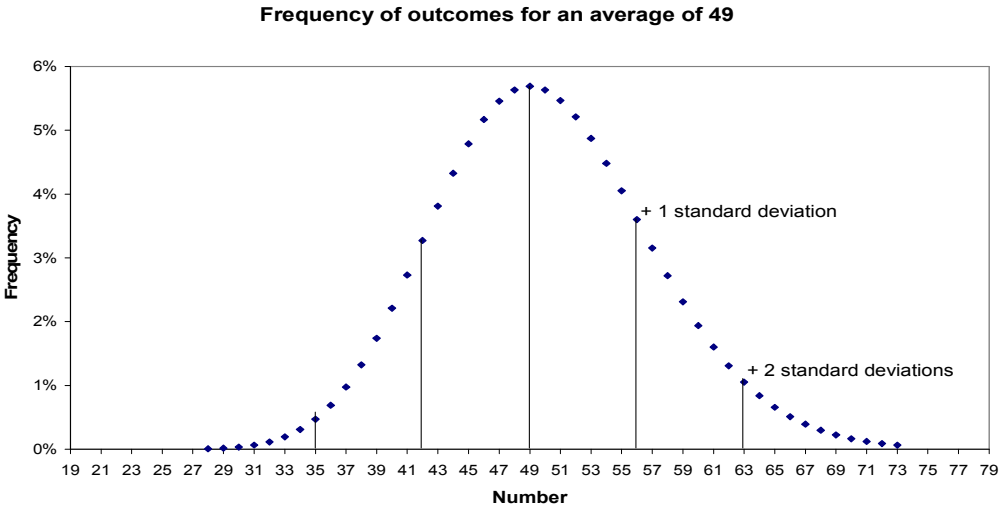
How much capacity do we need?

To answer this question we ask another – why does the US healthcare system need 2 to 3-times more workers (doctors, nurses, radiographers, etc) per head of population than the UK?

Is it that they are profligate wasters or does it have something to do with the fact that there is very little queuing for healthcare in the US.

This leads us to a consideration of how much 'excess' capacity is required in order to deliver a guarantee of not breaching a certain level of queuing, i.e. a maximum waiting time.

Figure One: Frequency of outcomes around an average



Obviously the excess capacity will be related to the variation around the average of the expected demand. Hence if demand is 10 ± 1 per day we will need to have a far lower excess than for demand of 10 ± 10 per day, i.e. we need to cope with a maximum of 11 vs 20 per day. Hence in the case of 10 ± 10 per day although our average is 10, on some days we get no one arriving but we need to have capacity to deal with 20 and so we would have only a 50% usage of our available resources.

This leads us to consider the question – how variable is healthcare demand? The second chart shows that variation in healthcare demand is in fact very high when taken at the level of a single consultant or specialty. This is typically up to twice that forecast from Poisson statistics for the surgical specialties and up to 3-times higher for medical emergency admissions and A&E attendances, i.e. healthcare demand is a mixture of common (pure statistical) and special cause (environmental) variation.

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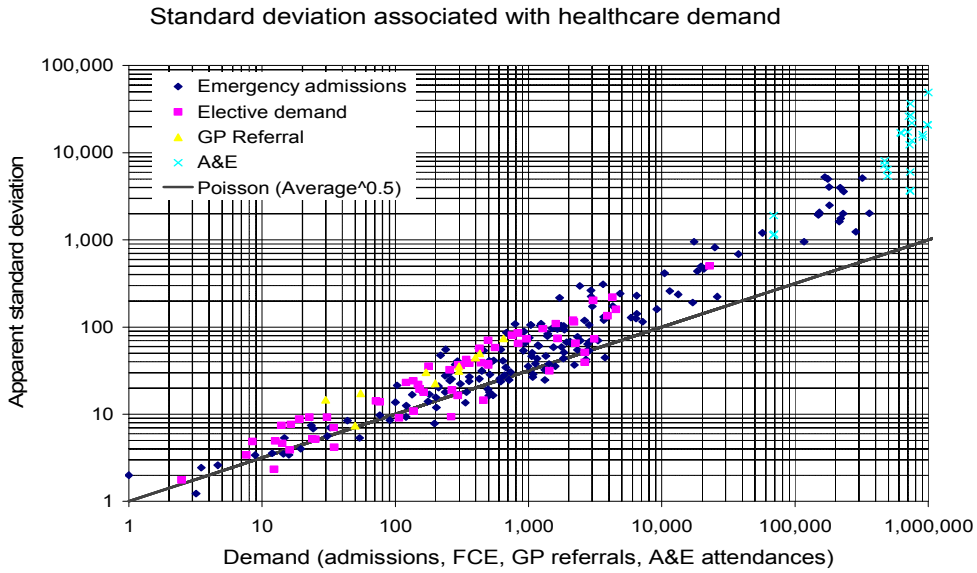
Having established the case that healthcare variation is both real and large we now need to consider how much excess resources we need to meet a guarantee[1].

Figure Two: Variation around the average in healthcare demand



The answer relates to the length of time allowed by the guarantee. Hence a twelve month guarantee requires an excess appropriate to that associated with a full year of demand while a three month guarantee requires a larger excess appropriate to a smaller time frame.

On the basis of affordability an excess equivalent to somewhere between one and two standard deviations is probably appropriate. In the longer term this implies significant capital investment to over-size physical resources or the implementation of region-wide demand equalisation schemes (to take the benefit of the lower variation associated with larger size).

In the short term, given that the longer term solutions are not in place and that a high level of overspend is anticipated the minimum level of plus one standard deviation is the recommended alternative.

This results in a 'theoretical' planning calculation against which providers can assess their capacity to deliver. It does not mean that the provider will need to do this level of activity – indeed in particular years they may only need to do 3 standard deviations less than the expected average demand. The one standard deviation is simply a margin of safety (similar to the 82% average occupancy for beds) required by the guarantee of hitting various targets.

The final chart gives the resource efficiency implied by a guaranteed three month maximum wait. In this example the range between 100 and 1,000 per 3 months

[1] Did the government really understand what they were committing the NHS to when they promised a 3 month maximum wait!

represents the typical volumes of cataract operations performed by Ophthalmology Units in Thames Valley. The smallest department at Milton Keynes performing around 100 every three months while the largest department at the Oxford Radcliffe Hospital performing around 1,000 every three months.

It is fairly obvious that the smaller units cannot sustain a dedicated eye theatre and that even the largest units will be operating at 90% theatre utilisation – assuming that they have the excess capacity implied by this relationship which arises from the randomness in demand detailed above.