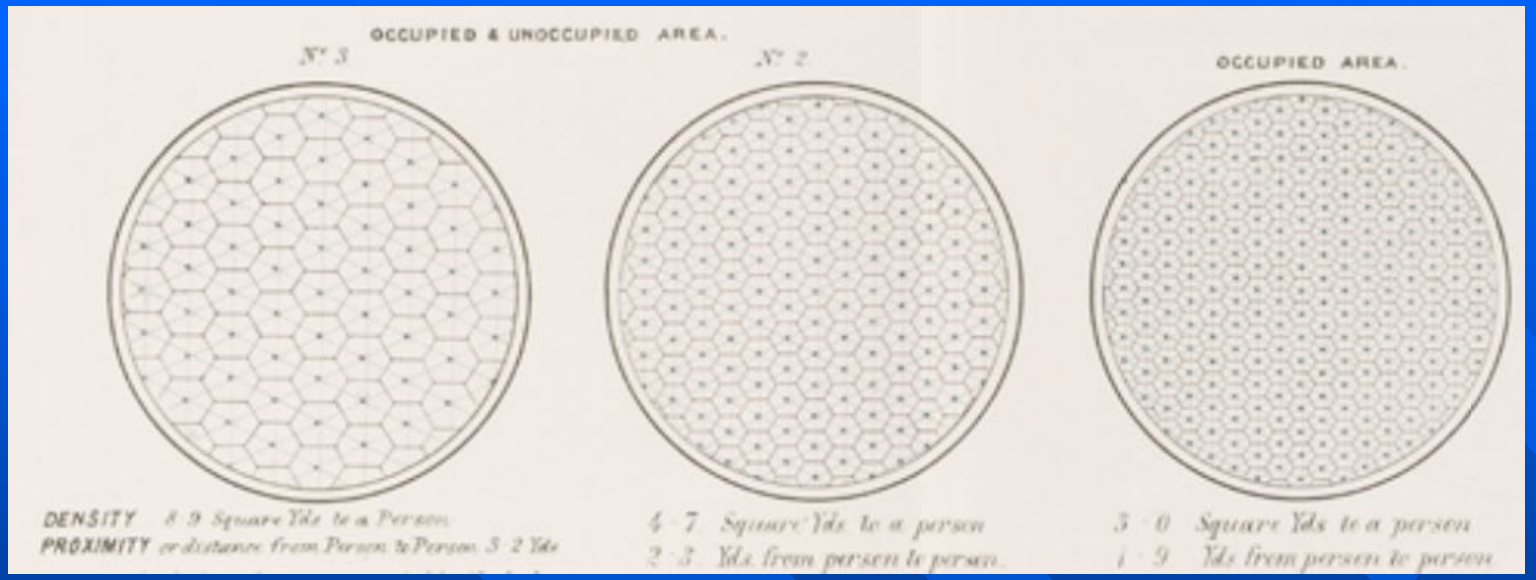


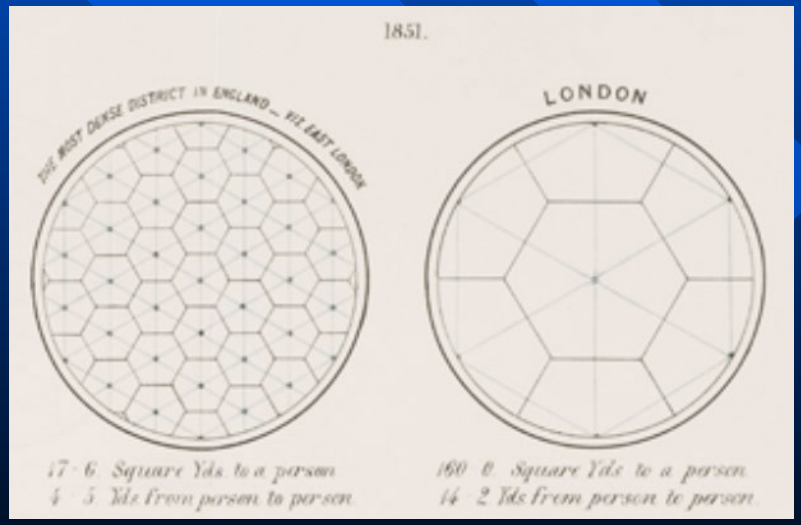
Florence Nightingale: Other Diagrams (1)

- Compares encampment plans (left three circles) with density of inner city London (fourth circle) and London as a whole (fifth circle)
- The inner city of London was known to be unhealthy for inhabitants
- What would that mean for soldiers to be so close?



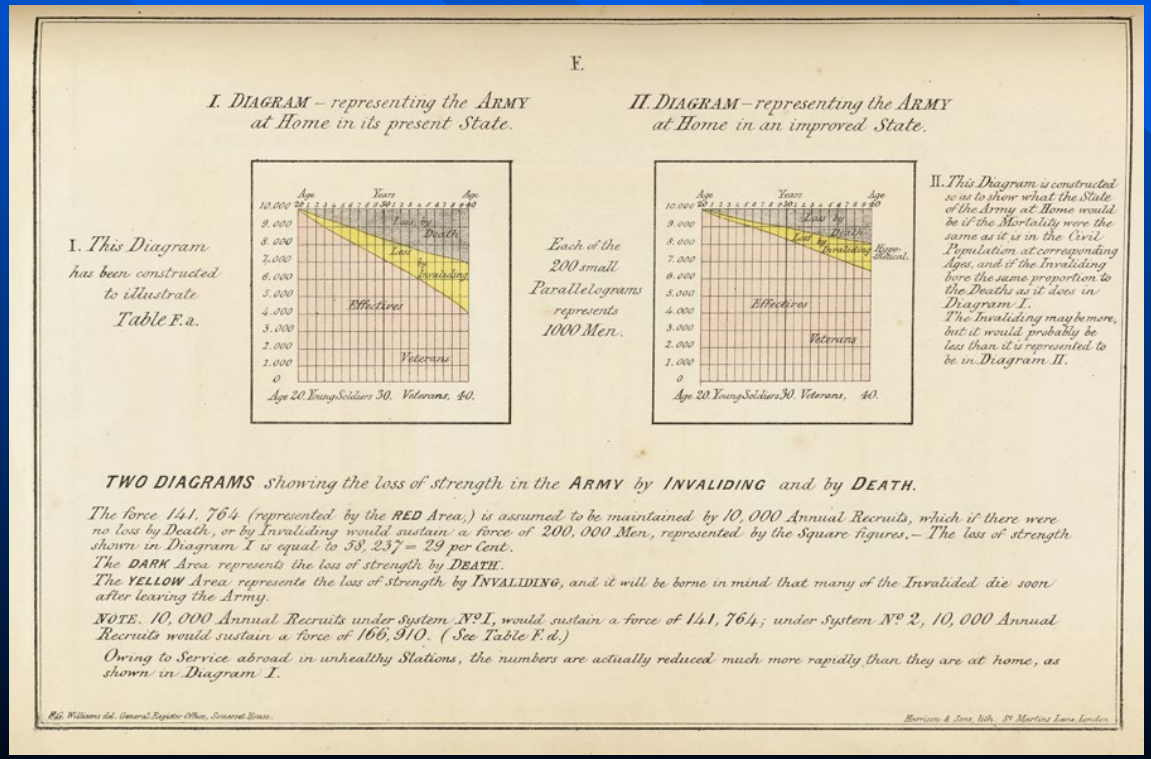
Florence Nightingale: Other Diagrams (2)





Florence Nightingale: Other Diagrams (3)

- Diagrams show the "loss of strength in the Army by **Invaliding** and by **Death**"
- The left shows the information on the Army in its current state
- The right shows the information on the Army in an improved state



F.

I. DIAGRAM – representing the ARMY at Home in its present State.

II. DIAGRAM – representing the ARMY at Home in an improved State.

I. *This Diagram has been constructed to illustrate Table F.a.*

Each of the 200 small Parallelograms represents 1000 Men.

II. *This Diagram is constructed so as to show what the State of the Army at Home would be if the Mortality were the same as it is in the Civil Population at corresponding Ages, and if the Invaliding bore the same proportion to the Deaths as it does in Diagram I. The Invaliding may be more, but it would probably be less than it is represented to be in Diagram II.*

TWO DIAGRAMS *showing the loss of strength in the* **ARMY** *by* **INVALIDING** *and by* **DEATH.**

The force 141, 764 (represented by the **RED** *Area,) is assumed to be maintained by 10, 000 Annual Recruits, which if there were no loss by Death, or by Invaliding would sustain a force of 200, 000 Men, represented by the Square figures. – The loss of strength shown in Diagram I is equal to 58, 237 = 29 per Cent.*

The **DARK** *Area represents the loss of strength by* **DEATH.**

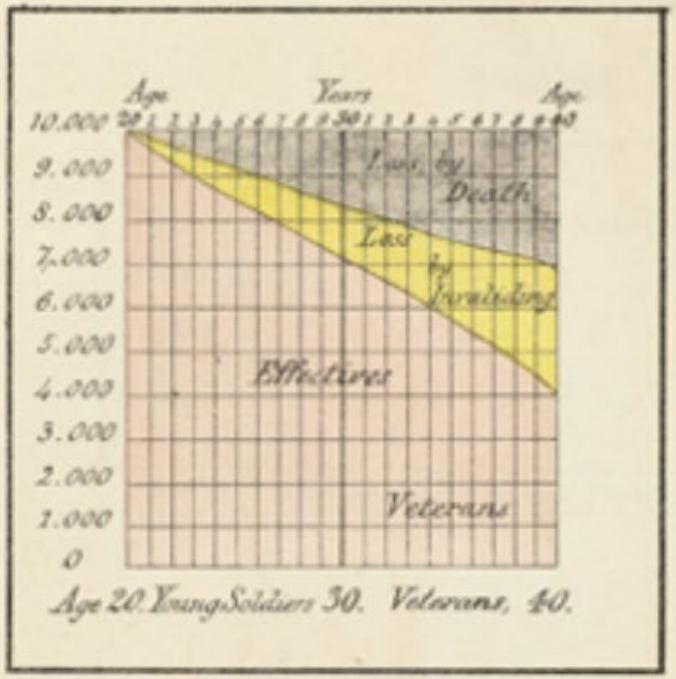
The **YELLOW** *Area represents the loss of strength by* **INVALIDING**, *and it will be borne in mind that many of the Invalided die soon after leaving the Army.*

NOTE. 10, 000 Annual Recruits under System Nº I, would sustain a force of 141, 764; under System Nº 2, 10, 000 Annual Recruits would sustain a force of 166, 910. (See Table F.d.)

Owing to Service abroad in unhealthy Stations, the numbers are actually reduced much more rapidly than they are at home, as shown in Diagram I.

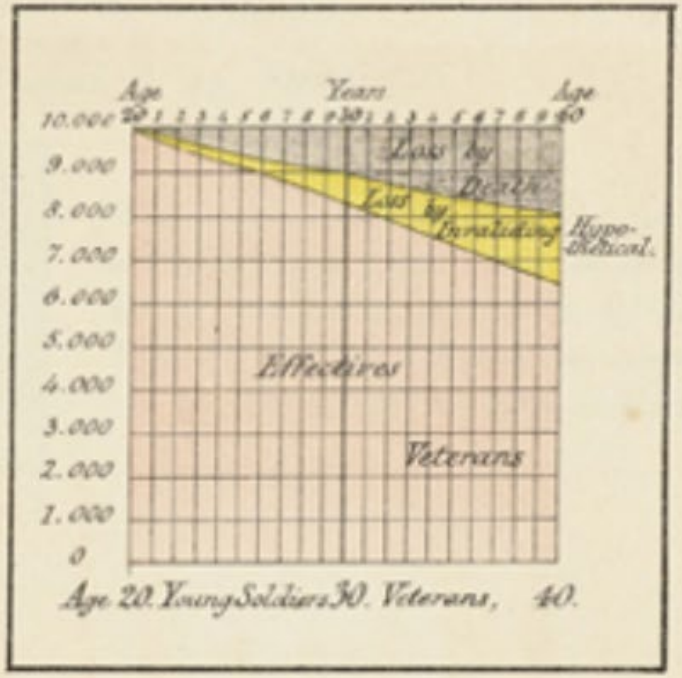
Florence Nightingale: Other Diagrams (4)

I. DIAGRAM – representing the ARMY at Home in its present State.

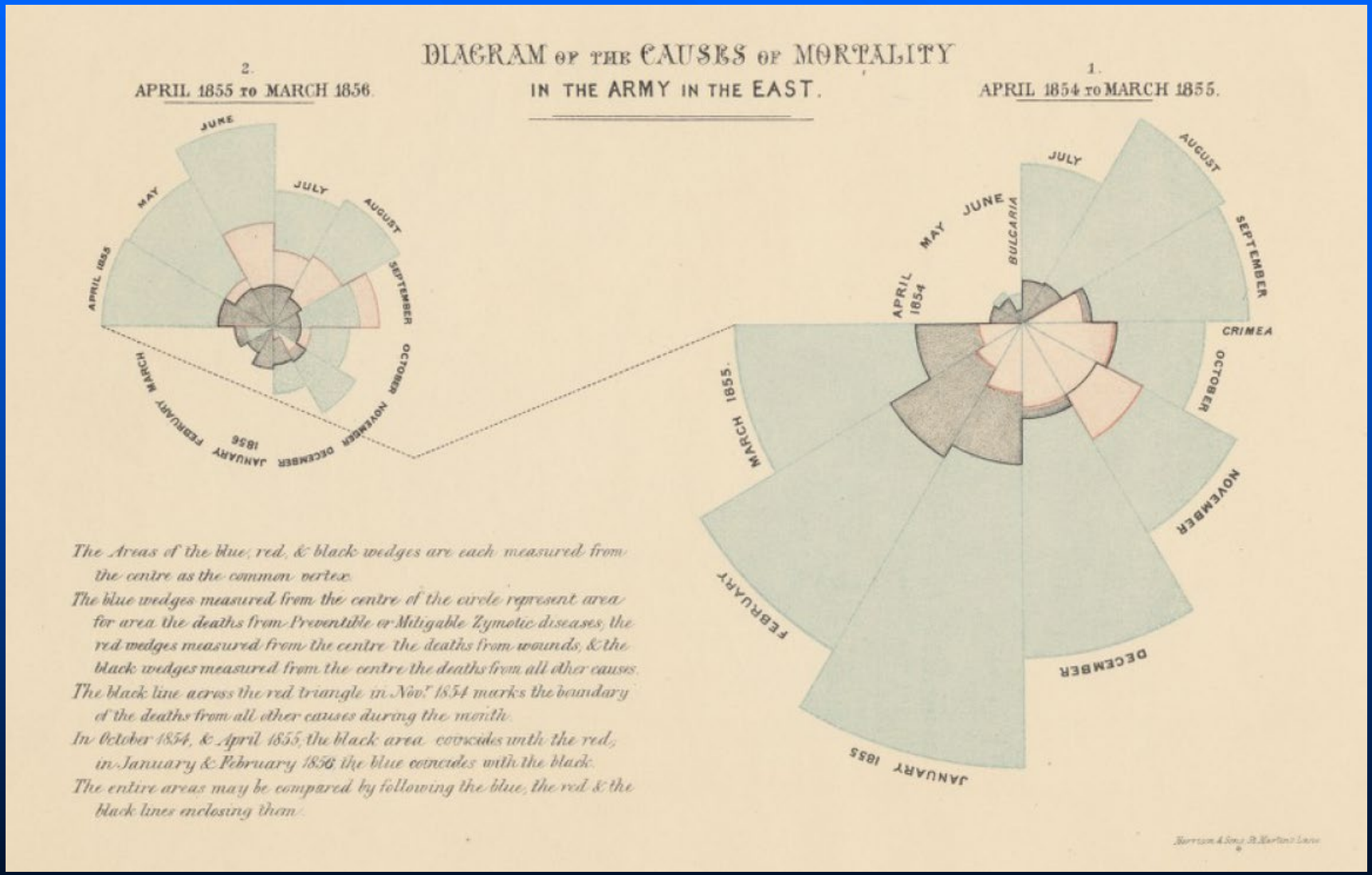


Each of the 200 small Parallelograms represents 1000 Men.

II. DIAGRAM – representing the ARMY at Home in an improved State.

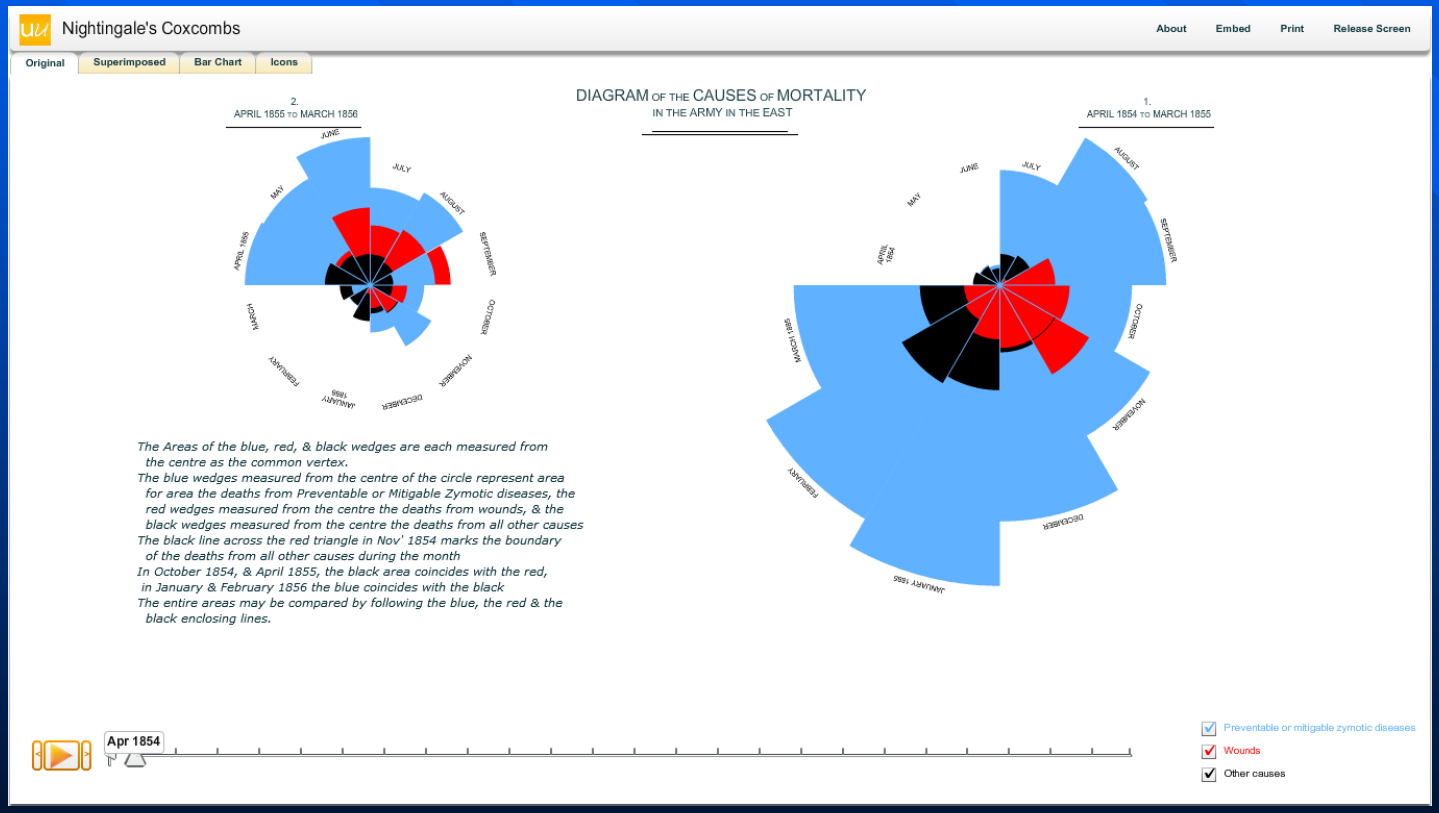


Florence Nightingale: Best-Known Diagram



Florence Nightingale: Animated Diagram

- Here is an animated version with alternative visualizations
- https://understandinguncertainty.org/coxcombs



Florence Nightingale: Infographic Artist

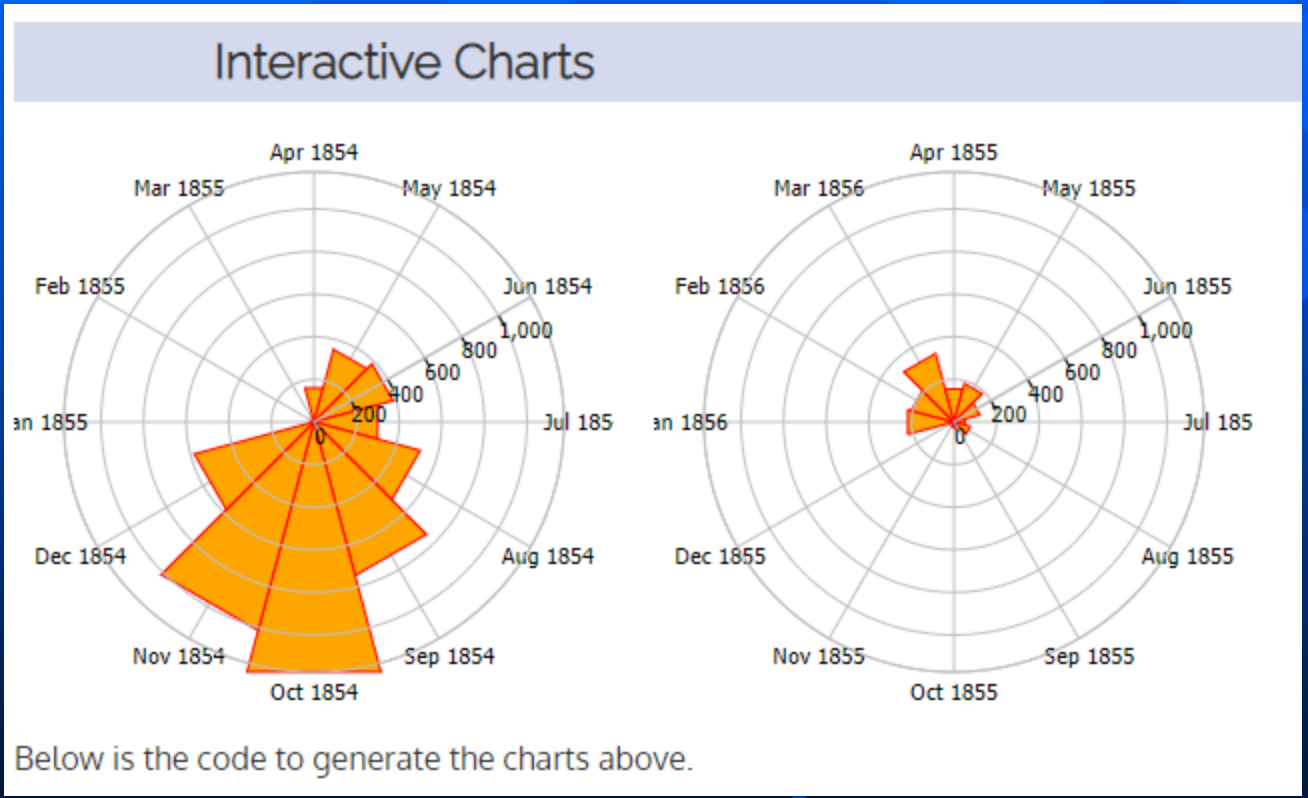
https://history.infowetrust.com/

Florence Nightingale: R Data

- The data can be found in the HistData R Package: **Nightingale**
- https://www.rdocumentation.org/packages/HistData/versions/0.8-6/topics/Nightingale

Florence Nightingale: R Version of Rose

- Interactive d3js version using R
- http://timelyportfolio.github.io/rCharts_micropolar/nightingale/index.html



Florence Nightingale: Controversies (1)

Angel of mercy or power-crazed

theguardian.com/uk/2007/sep/03/health.healthandwellbeing

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Angel of mercy or power-crazed meddler? Unseen letters challenge view of pioneer nurse

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- **Wellcome Trust obtains papers charting rivalry**

Maev Kennedy
Mon 3 Sep 2007 18.56 EDT

8

"Miss Nightingale shows an ambitious struggling after power inimical to the true interests of the medical department," Sir John Hall, the chief British army medical officer in the Crimea, wrote to his superior in London.

When she went over his head to order supplies from his stores, observers, Sir John wrote, were astounded at the "petticoat imperium! in the medical imperio!"

Florence Nightingale: Controversies (2)

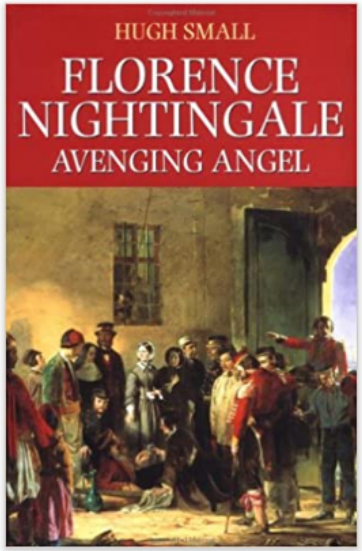
amazon.com/Florence-Nightingale-Avenging-Hugh-Small/dp/0312226993

Books › Biographies & Memoirs › Historical

Florence Nightingale: Avenging Angel Reprint Edition

by Hugh Small (Author)

7 ratings



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This study of the personality and achievements of Florence Nightingale is based on extensive research and unpublished material. She achieved fame for her leadership of a group of British nurses during the Crimean War, and afterwards she dedicated herself to promoting public health. Following a collapse at age 37, she remained bedridden for more than ten years and became one of history's most famous invalids. Hugh Small has produced a new and startling explanation of Florence Nightingale's actions, comparing the conflicting contemporary accounts of what really happened in her hospital at Scutari during the war and uncovering an official cover-up of a public health disaster for which Nightingale felt personally responsible.

› Read less

Florence Nightingale: Controversies (3)

The real goods and the oversell

To many, Florence Nightingale is a hero. But like all heroes, elements of her story have been exaggerated. **Lynn McDonald**, editor of Nightingale's collected works, sorts fact from fiction

She helped save lives, if not in the way often supposed

Making results accessible – and persuasive – was always part of her mission. She failed in many of her particular endeavours, not because her ideas were poor, but because she was too far ahead of her time. What she did accomplish was formidable.

References: Selected Work by Florence Nightingale

- Nightingale, F. (1858). Mortality of the British Army: At Home and Abroad, and During the Russian War, as Compared with the Mortality of the Civil Population in England. London: Harrison and Sons, https://archive.org/details/mortalityofbriti00lond
- Nightingale, F. (1858). Notes on Matters Affecting the Health, Efficiency, and Hospital Administration of the British Army. London: Harrison and Sons, https://archive.org/details/b20387118
- Nightingale, F. (1859). A Contribution to the Sanitary History of the British Army During the Late War with Russia. London: John W. Parker and Son, https://curiosity.lib.harvard.edu/contagion/catalog/36-9901016467502039 41
- Nightingale, F. (1863). Army Sanitary Administration and its Reform under the Late Lord Herbert. London: McCorquodale, https://wellcomelibrary.org/item/b18627791
- Nightingale, F. (1863). Sanitary Statistics of Native Colonial Schools and Hospitals. London, https://archive.org/details/sanitarystatisti00byunigh
- Nightingale, F. (1871). Introductory Notes on Lying-in Institutions. London: Longmans, Green, and Co, https://archive.org/details/introductorynot00nighgoog

References: Florence Nightingale

- **Good explanations and examples of the rose and other diagrams:**
- Going Beyond Florence Nightingale's Data Diagram: Did Flo Blow It with Wedges?, https://www.r-bloggers.com/going-beyond-florence-nightingales-data-diagram-did-flo-blow-it-with-wedges/
- Nightingale's 'Coxcombs', https://understandinguncertainty.org/coxcombs
- Florence Nightingale: 200 Years Since Her Birth and We Are Still Making the Same Errors With Data, https://ima.org.uk/13854/florence-nightingale-200-years-since-her-birth-and-we-are-still-making-the-same-errors-with-data/
- Florence Nightingale is a Design Hero, https://medium.com/nightingale/florence-nightingale-is-a-design-hero-8bf6e5f2147
- Florence Nightingale: Data Visualization Pioneer, https://about.dataclassroom.com/blog/florence-nightingale
- How Nightingale's Diagram Helped to Save Millions of Lives, http://www.florence-nightingale-avenging-angel.co.uk/?p=462

References: Florence Nightingale

- **Her Life:**
- Florence Nightingale, http://www.hants.gov.uk/rh/archives/florence.pdf
- Florence Nightingale: The Compassionate Statistician, https://plus.maths.org/content/florence-nightingale-compassionate-statistician
- A Statistical Campaign: Florence Nightingale and Harriet Martineau's *England and her Soldiers*, http://journal.sciencemuseum.ac.uk/browse/issue-05/a-statistical-campaign/

- **Infographics Artists:**
- The Surprising History of the Infographic, https://www.smithsonianmag.com/history/surprising-history-infographic-180959563/
- Florence Nightingale; the Mother of Infographics? (btw She was also a Nurse…)
- https://whatsthepont.blog/2013/01/27/florence-nightingale-the-mother-of-infographics-btw-she-was-also-a-nurse/
- Interacting With History: 300 Years of Information Graphic Milestones, https://history.infowetrust.com/
- Historic Maps Collection, Princeton University Library: Medicine, https://library.princeton.edu/visual_materials/maps/websites/thematic-maps/quantitative/medicine/medicine.html

References: Florence Nightingale

- **R Code and Data:**
- Florence Nightingale's Data On Deaths From Various Causes In The Crimean War, https://www.rdocumentation.org/packages/HistData/versions/0.8-6/topics/Nightingale
- R Dataset / Package HistData / Nightingale, https://www.picostat.com/dataset/r-dataset-package-histdata-nightingale
- micropolar Nightingale Coxcombs, http://timelyportfolio.github.io/rCharts_micropolar/nightingale/index.html
- Going Beyond Florence Nightingale's Data Diagram: Did Flo Blow It with Wedges?, https://www.r-bloggers.com/going-beyond-florence-nightingales-data-diagram-did-flo-blow-it-with-wedges/
- Crimean: Florence Nightingale's Data on Deaths from Various Causes in..., https://rdrr.io/github/jhmaindonald/DAAGviz/man/Crimean.html
- Florence Nightingale's Data on Deaths from Various Causes in the Crimean War, https://rpubs.com/chidungkt/371875
- Florence Nightingale, https://github.com/edwardgunning/FlorenceNightingale

Florence Nightingale: Modern-Day Web Sites

- Welcome to the Florence Nightingale Museum, https://www.florence-nightingale.co.uk/
- The Nightingale Society, http://nightingalesociety.com/
- The Florence Nightingale Digitization Project, http://archives.bu.edu/web/florence-nightingale
- Florence Nightingale, https://en.wikipedia.org/wiki/Florence_Nightingale

What would Snow, Nightingale, and Farr Do in 2020?

- What John Snow and Cholera Tell us About the COVID Pandemic, https://www.kevinmd.com/blog/2020/05/what-john-snow-and-cholera-tell-us-about-the-covid-pandemic.html
- The Duchess of Cambridge's Ancestor Would have Led the Fight Against COVID-19, https://www.pressreader.com/uk/the-daily-telegraph/20200328/282531545499394
- COVID-19: William Farr's Way out of the Pandemic, https://www.cebm.net/covid-19/covid-19-william-farrs-way-out-of-the-pandemic/
- COVID-19 – Florence Nightingale Diagram's of UK Deaths, https://www.cebm.net/covid-19/covid-19-florence-nightingales-daigrams-for-deaths/

Conclusions

- John Snow and Florence Nightingale did not receive full recognition during their lifetimes, but are highly respected these days (despite some controversial views)
- Neither is a Marvel-style superhero
- Both created hypotheses from data and extensively used maps and/or statistical graphs
- Both could be described as data scientists who worked with others and used various sources to come to their conclusions

Questions ???

or

e-mail: symanzik@math.usu.edu