Does the debacle at Medway NHS Trust have anything to do with hidden assumptions in the capitation formula?

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How humans perceive the way the world should/ought to work changes with our understanding of how things actually work in the real world. For example, the James Webb telescope is revealing anomalies in the universe which will require existing models to be re-evaluated.

The capitation formula is a model based on existing understanding and therefore contains hidden assumptions of how human health behaves, i.e., never confuse reality and the model's view of how things such as NHS demand and costs should/ought to behave.

Back in 1993 I stumbled across something that behaved like an infectious outbreak. This outbreak showed spatiotemporal spread across the entire UK and led to medical beds filling up and staying full for an extended period of time. This was investigated and the blame was conveniently placed on 'failings' in how the NHS was managing demand. These outbreaks continued to occur and always created severe financial pressures on the NHS. On two occasions big name management consultants were called in who declared that the NHS was at fault for failing to correctly manage demand.[1] Ah! It is always the fault of the NHS who seem to need radical change or a bloodbath of staff.

In his perceptive study Jon Nichol[2] describes the constant risk fallacy, where the dangers of using readily available statistical proxies for health behaviours, i.e., race, the Index of Multiple Deprivation, age (as opposed to nearness to death), etc., are exposed as potentially causing erroneous risk adjustment, as in tools such as the capitation formula. It should not therefore come as any surprise that each new version of the capitation formula seems to randomly create winners and losers. Too bad if you are deemed a looser…. It's all your fault for failing to manage demand.

One huge omission in the capitation formula is the astonishing omission of the role of the external environment, namely, weather patterns, levels of

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[1] Details of 30 years research into healthcare demand, financial risk and how to fund healthcare can be found in Supplementary Material S1 of this recent study https://www.mdpi.com/1660-4601/23/6/711

[2] Nicholl J. Case-mix adjustment in non-randomised observational evaluations: the constant risk fallacy. J Epidemiol Community Health. 2007, 61(11):1010-1013. doi: 10.1136/jech.2007.061747.

pollutants, etc., in influencing human health and mortality. This huge omission has only recently been addressed[3] in a US study linking pollution and other environmental factors at county-level to the risk of chronic illnesses. One can only hope that this approach is rapidly applied into how the capitation formula is revised.

In addition to the above are somewhat enigmatic ways in which pathogens exert wider unexpected effects against human health via a process called pathogen interference and how vaccines also exert unexpected wider non-specific or off-target effects. For example, the BCG vaccine appears to exert unexpected benefits beyond tuberculosis with vaccinated individuals showing lower COVID-19 mortality, and previous vaccination against influenza also provided a degree of protection against COVID-19 mortality. The non-specific effect of any vaccine will depend on the type and manufacturer of the vaccine.

I am not in any way questioning the efficacy of vaccines against the target pathogen.

As an example, Figure 1 shows the trend in deaths per 1000 population in the USA since 1960. Note the increase in all-cause mortality in 2021 when the population was widely vaccinated against COVID-19.

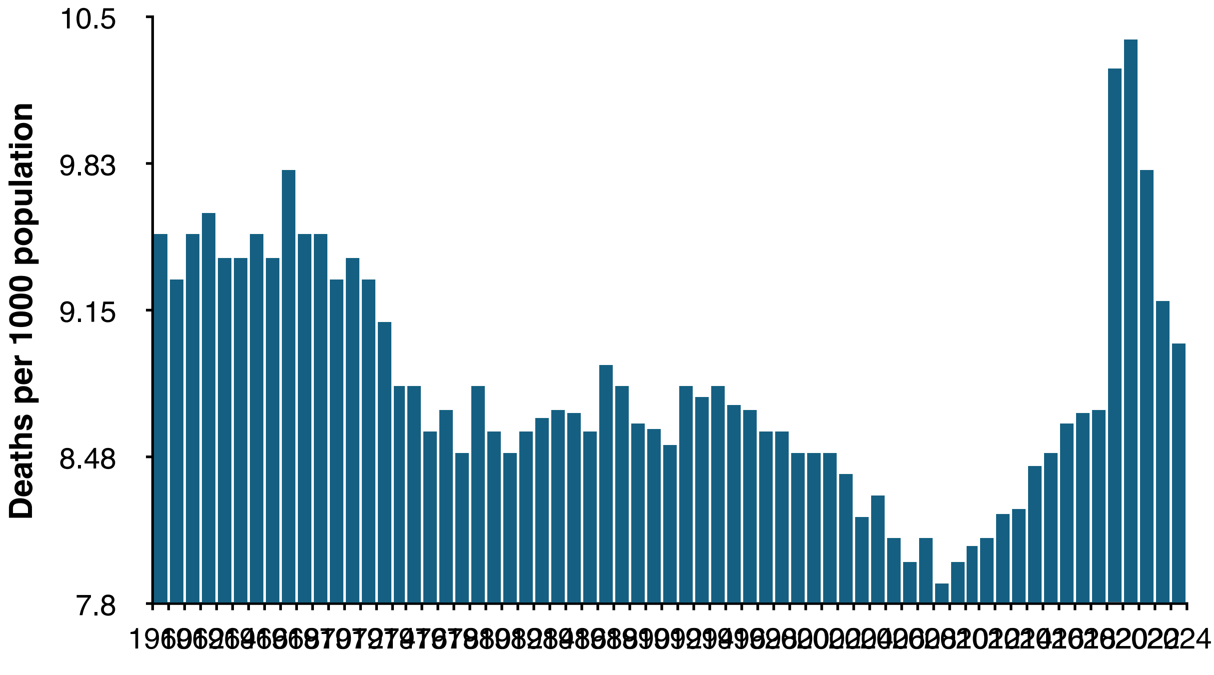

Figure 1. trend in deaths per 1000 population in the USA. Data from https://data.worldbank.org/indicator/SP.DYN.CDRT.IN

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[3] Shrestha, R.; Rana, M.M.; Sun, B.; Witvliet, M.G.; Kostandy, R.; Roden, T.; Saquib, M. An Interpretable Machine Learning-Based Multi-Model Framework for Constructing and Characterizing a County-Level Chronic Illness Vulnerability Index. *Int. J. Environ. Res. Public Health* **2026**, *23*, 1104. https://doi.org/10.3390/ijerph23091104

Once again, I reiterate the vaccine was highly effective in preventing COVID-19 induced mortality. Mortality falls in 2022 with the emergence of the more benign Omicron variant.

The next example shown in Figure 2 comes from sickness absence in the NHS which is displayed as a moving 12-month average. A moving 12-month average removes the effect of seasonality.

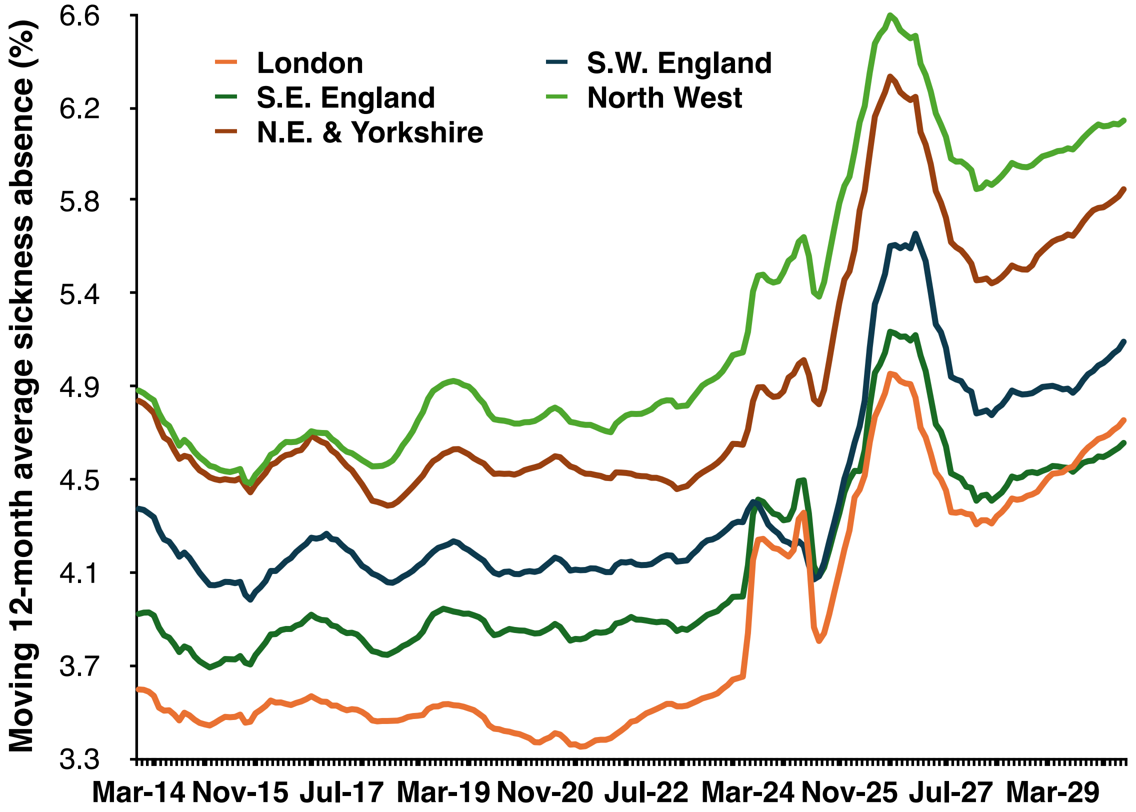

Figure 2. Trend in sickness absence for staff in selected NHS regions. Data from https://digital.nhs.uk/data-and-information/publications/statistical/nhs-sickness-absence-rates

In Figure 2 note how the London region responds to outbreaks of the previously unknown disease type (the intermittent hills in average sickness absence) before the arrival of COVID-19. At the arrival of COVID-19 London is disproportionately affected during the first year. Note that from Sep-23 onward London and the N.E. and Yorkshire seem to escalate slightly faster, while S.E. England does so from Jul-25 onward. Feel free to reach your own conclusions, only that something highly peculiar is happening to human health in different parts of the country.

My point is that human health is behaving in ways which affect NHS demand and costs that rely on mechanisms entirely outside of those encompassed in the NHS England capitation formula.

Finally, Figure 3 demonstrates a left-field approach to NHS bed demand. Note that bed demand is an entirely different matter to bed supply. In Figure 3 age the standardized mortality rate (ASMR) which is a measure of population 'need' is plotted against the deaths per 1000 population[4], which my own research shows is a measure of population bed demand.

At the far left are City of London, Tower Hamlets, Newham and Hackney, while at the far right are Rother, East Lindsey, North Norfolk and Tendring. Clearly the number of deaths per 1000 population and the nearness to death effect will also have profound effects on GP workload.

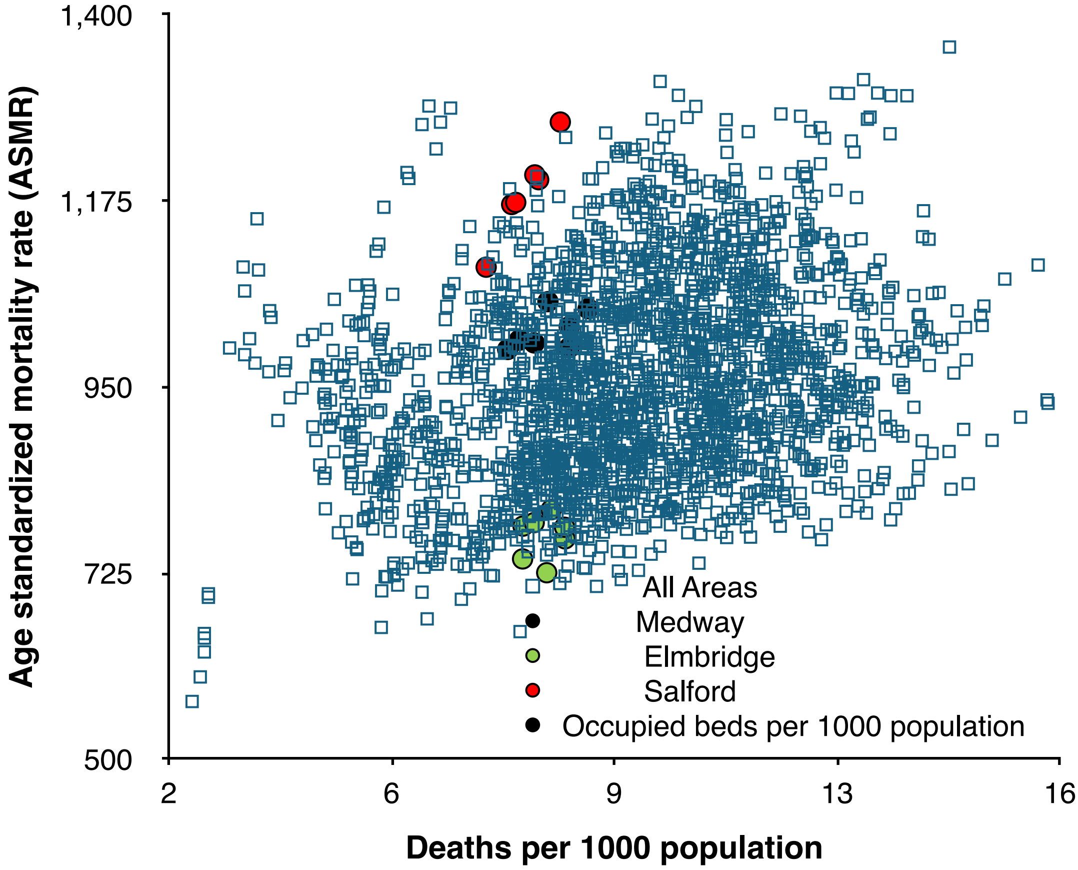

Figure 3. Age standardized mortality rate, deaths per 1000 population and occupied beds per 1000 population for English local authorities. Data is between 2016 and 2024 excluding 2020 and 2021. Deaths and ASMR from: https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/deaths/datasets/deathsregisteredsummarystatisticsenglandandwales, **Population from:** https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/estimatesofthepopulationforenglandandwales **and the formula for occupied beds from** https://www.mdpi.com/1660-4601/21/8/1035

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[4] As opposed to adult care the demand for maternity and paediatric beds depends on the trend in births, see https://www.mdpi.com/1660-4601/22/1/87, https://www.preprints.org/manuscript/202507.0458, and https://www.mdpi.com/1660-4601/23/6/711. These trends are driven by a long-term cycle in births arising out of the World War II baby boom.

The occupied beds per 1000 population are at the average for England and a 100 unit increase in ASMR leads around 15.3 more occupied beds per 1000 deaths.

All three local authorities highlighted have roughly similar deaths per 1000 population but strikingly different ASMR. However, Elmbridge is far more stable for both ASMR and deaths per population, Medway is intermediate, while Salford is the most unstable (variable).

As those into process control say, “the variation is the voice of the process”. The capitation formula allows no mechanisms for describing the entirely real and unavoidable variability in costs.

Taking the English average around 2.4 occupied beds per 1000 population would give a weighting in a theoretical capitation formula for acute inpatient costs of around 0.79 for City of London and 1.2 for Rother. This range becomes wider if you adjust for the effect of ASMR on bed demand, around 1.29 for Rother, and just 0.67 for City of London. Clearly ICB’s are a collection of local authorities each with disparate behaviours.

Thinking laterally, you will begin to realize how the above may shed light on those luckless souls getting embroiled in the you haven’t managed demand and costs blame game. It would seem that yours is not to question why, but to do or die.

For those interested in investigating further:

1. Try plotting the admissions for different diagnoses over time. You will find all manner of inexplicable trends ranging from long-term cycles to subtle shifts in apparent complexity. You will quickly realize that age-based forecasting fails in the real world.
2. Try plotting a moving 12-month total/average for admissions and occupied beds over time (as with sickness absence). Much to your consternation hidden patterns will emerge.
3. You cannot give clinical codes to the mechanisms behind poor health and morbidity which are currently not understood.