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Forecasting conundrum: a disease time cascade

Dr Rodney P Jones
Statistical Advisor
Healthcare Analysis & Forecasting
hcaf_rod@yahoo.co.uk

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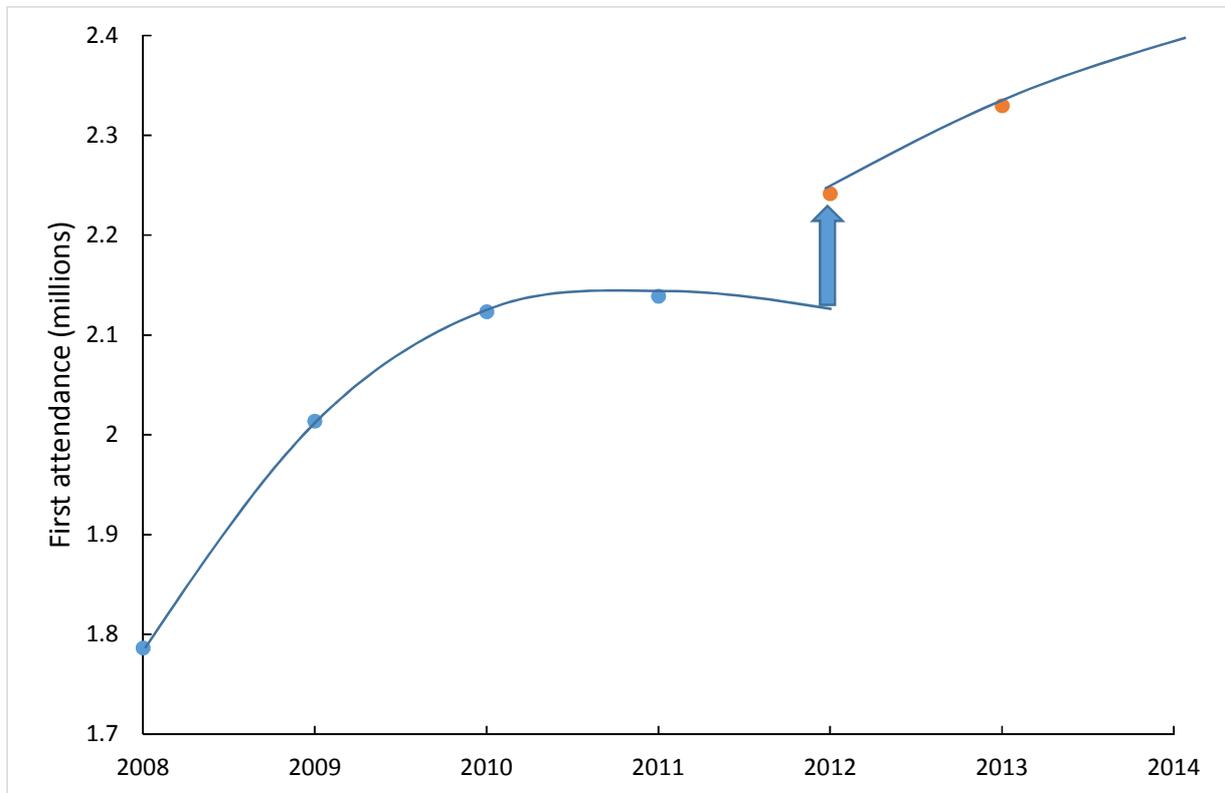
As some of you will know I have spent the last 22 years involved in forecasting health care demand and capacity planning. Coming from an academic background I have sought to understand the forces lying behind growth in demand and how these relate to capacity planning. This year marks the start of the fifth year of the Money Matters series where I have attempted to combine epidemiology, queuing theory and other tools into understanding financial planning. I have especially pointed out that infectious outbreaks may play a far more important role in capacity planning and resource allocation than is currently realized (Jones 2013a).

Most of you will not be at all surprised to note that there is a huge gulf between my work and the message communicated by the Department of Health (DH) and other arms-length bodies who seem bent on promoting a politically correct view of how growth is 'supposed' or 'ought' to occur. Any view which is divergent to theirs is usually ignored. Events surrounding the recent A&E crisis are a good place to investigate these divergent views of reality (Jones 2012e, 2013c,d). Firstly there has been an obvious capacity planning failure in that A&E departments seem too small and contain insufficient staff to meet the emerging demand. The reality of this demand is seemingly denied and the 'problem' must therefore lie with the NHS and how it must have 'failed' in what it 'should' or 'ought' to have been doing.

Figure 1 is illustrative of this clash of ideologies where a 4.8% step-like increase in outpatient first attendance (mostly GP referred) occurs in December of 2011. A 5.2% increase in admissions via A&E has already been demonstrated to occur in February of 2012 (Jones 2013b-c). The point of great interest lies in the fact that February 2012 also marked the point at which deaths in England and Wales showed an unexpected and unexplained increase (Jones 2013b) although this increase had commenced earlier in Scotland and is part of a far longer time series of such unexpected and unexplained increases which show spatial spread reminiscent of an infectious outbreak (Jones 2013h,i,k 2014). Hence the slightly earlier increase in GP referral and consequent outpatient first attendance can be understood in terms of deteriorating health necessitating GP referral, eventual hospital admission and then death (Jones 2012g,h). A similar time and spatial cascade involving outpatient first attendance has been documented following an event in 2007 (Jones 2012c,d,f,i). On that occasion the increase in outpatient demand was far higher than seen in 2012 and this could be the outcome of a different strain of the same infectious agent as can be observed in the differential effects of influenza strains against morbidity and mortality.

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Figure 1: Trend in outpatient demand in England



Footnote: Monthly outpatient attendance has been adjusted to 21 work days per month. The step change occurs in December 2011 and so twelve month totals run from December to November. Data is from the Health and Social Care Information Centre website

<http://www.hscic.gov.uk/searchcatalogue?productid=13918&returnid=1684>

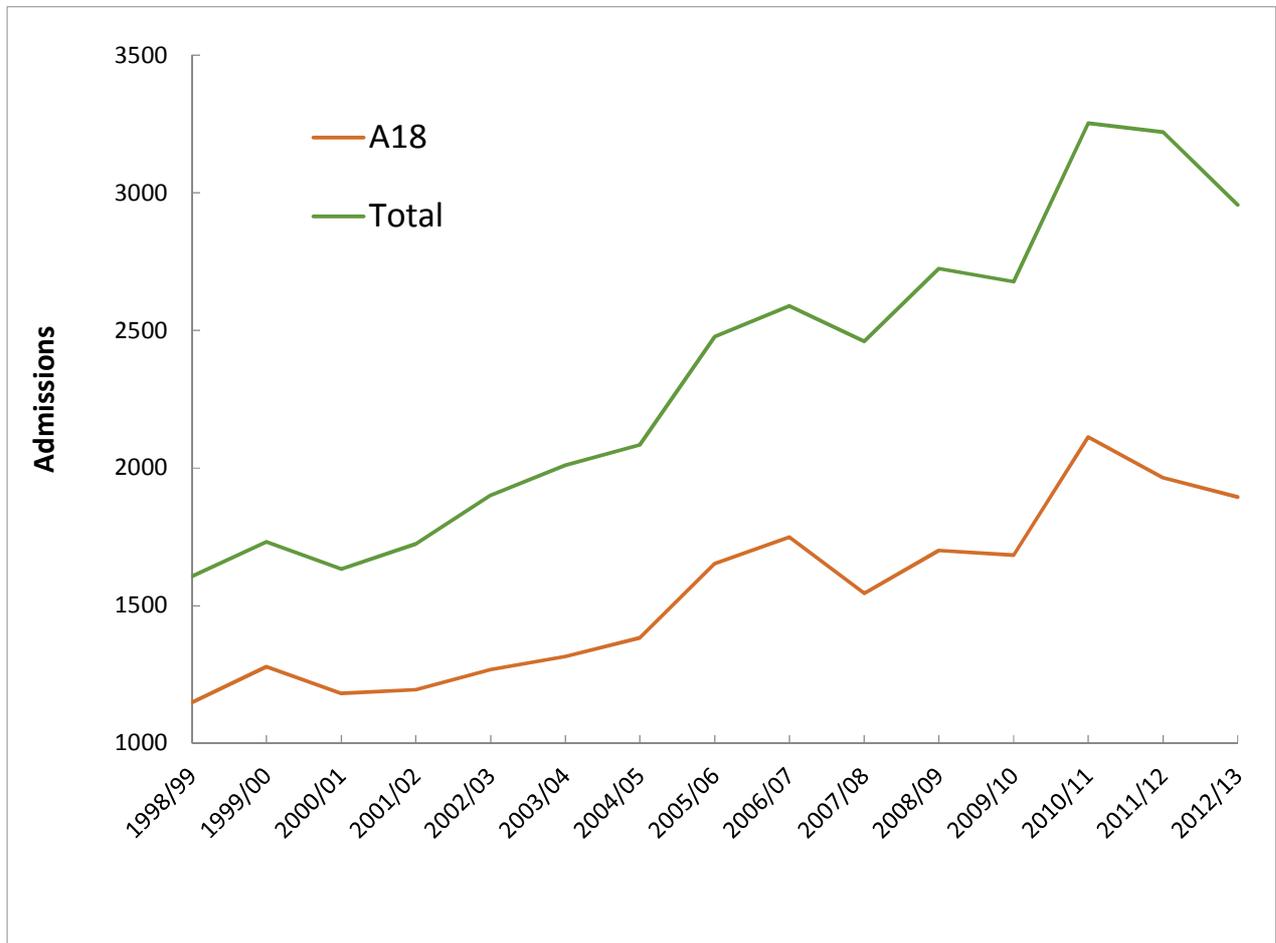
This repeating series of events is replicated elsewhere in the western world (Jones 2010a) and with similar financial consequences to that experienced in the NHS (Jones 2010b, 2012a).

A lag of around one to two years was demonstrated in last month's Money Matters and in this respect Figure 2 shows another set of lagged outcomes for tuberculosis which needs to be understood in terms of a three year lag behind the outbreaks. Hence the 1996 outbreak creates the peak in 1999, a small outbreak affecting mostly northern England in 1999 creates the small peak in 2002 and the outbreaks in 2002/03 and 2007/08 create the peaks in 2005/06 and 2010/11 respectively. We will have to wait until 2015 to see the outcome of the 2012 outbreak. The large influx of immigrants from third world countries during the time of the former Labour government explain why the two most recent peaks are larger.

The ubiquitous herpes virus cytomegalovirus (CMV) has been proposed as a possible candidate for the infectious outbreaks precipitating these disease cascades (Jones 2013h-i) and is recognized as an immune impairing factor capable of encouraging the development of tuberculosis (Al-Saadi et al 2014). Hence a three year lag between the outbreak and the increase in admissions is entirely feasible.

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Figure 2: Trend in admissions for tuberculosis in England



Footnote: Data is from Hospital Episode Statistics. A18 = Tuberculosis of other organs, other tuberculosis forming the total are A17 (Tuberculosis of nervous system), A19 (Miliary tuberculosis), B90 (Sequelae to tuberculosis) and J65 (Pneumoconiosis with tuberculosis). Rough proportions are: A17 (19%), A18 (66%), A19 (14%) and B90 + J65 less than 1%.

Whatever the cause, the 'politically correct' view regarding demographic-based growth has some serious real world deficiencies and leaves a serious problem for accurate forecasting in commissioning and financial planning. Hence the somewhat extensive series of articles published in BJHCM on the issues of financial risk in health care financial planning (Jones 2012b, 2013j).

So we have a series of step increases in demand affecting both outpatient, A&E and inpatient demand which go back to 1993 (and probably earlier) which added to underlying demographic-based growth are leading to unexplained rapid expansion in overall demand. Like the DH you can bury your head in the sand and blame the NHS or you can accept reality and plan accordingly. These demand pressures are necessitating changes in the way the NHS delivers care, however, having implemented such changes the demand trends will still continue to increase unless someone accepts reality and seeks to understand the cause rather than focusing on the symptoms (Jones 2012g,h, 2013h-k, 2014).

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