

# Ambulance call-outs and 'disruptive technology'

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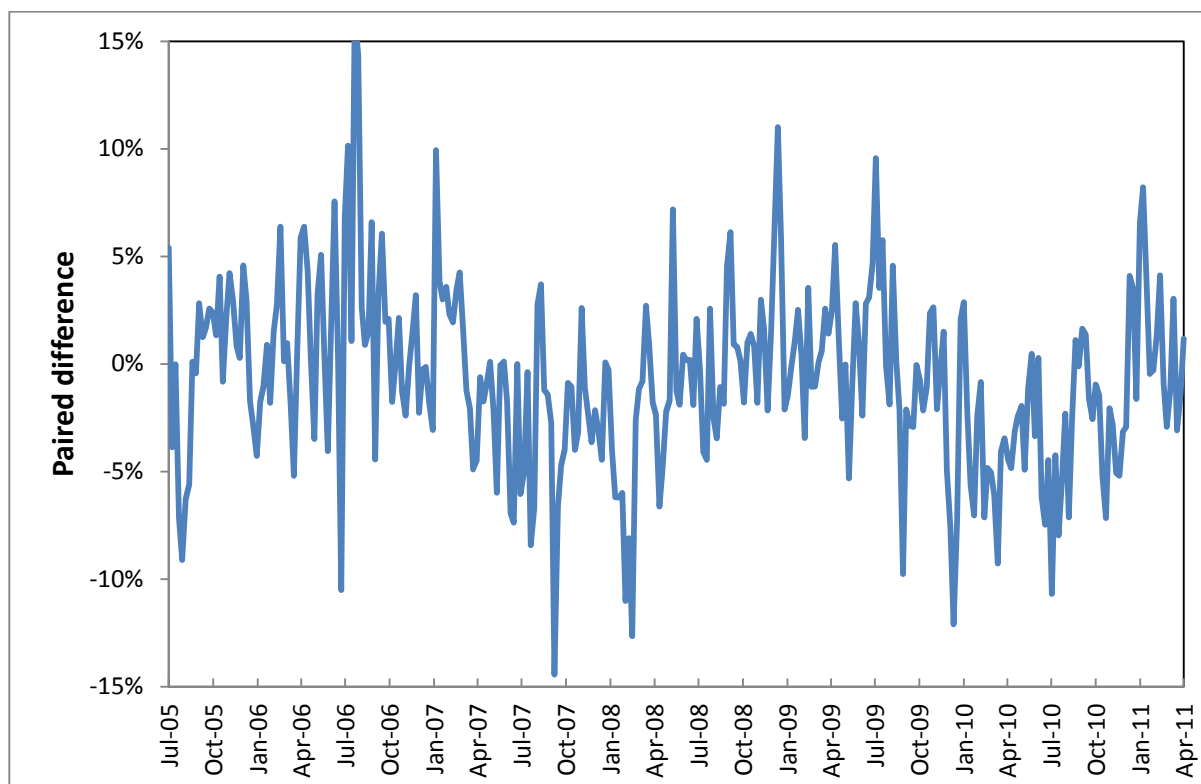
Disruptive technology is a term coined by Harvard Business School professor Clayton M. Christensen to describe a new technology that unexpectedly displaces an established one. His 1997 best-selling book, "The Innovator's Dilemma," separates new technology into two categories: sustaining and disruptive. Sustaining technology relies on incremental improvements to an established technology. Disruptive technology lacks refinement, often has performance problems because it is new, appeals to a limited audience, and may not yet have a proven practical application. For example, Alexander Graham Bell's "electrical speech machine", now the telephone.

Of relevance to health care is the fact that large corporations (i.e. Department of Health) are designed to work with sustaining technologies. They excel at knowing their market, staying close to their customers, and having a mechanism in place to develop existing technology. Conversely, they have trouble capitalizing on the potential efficiencies, cost-savings, or new marketing opportunities created by low-margin disruptive technologies. Christensen demonstrates how it is not unusual for a big corporation to dismiss the value of a disruptive technology because it does not reinforce current company goals, only to be blindsided as the technology matures, gains a larger audience and market share and threatens the status quo ([http://whatis.techtarget.com/definition/0,,sid9\\_gci945822,00.html](http://whatis.techtarget.com/definition/0,,sid9_gci945822,00.html)).

Over the previous three years a series of articles in BJHCM have introduced the conceptual equivalent to 'disruptive technology' into our understanding of how health care demand behaves through time (see Jones 2009, 2010, 2011a,b, 2012 for further references). The existing incremental technology (demographic-based growth) has been demonstrated to fail in the real world and unheard of 'disruptive' concepts such as 'cycles', 'step-like changes' and 'wavelets' have been proposed to offer better insight into how costs behave over time. The combined and interactive effects of the environment (weather, air quality, infectious outbreaks) have been proposed as a major contributing factor in these disruptive changes and explain why it is almost impossible to run a balanced health care budget. Hence changing commissioners from PCTs to CCGs is mere window dressing based on the old incremental 'technology' and its hidden assumptions.

For those of you who are bewildered Figure 1 gives a good illustration of the issues at stake. In this figure weekly ambulance call outs across England have been compared pair-wise for the same week of the year, i.e. first week 2005 compared to first week 2006, etc. This pair-wise process is designed to adjust for the seasonal nature of ambulance demand. Underlying growth is somewhere around 5% per annum (over the time period weekly call-outs grew from around 80,000 to 90,000) and the data has been adjusted to account for this factor. As can be seen the resulting difference follows wave-like movement giving three broad peaks and troughs.

**Figure 1: Category A+B ambulance call-outs for England**



Footnote: Data is from "Unify2 data collection – WambReps" and was kindly supplied by Paul Steele of the Department of Health. Percentage difference is same week year 'n' minus year 'n-1' divided by average of the two weeks (n, n-1). Move forward one week and repeat the calculation. Data has been corrected to remove the effect of 5% p.a. underlying growth. No adjustment has been made for the different dates for Easter and Christmas/New year holidays although these will only affect single peaks rather than an entire cycle.

The more cautious among you may counter by pointing out that health care data jumps around all the time. This is indeed true, but if it were pointed out that a 9% difference between call-outs in the same week of the year represents 26.5 standard deviation worth of Poisson-based change (anything greater than 3 standard deviations is generally considered highly statistically significant) then the proposition that something other than simple random variation is at work is more plausible. Since the gap between peak and trough is around 10%, then something capable of causing a 10% wave-like change across the whole of England has to be considered of great importance to understanding the nature of costs.

It would seem that we need to have a fundamental re-think around how we forecast future healthcare activity and costs, i.e. the new 'technology' which utilizes different concepts for

An edited version of this article has been published as: Jones R (2012) Ambulance call-outs and 'disruptive technology'. *British Journal of Healthcare management* 18(2): 112-113. Please use this to cite.

how health care demand behaves and mathematical tools rather than machines per se. The fundamental forces leading to such large magnitude changes need to be far better understood since if this is not achieved then CCGs will be subject to the same cycle of surplus and deficit as were the PCTs before them. Can the Department of Health rise to the 'disruptive technology' challenge or will they, like large corporations, dismiss the opportunity because it conflicts with accepted wisdom?

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