Florence Nightingale and Statistics: What She Did and What She Did Not

Radical Statistics Group
by Lynn McDonald
28 February 2020

Florence Nightingale (1820-1910)

- Fame from the Crimean War 1854-56
- First woman Fellow of the Royal Statistical Society, 1858, from her Crimean War analysis, done with Dr William Farr, leading medial statistician, and her nominator
- Founder of the first nursing school in the world, and major founder of the modern nursing

What She Did Not

- Did not collect any statistics herself, not on the battlefield, or at any hospital
- (Too many data collectors!)
- Did not do the charts herself, but worked with Farr and staff, for a good result
- Did not know much mathematics – not sure what her lessons from Sylvester covered

What she did not

- Did not have the highest death rates of the Crimean War (despite claims of Hugh Small)
- Did not, by nursing, succeed in bringing down the high death rates, despite many claims to this effect
- Probably a combination of interventions, but especially the work of the Sanitary Commission did

Application of stats to the Army

- First task: make sure that the same high death rates did not recur
- Rigorous research, with expert collaborators, Farr and staff at General Register Office
- How much did Nightingale do, how much they?
- Her knowledge of mathematics? Not clear
- Lessons from J.J. Sylvester, only 6 weeks

Nightingale and mathematics

- She coached a cousin in algebra before his entry to Sandhurst (but had to be kept quiet as she was a FEMALE)
- She knew what a logarithm was – joked about them in a letter
- But she thanked Farr and assistants for their help; evidently they did tables (and graphs?) then passed on to Nightingale – her write up

$$A + \frac{F}{2} - \frac{L}{2} = C.$$

But, by putting D for cases discharged, it may be shown by similar reasoning that

$$D - \frac{F}{2} + \frac{L}{2} = C.$$

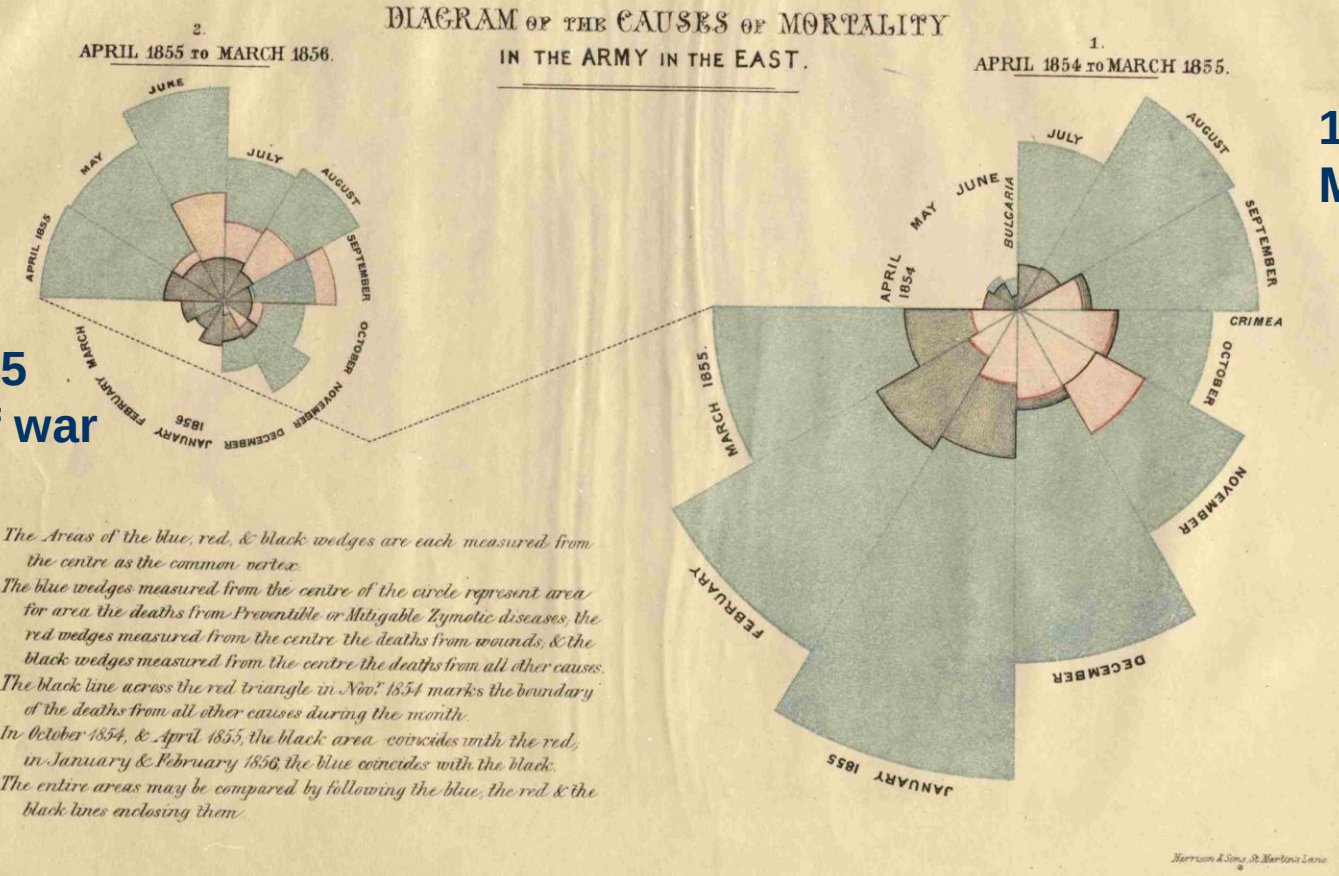
And, on adding these two equations together, we have

$$A + D = 2C \therefore C = \frac{A + D}{2}$$

Those charts

- Farr had done before, but those they produced together better, made the case, were persuasive
- Far better than anything put out in the official report by Dr Andrew Smith as director-general of the Army Medical Department
- They had a useful bar chart (what diseases), but it under-stated the key point of decreasing death rates

Causes of Mortality in the Army in the East, 1854-1856



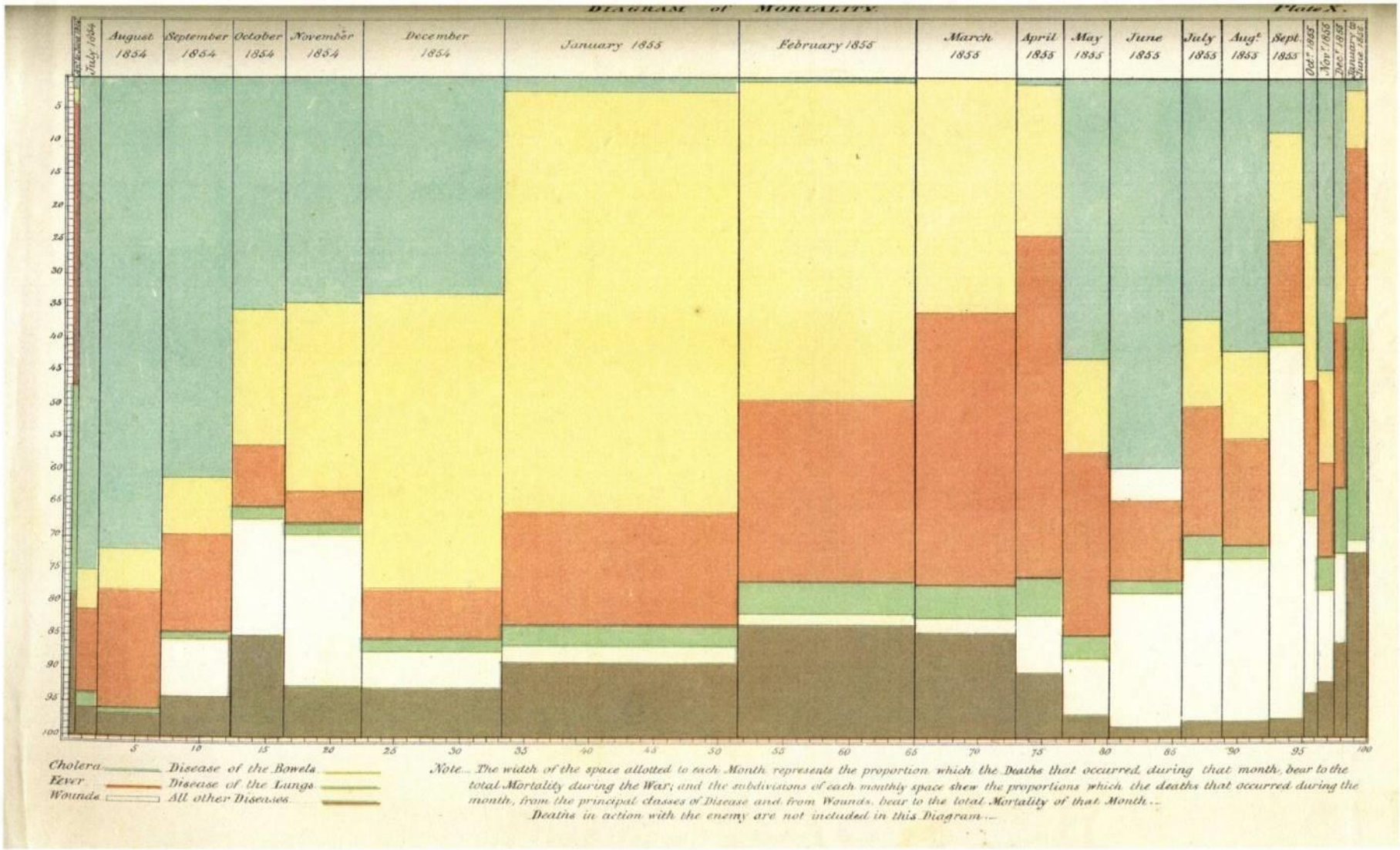
April 1855 to end of war

1854-March '55

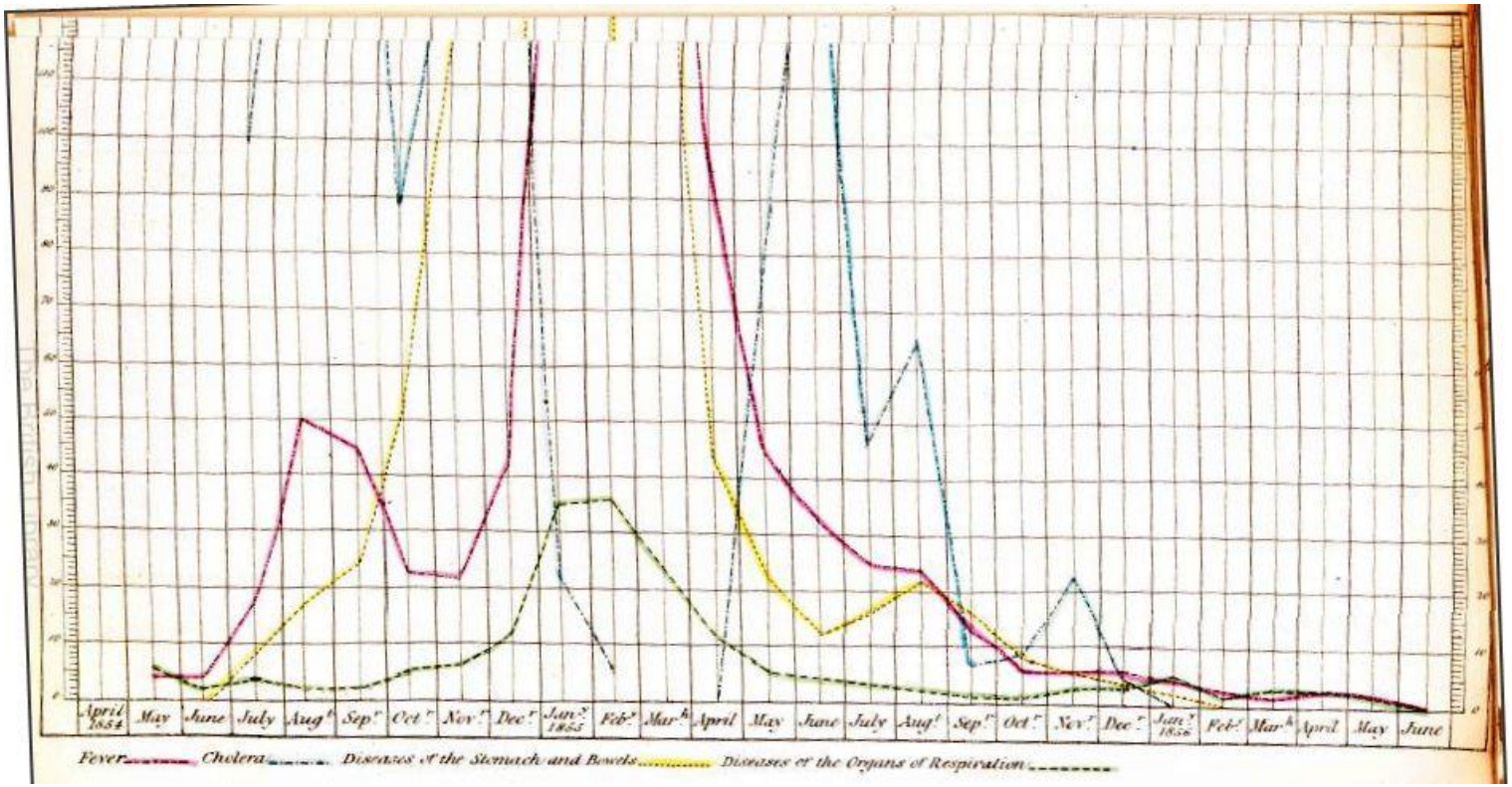
Nightingale and Farr's classic "polar area charts"; note break between the 2 charts on the arrival of the Sanitary Commission

Medical and Surgical History of the British Army, 1858

Turquoise = cholera; yellow = bowel diseases; red-brown = fever; green = lung disease; white = wounds; olive/brown = other.

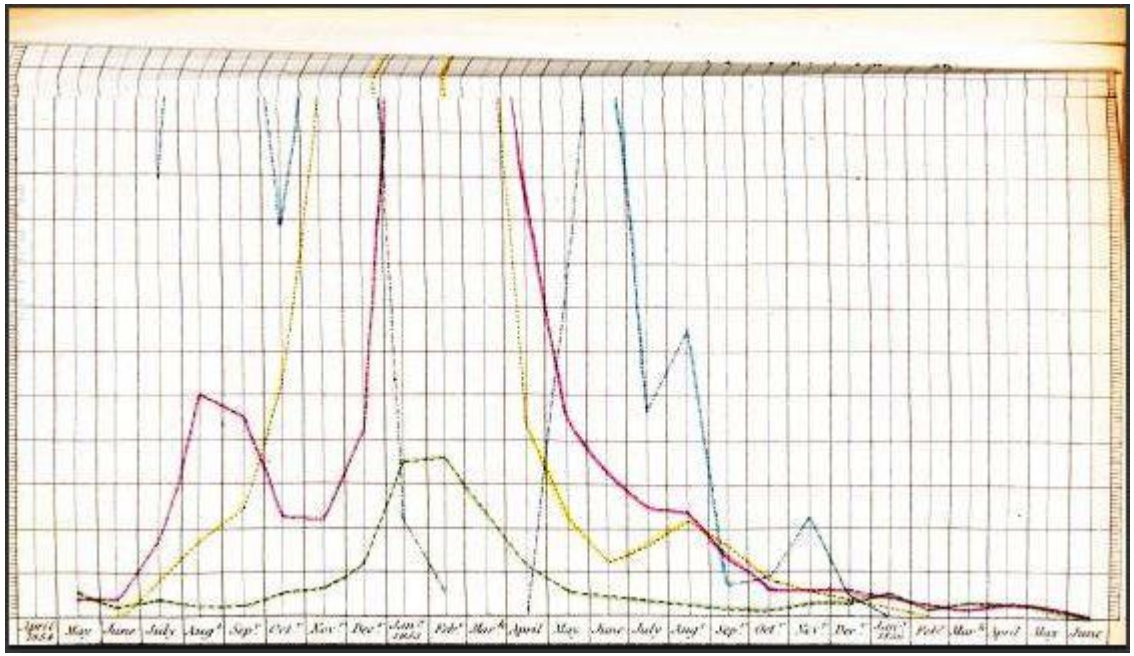


Medical and Surgical History 2:210



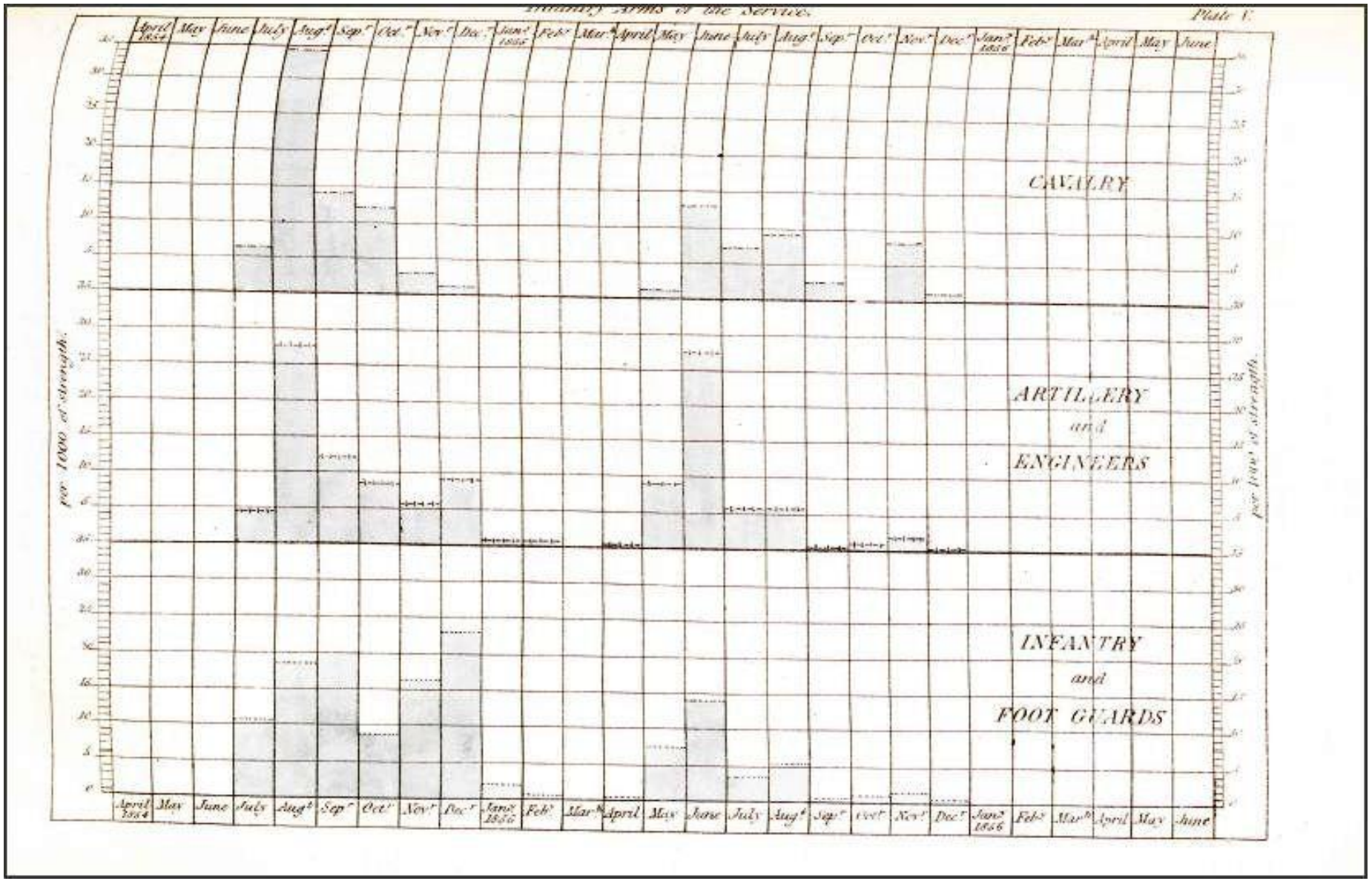
Mortality per 10,000 strength, for 3 major branches of the Army

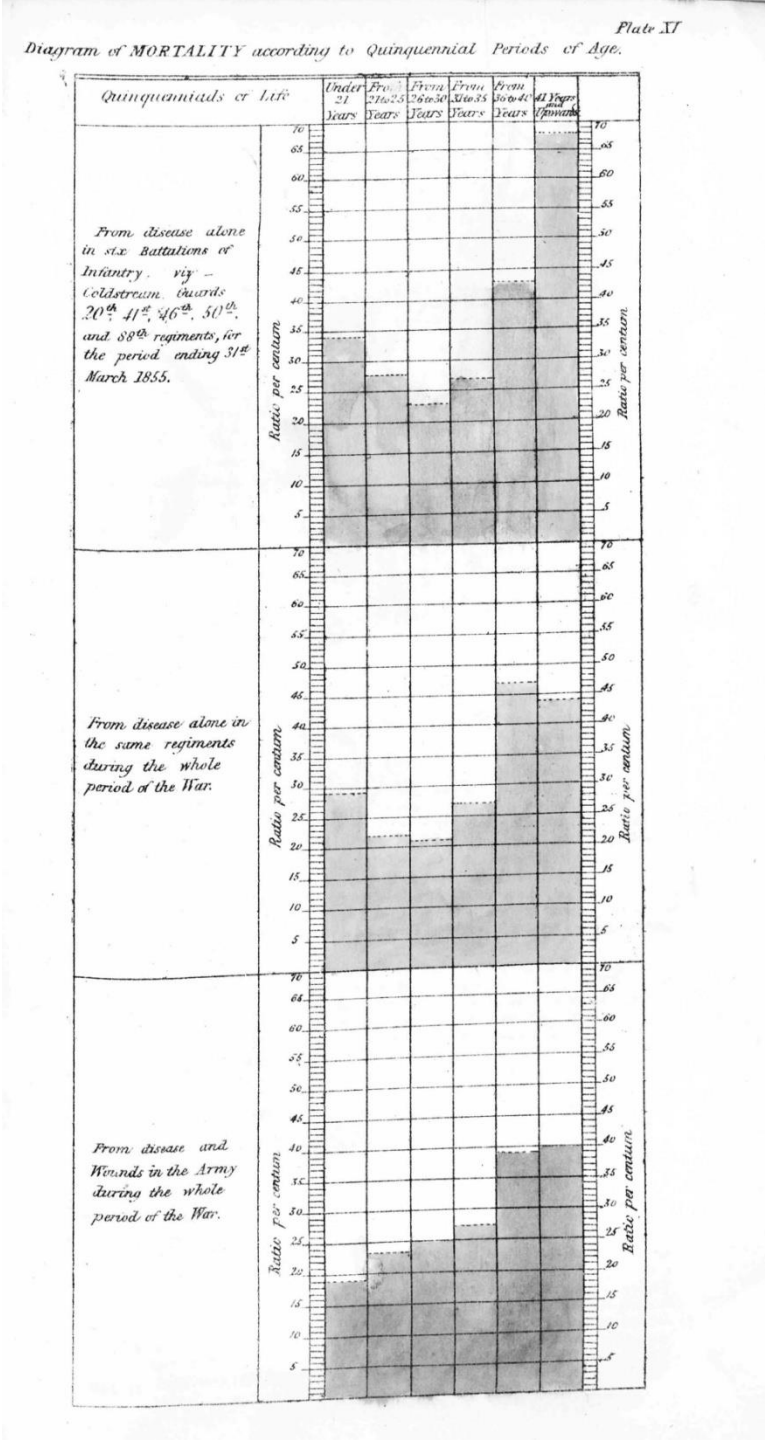
Plate II, 2:216, 3 major branches



Mortality per 10,000 strength from disease (wounds and injuries excluded

Mortality: Cavalry, Artillery & Engineers, Infantry & Foot Guards, per 10,000 streng





Mortality by age

Plate VI, 2:223
Mortality by
quinquennial periods of age

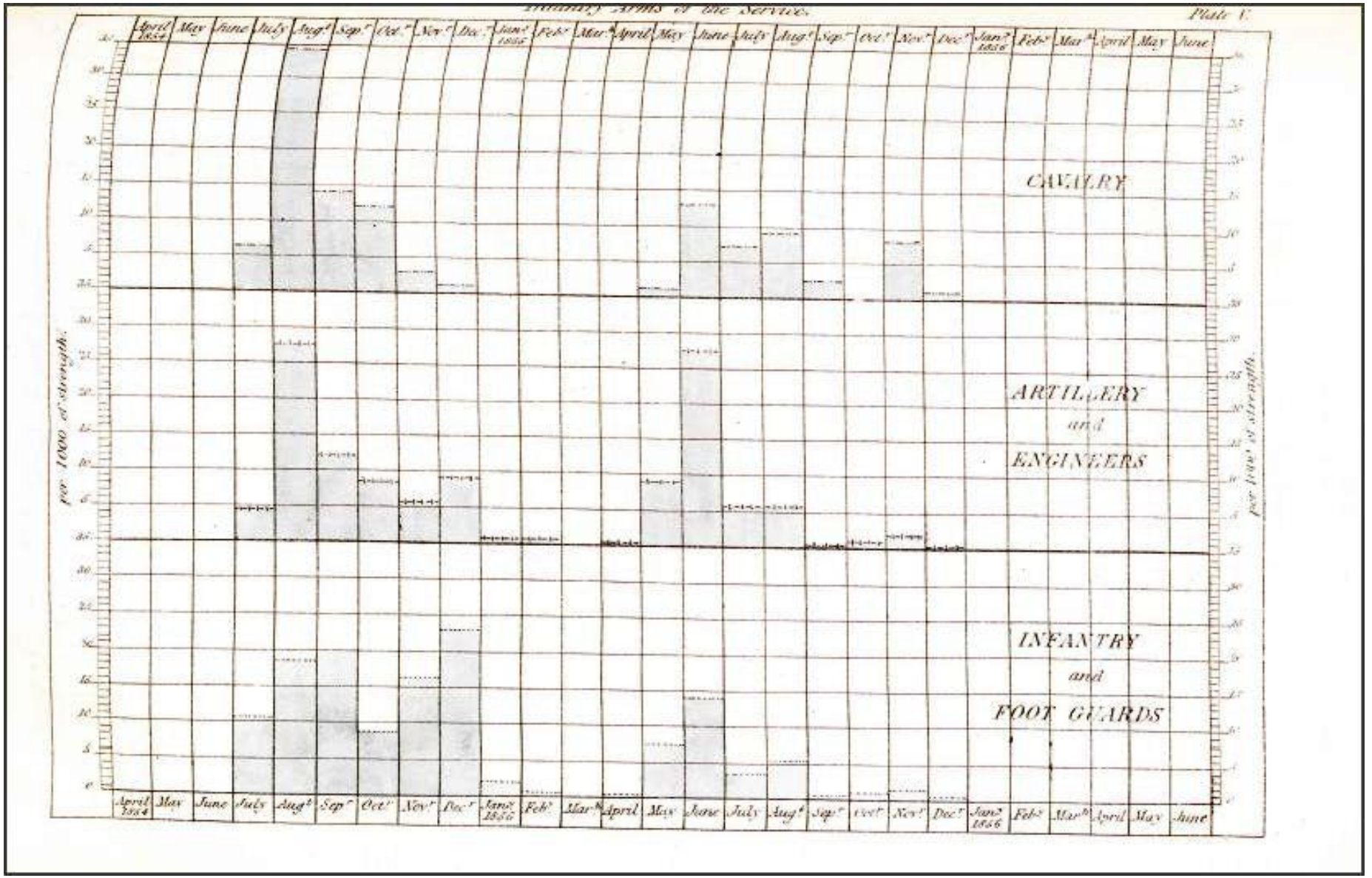
Top third: from disease alone
In cavalry, to 31 March 1855

Middle third: from disease
Alone in same regiments
For whole of war

Bottom third: from disease
And wounds for whole of war

Columns from left: under 21
22-25, 26-30, 31-35,36-40,
41 and over

Mortality: Cavalry, Artillery & Engineers, Infantry & Foot Guards, per 10,000 strength



Meteorological tables

- Barometer
- Thermometer
- Mean temperature (open air, sheltered) taken at 5 different times daily
- Degree of humidity
- Average aspect of the sky
- By John Hall, Inspector General of Hospitals

Official report

- Also had graphs of barometric pressure and temperature
- Nightingale always keen to downplay climate (you can't do anything about that)
- To emphasize sanitary conditions (which you can reform)
- Official report did not note role of Sanitary or Supply Commission, Nightingale's chart did

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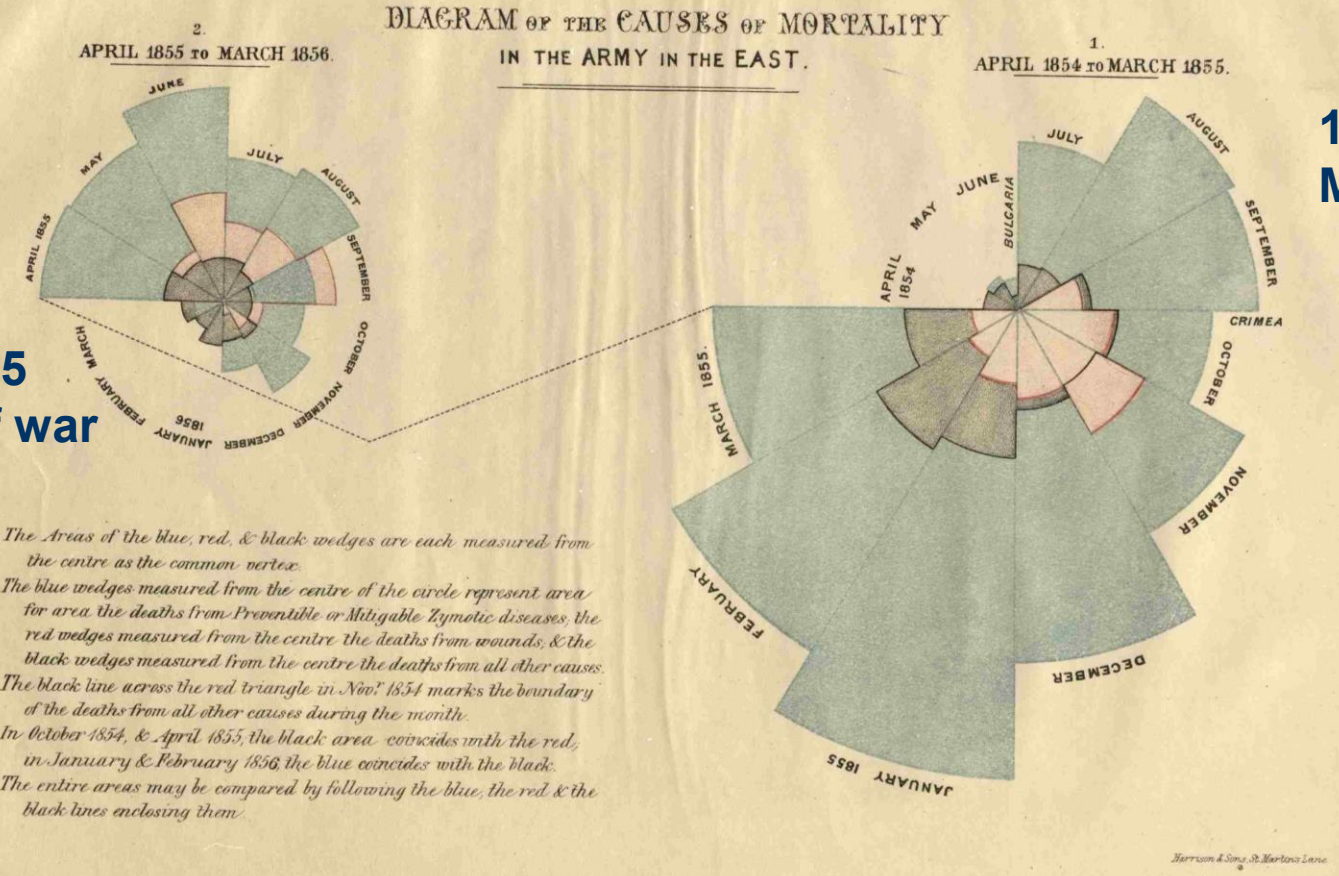

April 1855 to end of war

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Nightingale and Farr's classic "polar area charts"; note break between the 2 charts on the arrival of the Sanitary Commission

The charts

- So did the two accompanying charts, black and white
- Comparing Crimean War death rates with rates of Manchester of comparable ages
- And of deaths in peacetime British Army hospitals in London
- ALL emphasize the declines, after sanitary reforms

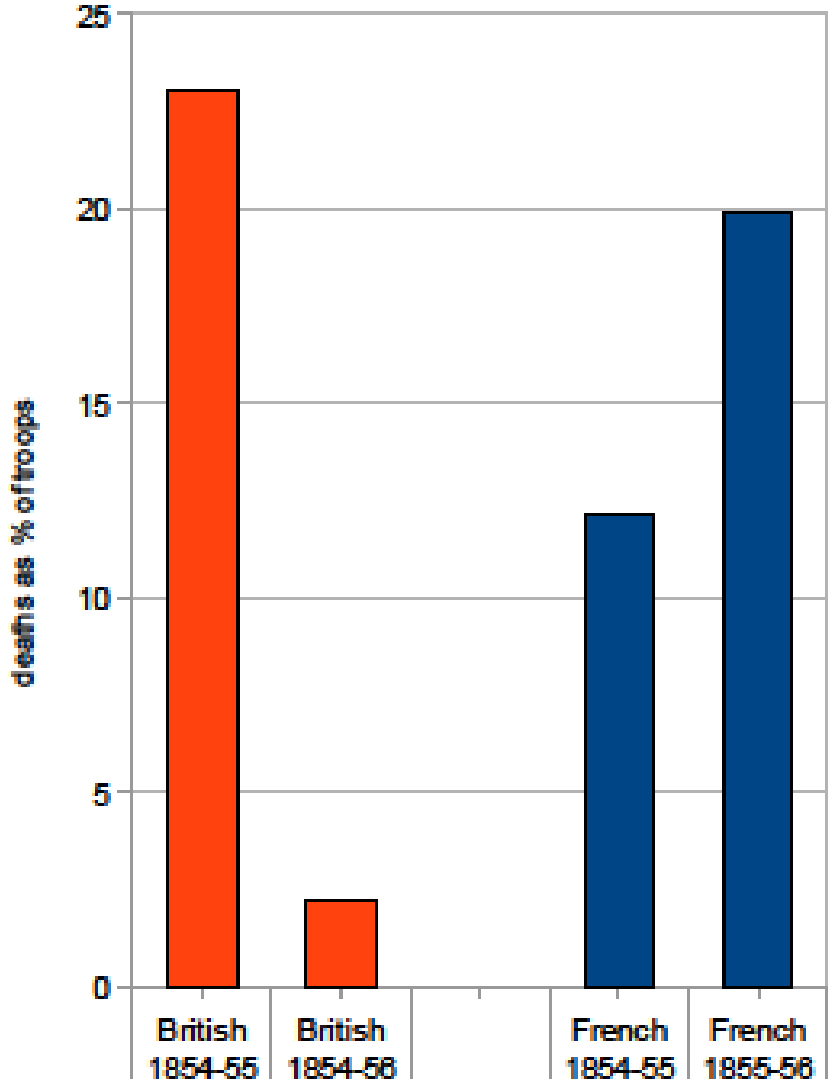
Lessons from French comparisons

- French Army better prepared for the war – France the instigator – sent better transport equipment, sent nurses (nuns)
- Their death rates lower in the first year of the war, then rose in the second year, although no fighting
- Bit this not documented until 1865, long after Nightingale's and other reports, 1858

British – French Army comparisons

- That the French did badly in the second year was known informally, and commented on
- But only the French did the actual comparisons, in a report of 1870 (official report 1865)
- Comments by French doctors complimentary to the British, especially of Nightingale

British and French Army death rates by winter



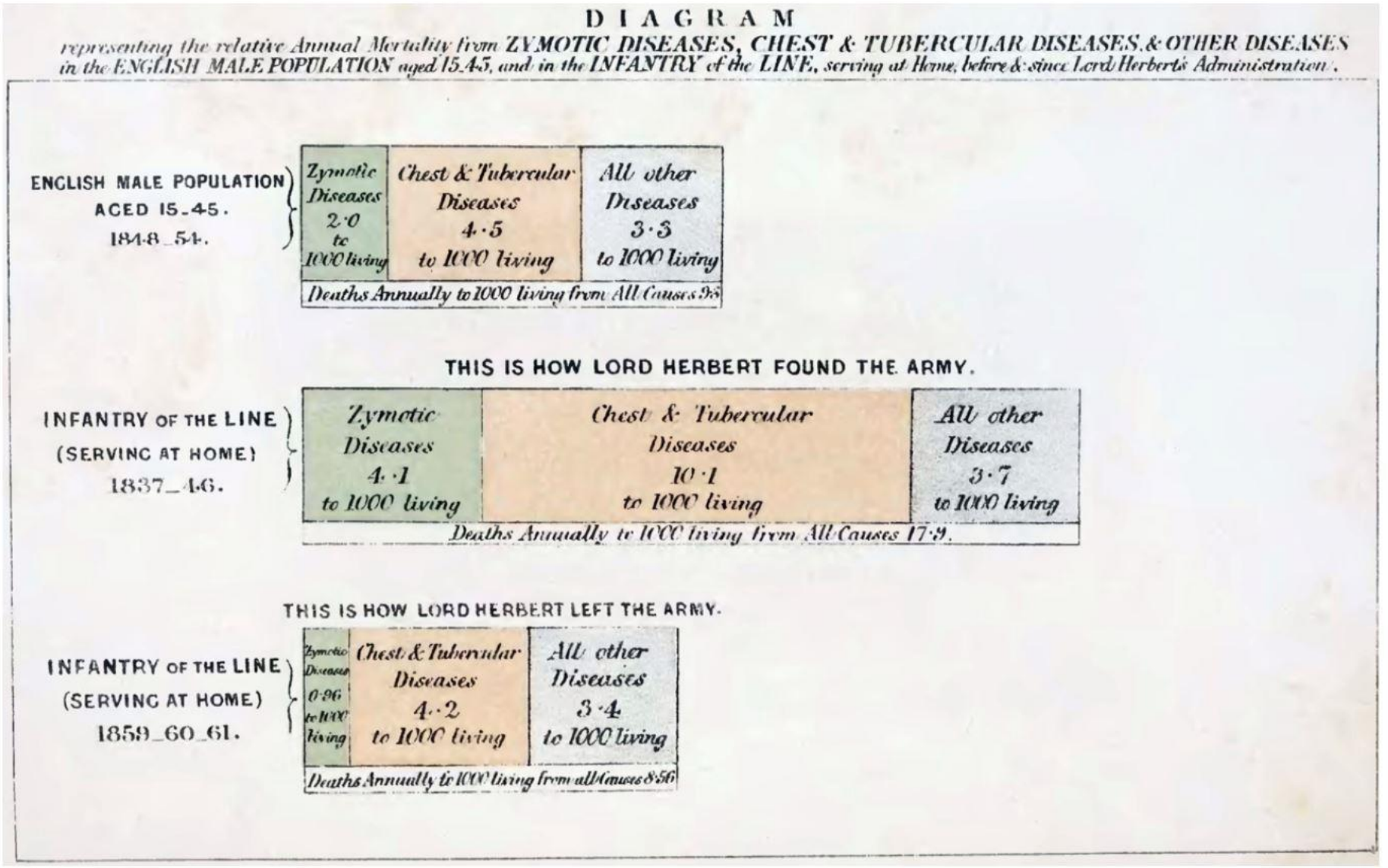
Yet no fighting in the second winter!

British – French comparisons

- In effect a controlled experiment: same war, same distance from home, same climate
- British death rates went down because they made sanitary reforms, thanks to civilian commissions sent out, not the army
- The lesson for Nightingale? Learn from the results, check the death rates

Sidney Herbert's role

- On the death in 1861 of Sidney Herbert, who got her invited to head the nursing, and supported her reforms, headed the Royal Commission and worked with her post-Crimea – a tribute
- Nightingale's tribute to him – bar charts depicting his success



Nightingale, Army Sanitation and its Reform under the late Lord Herbert

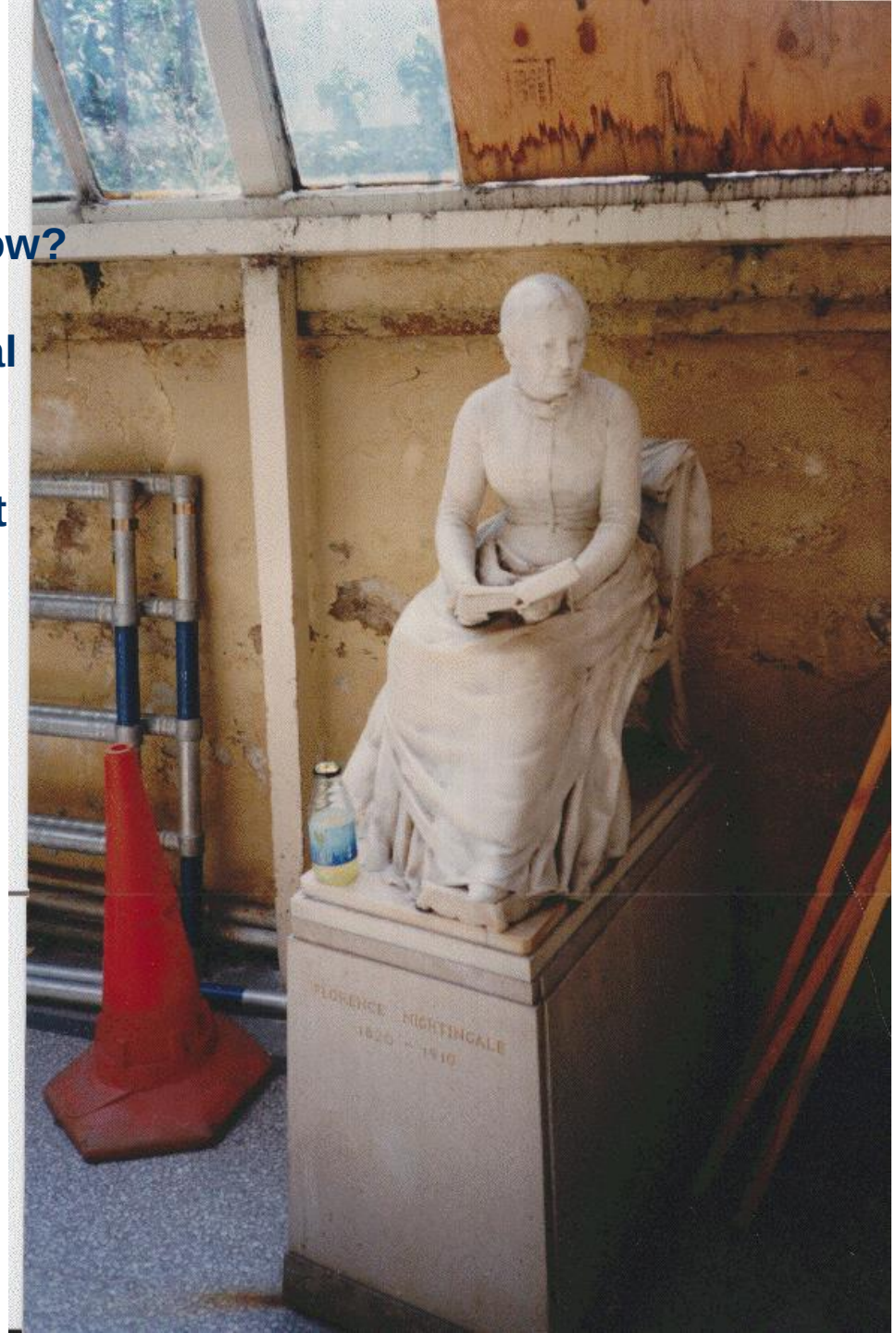
Nightingale – the basics

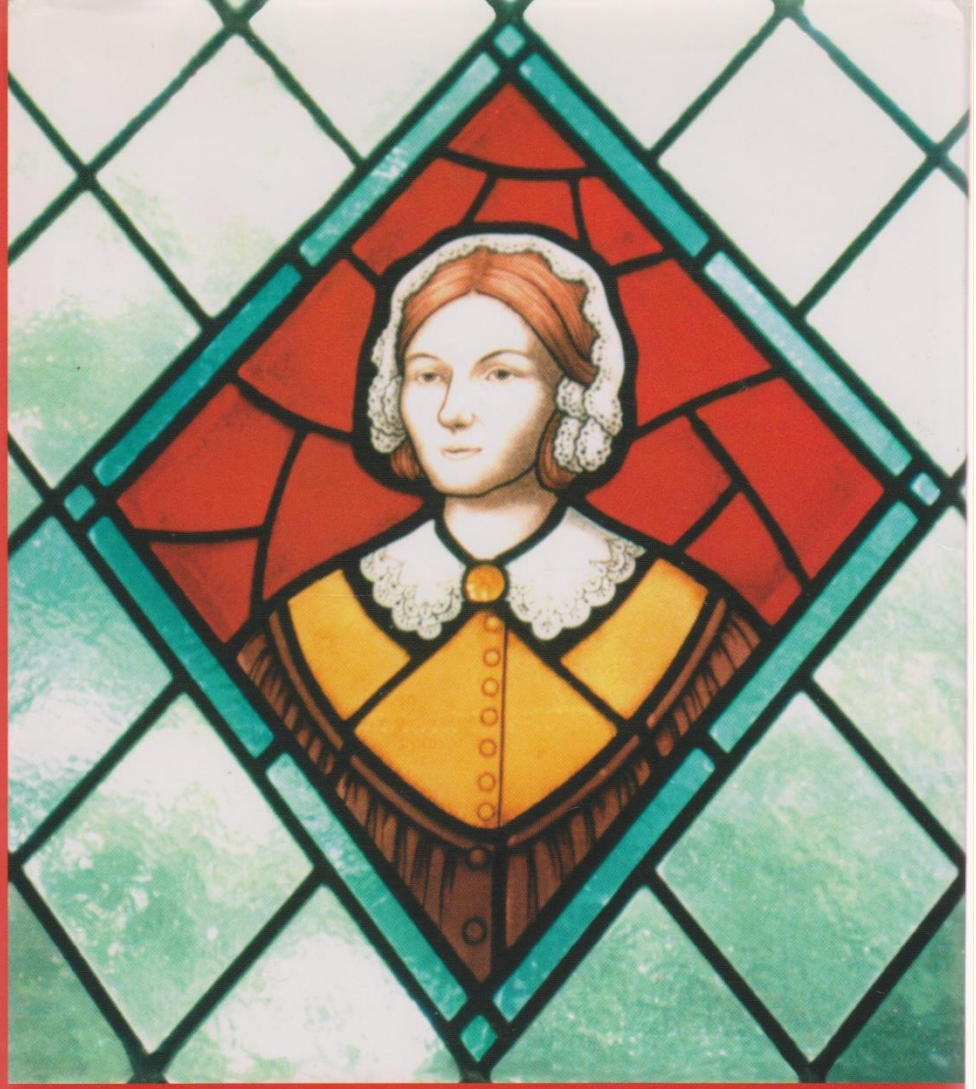
- Social scientist, pioneer of evidence-based health care, first environmental health theorist (from the lessons of the Crimean War)
- Chapters of her *Notes on Nursing* give the positive side of what was wrong at the war: ventilation, cleanliness, light, nutrition, removal of stresses

Statue moved to Front lobby of Glasgow Royal Infirmary, next To bronze relief of Lord Lister, who pioneered antiseptic surgery at that hospital

Where is Nightingale now?

Statue at Glasgow Royal Infirmary, storage area, at beginning of the Collected Works project with traffic cone and pop bottle





Florence Nightingale on Women, Medicine, Midwifery and Prostitution

Lynn McDonald
editor

Collected Works of Florence Nightingale


MACEWEN
LISTER
10.07.2006