An edited version of this article was published as: Jones R (2012) Increase in GP referrals: jump or infectious push? British Journal of Healthcare Management 18(9): 488-497. Please use this to cite.

Increasing GP referrals: collective jump or infectious push?

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Abstract

Over the past decades GP referrals have been increasing much faster than implied by demographic change, i.e. the ageing population. Up to the present this has been assumed to be a problem with the GP referral process which should be remedied by US style scrutiny of GP referrals and GP training. While some of this is warranted the mechanism for growth appears to be localised, unexpected and unexplained, leading to a permanent increase of around 15% within a one to two month period. This growth moves across the UK in a manner reminiscent of the infectious spread of a persistent agent which exhibits moderately slow transmission. The relative inability of existing demand management schemes to halt this spread suggest that a genuine infectious agent is involved.

Key Points

- GP referrals are shown to increase predominantly via unexpected, sudden and large step-like increases
- Some locations experience a far larger increase than others (range 8% to 25%) which is equivalent to 8 to 25 years worth of demographic-based growth.
- These increases show spatial spread similar to that which may occur from a relatively difficult to transmit (and hence slow) spread of a persistent infectious agent
- The event which commenced in 2007 appears to initiate in Scotland followed by movement across England and Wales
- Whatever the ultimate mechanism this has profound implications to benchmarking between locations, the capitation formula and the management of health care costs.

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Introduction

In 2010/11 outpatient attendances accounted for £8.3 billion or 9% of total health care expenditure in England. During 2007/08 it would seem that GPs across the length and breadth of the UK collectively 'jumped' their referral rate for outpatient appointments. Due to the lag in data reporting and the use of financial year totals it was not until late in the 2008/09 financial year that everyone had become aware that something had 'happened'. Your choice of words to describe the event will of course depend on your point of view. However what has not been widely discussed is the fact that many Western countries also experienced an increase in medical emergency admissions at roughly the same time and that such events appear to regularly occur at around three to eight year intervals (Jones 1996, 2009a-b, 2010a-f, 2011a-c).

The Nuffield Trust proposed that this was due to increased acute efficiency leading to a reduction in thresholds to admission (Blunt et al 2010), a conclusion which is disputed by research in the US which demonstrates that admission thresholds are maintained in spite of wide fluctuations in demand (Sharma et al 2008). The Nuffield report rightly pointed out that in England 'admissions' via emergency assessment units had caused much of the increase. However, this particular source of 'admissions' is not due to admission thresholds *per se* but more to ambiguity in the NHS Data definitions (Jones 2007) and the pressures to achieve the A&E four hour target (Jones 2011b). Acute Trusts simply exploited a 'counting' loophole, which due to flaws in the HRG tariff, also happened to be highly lucrative, i.e. otherwise A&E activities were counted as an emergency 'admission' and were paid at many times higher than real cost (Jones 2010g). Less well known is the fact that genuine overnight stays, i.e. excluding admissions with a same day stay, also increased as did occupied beds (Jones 2012i, 2012d). Figure 1 which excludes zero/same day 'admissions' gives an example of this recurring phenomenon which is specific to medical admissions. It must also be pointed out that bed occupancy is now so high in the UK that acute hospitals have little headroom to admit patients simply to increase income (Jones 2011b-c). Having eliminated increased 'efficiency' as the cause for the parallel increase in medical admissions, do we need to investigate 'inefficiency' as the cause for the increase in GP referrals? Or is there some other factor which appears to defy commonly accepted 'norms' of how health care is supposed to behave?

Demography

After a twenty year career in health care analysis the author has reached the conclusion that the assumption of a largely demographic basis for health care trends is the equivalent to a firmly held myth (Jones 2010a, 2012a,e). Demography merely provides a background context but cannot explain the detailed trends in activity or cost. Long term cycle-like trends (as opposed to short term seasonal cycles) appear to be far more prevalent than has been appreciated (Jones 2010a, 2012a). Such trends appear to arise from the combined and cumulative interaction between the environment (weather, air quality, infectious outbreaks)

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and human physiology/health. In this respect a series of articles have explored the possibility that the volatility associated with health care costs is highly location (local environment) specific, i.e. some locations find it far harder to maintain a balanced budget that others (Jones 2012d-g). How do these strands of evidence relate to GP referrals and the question as to whether GP referrals jumped or were pushed?

The author's research has led to the suggestion that the recurring cycle of medical emergency admissions, GP referrals, A&E attendances, ambulance journeys and general health care costs (Jones 2012a-g) behaves in a manner reminiscent of a recurring infectious outbreak. Hence, what evidence is there that GP referrals may be the result of an infectious 'push' rather than a collective 'jump' phenomena which would arise from a reduction in referral thresholds. Is something genuinely wrong with the patients rather than the process?

Demographic Growth

Table One presents the outpatient specialties with the *highest* expected growth over the period 2007 to 2017. All other specialties not given in this table have less than 1% p.a. growth. Highest possible growth (based on demography) is 2% p.a. in Old Age Psychiatry. All of these 'high' growth specialties are largely devoted to treatment of the elderly. Hence the ageing population does have an impact on expected growth but it is relatively modest.

Data & Limitations

In order to illustrate the exact nature of the changes monthly data for a direct count of GP referrals (Wales) or GP referred first outpatient attendance (Scotland and Berkshire) has been analysed. Monthly data for England is not easily obtained and hence a Freedom of information request was used to obtain data at local authority level in Berkshire to match the data for medical admissions in Reading (Figure 1). Data from Wales for GP referrals is the most accurate and has been corrected by StatsWales for data reporting errors and contains an audit trail of corrections.

Data from Scotland is less accurate and contains a minority of data reporting errors which the author has attempted to correct. Data from Berkshire contains no apparent data reporting errors. The data on GP referred first outpatient appointments will contain a slight lag between GP referral and first appointment, however, guaranteed maximum waiting times imply that NHS outpatient capacity must quickly adjust to any changes in incoming referral numbers. This data source may therefore slightly lag behind the real date at which any step-like changes have occurred. It may also give an initial over- estimate of the magnitude of any step-like change since there will some element of catch-up in the attendance data. The data from Berkshire shows this behaviour and after this catch-up period the outpatient attendance settles down to a new but higher level.

Given the superior nature of the data from Wales a single specialty (Dermatology) was chosen to illustrate the trends. Dermatology was also chosen to illustrate the trends in

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Berkshire. Analysis of the data from Scotland showed that the choice of a medical group of specialties was the best way to illustrate the trends, i.e. the larger group of specialties appeared less sensitive to data reporting errors and lags in responding to the increase in GP referrals which may be more prominent in individual specialties.

Methodology

In the mid-1990's the author reviewed the trends in GP referral using the paper-based Korner statistics and concluded that a recurring pattern of step-like increases were the major mechanism for growth rather than demographic-based growth. A step-change occurs when the level of referrals suddenly jumps from one stable level (say 100 per month) to a new and higher stable level (say 125 per month) – as demonstrated in Figure 1 for medical admissions.

GP referrals are subject to seasonal variation which can obscure the point where new trends originate. A running twelve month total represents a method by which this seasonality can be diminished to give a series of full year (12 month) totals. It is called a running total since the 12 month total is successively (retrospectively) re-calculated at one month intervals. When a step-like change in activity is involved the point at which the step change occurs marks the onset of a ramp up in the 12 month total, i.e. in the first month after the step change there are 11 months at the previous lower activity and one month including the new higher activity, etc. The base of the ramp therefore identifies when the step change occurred and the point 12 month on identifies the full magnitude of the step change which can be calculated as a percentage increase.

Dermatology

Dermatology has been chosen to illustrate the nature of the trends in Wales and Berkshirte due to the fact that it is a high volume outpatient specialty which has clearly defined clinical boundaries. If spatial movement of an infectious agent such as cytomegalovirus (CMV) were to be the ultimate cause then Dermatology would also be a clinically relevant indicator specialty. CMV is recognised as a causative agent (in particular individuals) in the amplification of autoimmune diseases (Posnett & Yarilin 2005, Varani & Landini 2011), drug-induced hypersensitivity (Seishima et al 2006) and cutaneous drug reactions (Ozcan et al 2010). CMV is proposed to increase cutaneous immunosuppression by its action on dendritic cells and T lymphocyte function leading to sustained cutaneous inflammation (Ballanger et al 2009) and its role in a variety of skin conditions has been the subject of several reviews (Drago et al 2000, Kano and Shiohara 2000, Resnik et al 2000). The active form of CMV infection is often present in patients with atopic dermatitis (Docke et al 2003, Hafez et al 2005), psoriasis (Weitz et al 2011) and is a risk factor in persistent erythema multiforne (Seshima et al 2001, Wanner et al 2007) and cutaneous vasculitis – as part of a far wider spectrum of vasculopathy (Weigand et al 1980). In the immunocompromised (transplant or T cell leukaemia) skin lesions represent the extreme of infection and before

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the advent of antiviral drugs were associated with 85% mortality (Lee 1989,Eizuru et al 1990).

While such a link is speculative it does give a possible medical basis for the very high, rapid and unexplained increases in GP referral which are about to be documented and could also provide a wider basis for the increase in referrals in other specialties based on a range of inflammatory and auto-immune processes (Posnett & Yarilin 2005, Varani & Landini 2011, Jones 2012c,i). The relatively slow spread coupled with permamnet infection which is about to be demonstrated also appears to be consistent with nthe known transmission characteristics of CMV (Cannon et al 2010, Hyde et al 2010).

Trends

Analysis of GP referral trends in England and Wales has already demonstrated that the increase in GP referrals is specific to particular specialties; that different specialties lag behind others, and some show no change whatsoever. In addition, Wales appears to lag behind England and this could arise from a pattern of infectious spread (Jones 1996, 2012i). The proposal is that an outbreak of a persistent infectious agent is leading to a mosaic of widespread secondary effects. If such were the case then patients would be presenting to their GP with unexplained syndromic or vague conditions through to the exacerbation of existing conditions (Hyams 1998). Given the general ambiguity surrounding the diagnostic process (Fink et al 2009) we have a potential cause for a push-based increase in GP referrals rather than some vague explanation around 'competence' – which in any case would not account for 'herd' behaviour or for the lags between specialties or locations or the related increase in medical admissions and A&E attendances.

It has been observed that these 'outbreaks' appear to occur slightly earlier in Scotland (Jones 1996, 2012f) and this is explored in Figures 2 and 3 and summarised in Table 2 where the pattern of first outpatient attendance within a medical group of specialties (Scotland) and to dermatology (Wales and at local authority level in Berkshire, England) is detailed for various geographies. The characteristic lags between specialties are also observed, but on this occasion it is the notion of geographic spread over time within a group of medical specialties that is the focus of attention.

Note that Figure 2 is a running 12 month total. Hence the start at Mar-03 is the total attendances between Apr-02 to Mar-03 while the next point in the time series is the total attendance between May-02 to Apr-03, etc. A running total is very useful to detect when a rapid shift in behaviour has occurred (Jones 2010b). The start of the shift is the point at the foot of a ramp-like change in the trend and the magnitude of the change is revealed as the difference between the total attendances at the foot of the ramp and the total at the point 12 months on or even longer. As can be appreciated Health Boards represent large geographic areas and infectious spread may occur over time especially if transmission were to rely on person-to-person contact, however on the whole, the results for each Health

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Board will be driven by what is happening in the large towns and cities. For comparison, Figure 3 uses a direct monthly count of GP referrals rather than a running 12 month total to show that the point of initiation, as identified by the running 12 month total, is indeed equivalent to a rapid step-like increase rather than some diffuse increase over time which would be the case if the threshold to referral were to be progressively reduced.

It should be noted that the longer time period encompassed in Figure 2 covers two outbreaks. The first commences somewhere in 2002 and the second in 2007, hence, depending on the extent of spread at Mar-03, using this as the reference point may place some Health Boards at different points in the extent of spread. Hence the 2002 outbreak did not appear to reach Grampian or Lothian until early 2003, etc.

Given this background the extent of the sudden step-like spread in GP referral and hence first outpatient attendance across Scotland and Wales has been summarised in Table 1. The locus of the 'outbreak' appears to occur in Ayrshire & Arran at a point around February 2007 and spread occurs such that the first step-like increase in Wales occurs in May 2007 in Denbigshire although the bulk of the increase in Wales occurs around April 2008 which includes the heavily populated major cities. The increase in Berkshire (England) appears to occur around July 2007 and similar mosaic spread has already been demonstrated to occur across the whole of England using the increase in PCT costs (Jones 2010f, 2011a). The author's unpublished research appears to indicate that the final extent of the spread in England may occur around November 2008 in North East Essex.

While it is not the main emphasis of this research it is of interest to note that the increase in GP referral in response to the 2002 outbreak in both Berkshire and Scotland was approximately only half of that seen for 2007(data not shown). This is in contrast to the very similar response shown by medical admissions on both occasions (Figure 1). This poorly understood phenomenon requires far greater research.

Spatio-temporal Granularity

Spatio-temporal granularity is the variable extent of an infectious outbreak in different locations over time. This arises from the spread of the infectious agent via large movements of people (commuting, holidays) along transport routes (airports, motorways) and the social networks which promote spread at a local level (Eubank et al 2004, Crighton et al 2007, Crighton et al 2008, Farnsworth and Ward 2009). In this respect Table 2 is an excellent example of spatio-temporal granularity. The fact that both emergency medical admissions and GP referrals increase simultaneously appears to rule out management or behavioural explanations since we are dealing with separate processes and the only common denominator is the patient.

An excellent example of the spread in medical emergency admission can be seen in Essex using the point of onset of the increase in admissions at the various acute hospitals as a

measure of the spread. The onset of the 2007 outbreak occurs between May-07 to Nov-08 at different hospitals (around May-07 at Mid Essex; Aug-07 at Essex Rivers; Oct-07 at Southend and Mar-08 at Princess Alexandra). Detailed small area analysis shows a progressive spread in medical admissions to the Colchester University hospital between September to December 2008 depending on the location within North East Essex (unpublished studies). Such spread within the catchment area of a single hospital effectively excludes explanations based on changes in admission threshold. As seen in Wales the combination of this local spread is driven by the areas with the highest population giving an overall picture of around November 2008 in North East Essex as listed in Table 2. As in Table 2 the percentage increase in medical admissions seen at each acute site is highly variable.

Age

Previous studies into these events have identified somewhat unique profiles of age specific increases (Jones2010c-d, 2012g). Using the fact that spread across England occurred during 2007/08 and 2008/09 Figure 4 takes data from either side of this time period for Dermatology to investigate the net increase in first attendance by age band after adjusting for any underlying demographic growth in each age band. As can be seen the growth in referral to Dermatology shows a peak in both middle age and increasing growth for those aged over 60, i.e. the change has nothing to do with demography per se but is highly age specific. This tends to rule out a general and non-specific reduction in GP referral thresholds which would tend not to be age specific. Given the fact that the increase in GP referrals is wider than just Dermatology or the medical group (Jones 2012c) Figure 5 investigates the net increase across all specialties (excluding maternity) in relation to population as the net increase in referral rate per 100 head. As can be seen the effect is highly age specific especially as age increases and a generally higher increase for age 30-39 is confirmed, i.e. approximately 1.5 per 100 higher than the underlying age trend. The jump of around 2 per 100 head above age 70 (which exists after adjustment for the underlying growth in population) explains why demography is failing to explain the real trends. This is due to the fact that we have an 'infectious' event which is specifically targeting the elderly, i.e. is taking advantage of their innate movement toward age-related immunoscenescence. Hence the ageing population is resulting in an increasing pool of elderly who are more susceptible to immune dysfunction or to agents capable of enhancing such dysfunction (Jones 2012i). In this respect, the total number of persons in England over age 70 has increased from 3.3 to 6.1 million in the interval 1961 to 2011 (from 7.6% to 12% of the total population). The impact of these additional 2.8 million persons is then amplified by the age-specific nature of the proposed infectious outbreak described here.

Benchmarking

There are particular implications to the benchmarking of GP referrals and medical admissions. Table 2 has demonstrated that we are dealing with a time-based phenomenon which does not respect the artificial boundaries imposed by financial years. Table 2 also

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demonstrates that the effect upon each location is specific to the factors determining infectious spread (age profiles, population density, specific risk behaviours leading to person-to-person transmission, etc). Benchmarking is based on the assumption that such factors are not important and that age, gender and possibly deprivation are the only factors of importance and that any residual differences are therefore due to GP behaviour. It would appear that this assumption is only partly true and that benchmarking needs to be far more sensitive to the role of time-based events such as the one described here.

Adding together these individual step-like increases over larger geographic areas, i.e. regions, state or whole country, then generates the different shaped time trajectories which have been demonstrated to be associated with this phenomena both in the UK and overseas (Jones 1996, 2010c-f, 2012a-d,i). When the impact on cost is summed up at financial year level the underlying spatio-temporal spread generates the confusing patchwork of cost pressures demonstrated to apply to English PCTs (Jones2010f).

Wider Implications

The implication of these findings to the issue of a fair funding formula, the derivation of stable prices within particular HRG used in the NHS tariff and to the necessary appropriate public health and management responses should be apparent, i.e. identify the causative agent and initiate mass vaccination rather than inappropriate assumptions that something is wrong with the processes of primary and secondary care and hence all that is required is more demand management in its various forms. This should not be taken to imply that demand management is not needed or important but that it is not the necessary solution to this particular problem.

Conclusions

The infectious outbreak theory requires further validation but whatever the eventual outcome the trends are not in any way related to population demography, are strongly cyclic (recurring) in character and depend greatly on location. In Scotland the change in the relative proportion of first attendances in different medical specialties show that between 2002/2003 and 2009/2010 Dermatology/Allergy/Immunology, Neurology and Respiratory were the only groups to increase their share (with the possibility of Gastroenterology – but unclear if this was a shift from General Medicine to Gastroenterology as a sub-specialty or to a real increase). This along with the other reasons previously outlined led to the use of Dermatology (rather than a wider medical group) for the more specific analysis of the trends in Wales and Berkshire.

Hence either GPs across Scotland, England and Wales increased their pattern of referral (to both a medical group and other specialties) in a way consistent with the known spatio-temporal irregularities associated with infectious spread (Eubank et al 2004, Crighton et al 2007, Crighton et al 2008) or we have to seek some other explanation – all within the

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context that this is part of a wider international phenomena – in which a similar geographic spread of medical emergency admissions within the catchment area of a single acute hospitals can also be demonstrated both in England and overseas.

In conclusion, while it is true that the threshold to refer does vary among GPs and there are instances of inappropriate referral which are amenable to resolution by GP training programmes, it does not automatically follow that such behaviour can explain the increasing evidence for long-term recurring events which characterise not only GP referral but a multitude of other health care behaviours. Whatever the eventual cause the behaviour is certainly unprecedented with respect to its recurring and remarkable nature.

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Table One: Expected demographic growth in GP referral

Specialty	Growth p.a.
Nuclear Medicine	1.1%
Community Medicine	1.1%
Haematology	1.1%
Allied Health Professional	1.1%
Respiratory Medicine	1.2%
Critical Care Medicine	1.2%
Urology	1.2%
General Medicine	1.2%
Medical Ophthalmology	1.2%
Clinical Haematology	1.3%
Ophthalmology	1.3%
Cardiology	1.3%
Nephrology	1.3%
Clinical Physiology	1.3%
Prosthodontics	1.4%
Medical Oncology	1.4%
Palliative Medicine	1.4%
Cardiothoracic Surgery	1.4%
Clinical Oncology	1.4%
Audiological Medicine	1.5%
Geriatric Medicine	1.8%
Old Age Psychiatry	2.0%

Footnote: Outpatient first attendance by 10 year age band from 2007/08 (http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=892) was matched against ONS 2007 population estimates and per annum growth to 2017 was then calculated. All other specialties have expected growth of less than 1% per annum. Expected growth for Dermatology was 1.0% p.a.

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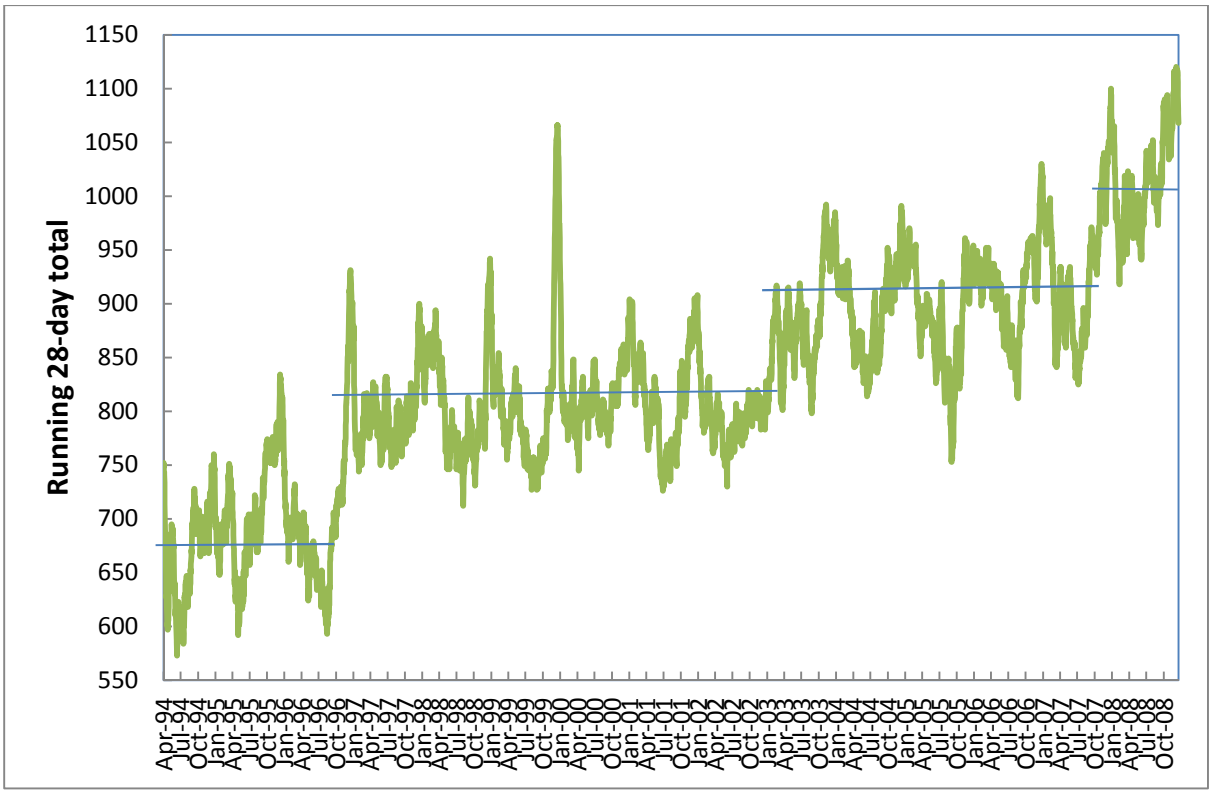
Table Two: Point of a step-like increase in GP referrals

Region	Location	Start	Change	Group
Scotland	Ayrshire & Arran	Feb-07	17%	Medical
Scotland	Tayside	Mar-07	24%	Medical
Scotland	Grampian	Mar-07	14%	Medical
Wales	Denbighshire	May-07	16%	Dermatology
Scotland	Fife	Jun-07	24%	Medical
Wales	Carmarthenshire	Jun-07	19%	Dermatology
Wales	Monmouthshire	Jun-07	18%	Dermatology
Wales	Pembrokeshire	Jun-07	40%	Dermatology
Wales	Newport	Jun-07	18%	Dermatology
Scotland	Lothian	Jul-07	15%	Medical
Wales	Cardiff	Jul-07	15%	Dermatology
Wales	Blaenau Gwent	Jul-07	20%	Dermatology
England	Bracknell Forest	Jul-07	36%	Dermatology
England	Windsor, Ascot & Maidenhead	Jul-07	32%	Dermatology
England	Wokingham	Jul-07	19%	Dermatology
England	Reading	Jul-07	13%	Dermatology
Wales	Flintshire	Aug-07	26%	Dermatology
Wales	Isle of Anglesey	Sep-07	11%	Dermatology
Scotland	Highland (1)	Sep-07	6%	All specialties
England	Slough	Sep-07	27%	Dermatology
Wales	Neath Port Talbot	Apr-08	15%	Dermatology
Wales	Swansea	Apr-08	14%	Dermatology
Wales	Rhondda Cynon Taff	Apr-08	19%	Dermatology
Wales	Caerphilly	Apr-08	18%	Dermatology
Wales	Wrexham	Apr-08	15%	Dermatology
Wales	Bridgend	Apr-08	13%	Dermatology
Wales	Conwy	Apr-08	29%	Dermatology
Scotland	Glasgow & Clyde	May-08	9%	Medical
Wales	Torfaen	May-08	14%	Dermatology
Scotland	Borders	Jul-08	11%	Medical
Scotland	Dumfries & Galloway	Aug-08	11%	Medical
Scotland	Lanarkshire	Aug-08	14%	Medical
Scotland	Forth Valley	Aug-08	13%	Medical
Wales	Merthyr Tydfil	Aug-08	11%	Dermatology
Scotland	Islands	Sep-08	13%	Medical
Wales	Ceredigion	Sep-08	25%	Dermatology
Wales	Powys	Sep-08	11%	Dermatology
Wales	Gwynedd	Sep-08	8%	Dermatology
Wales	Vale of Glamorgan	Sep-08	25%	Dermatology
England	North East Essex	Nov-08	15%	Medical Inpatient (2)

Footnote: The 'start' was determined by calculating the point where the running 12 month difference reached a maximum. The start was judged to be 12 month prior to this point. Outpatient first attendance following GP referral data from Berkshire was obtained at local authority level from Berkshire Shared Services. (1) Trend for the medical group of specialties was not clear and the larger all specialties total has been used to determine the start point, (2) unpublished analysis.

An edited version of this article was published as: Jones R (2012) Increase in GP referrals: jump or infectious push? British Journal of Healthcare Management 18(9): 488-497. Please use this to cite.

Figure 1: Trend in adult emergency medical admissions with an overnight stay



Footnote: Data is from the Royal Berkshire hospital in Reading, England and excludes all zero- or same-day stay admissions. Admissions are to the medical group of specialties including elderly medicine, haematology and oncology. Daily admissions were added together using a running 28 day total. Step changes in medical admissions were 18% in December 1996, 11% in November 2003 and 13% in October 2007. A previous step increase of around 13% occurred in February/March of 1993 (Jones 1996).

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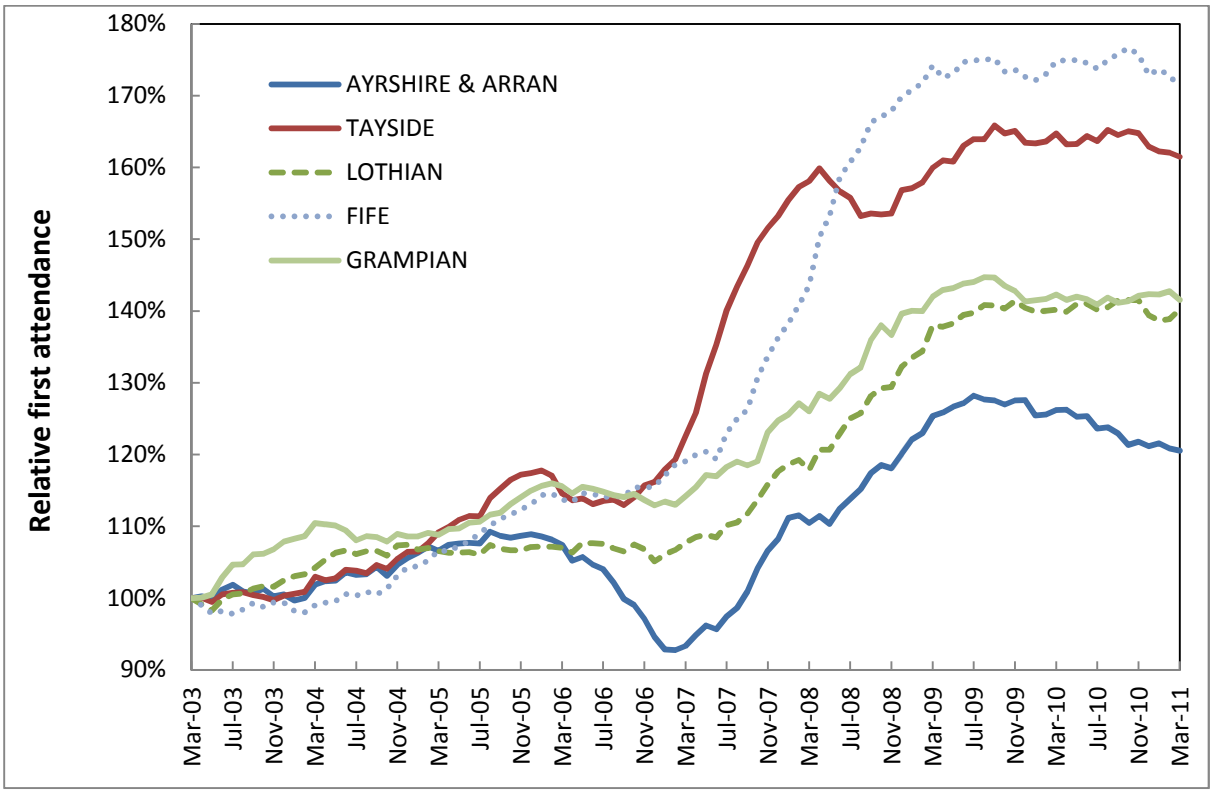
Figure 2: Running twelve month total of outpatient first attendance (Scotland)



Footnote: Data kindly supplied by ISD Scotland. To place the locations on a single chart all data is relative to the twelve month total from Apr-02 to Mar-03.

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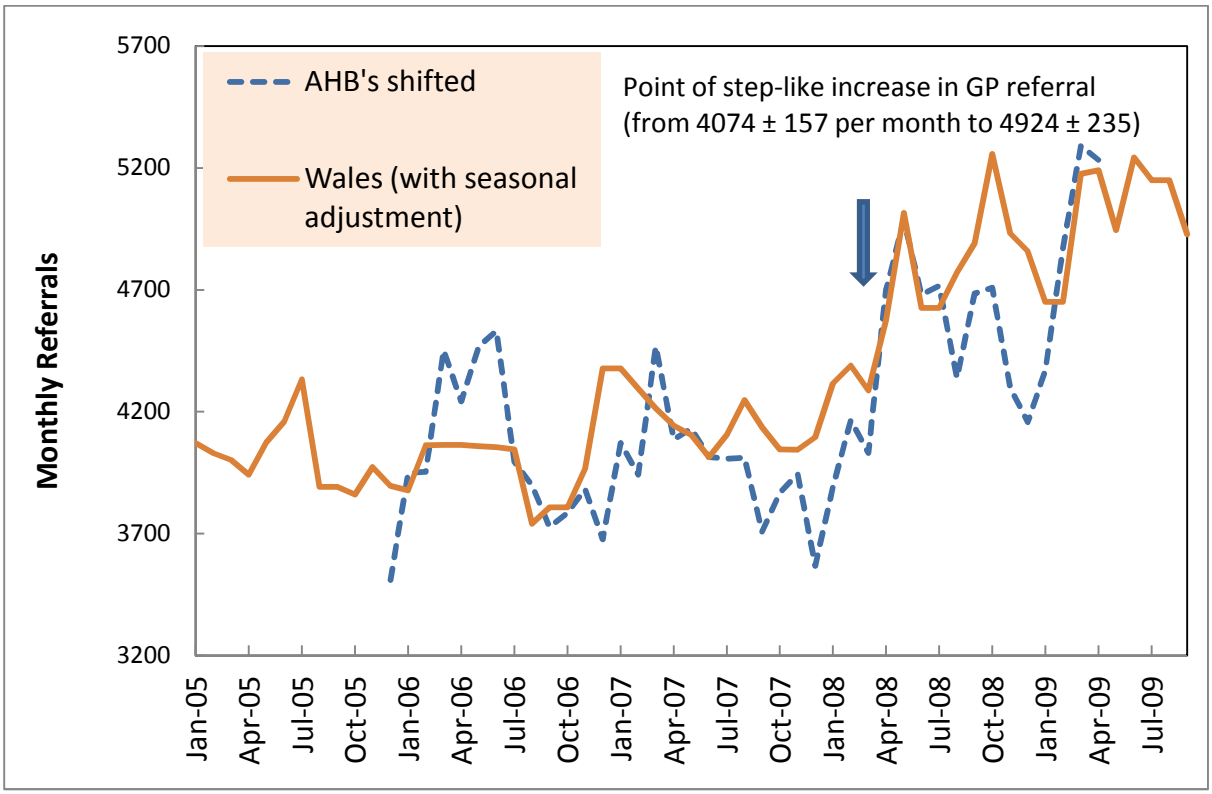
Figure 3: Monthly GP referrals to dermatology (Wales)



Footnote: Data is from the GP Referrals section in the 'NHS Hospital Activity' folder on the StatsWales website http://www.statswales.wales.gov.uk/ReportFolders/reportFolders.aspx Data for the whole of Wales has been seasonally adjusted by adjusting for work days per month and then applying seasonal factors to each month which were determined using the Solver function in Excel by minimising the sum of differences between adjusted months. The Area Health Board (AHB's) shifted data involved lining up the start month of the step change for all AHB's to that seen for the whole of Wales (seasonal adjustment has not been applied). AHB's were re-organised in September 2009.

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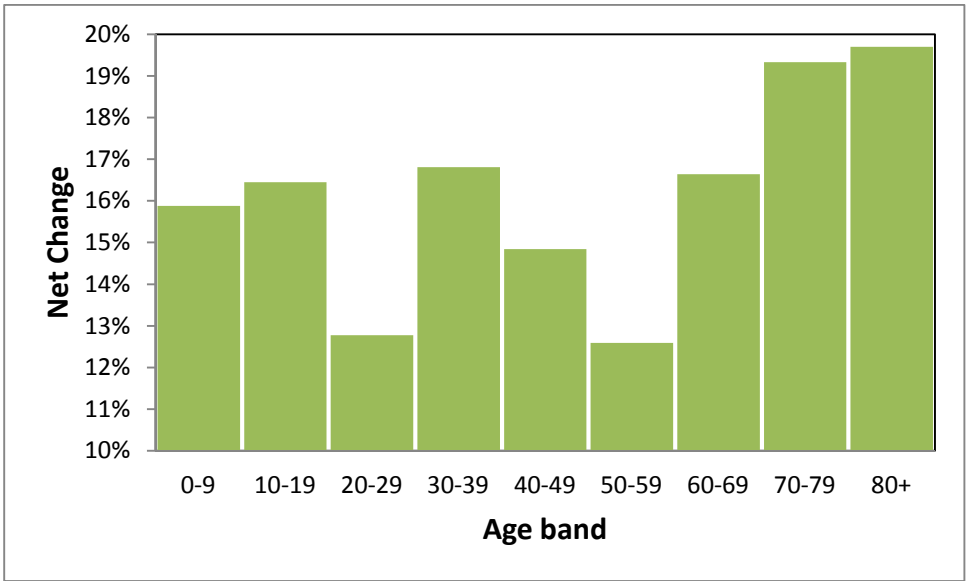
Figure 4: Net change in dermatology first attendance (England 2006/07 to 2009/10)



Footnote: Change in outpatient first attendance over the period 2006/07 to 2009/10 has been adjusted for population growth using ONS 2006 mid-year population forecasts. Data is from http://www.hesonline.nhs.uk/Ease/servlet/ContentServer?siteID=1937&categoryID=892

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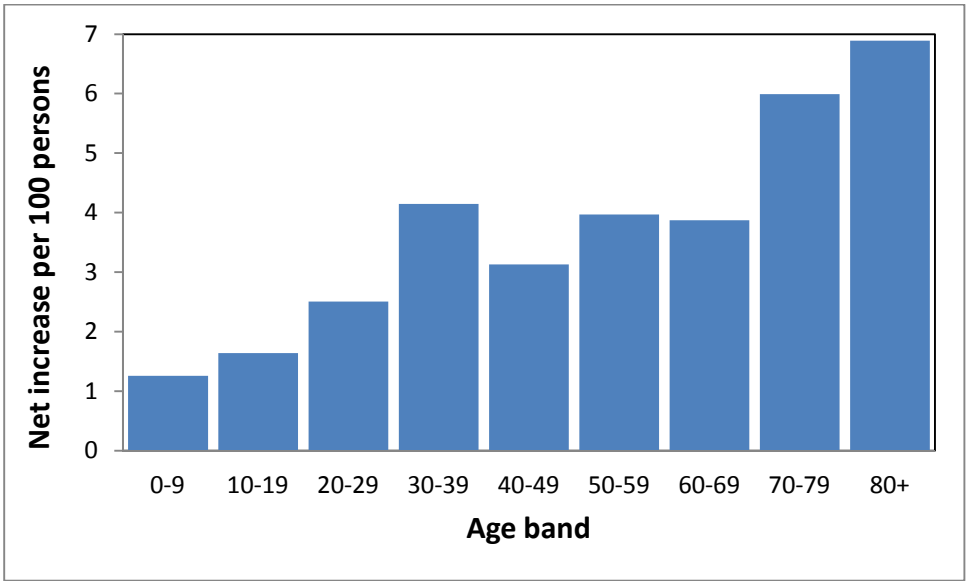
Figure 5: Net increase in total first attendance per 100 persons



Footnote: As per Figure 4 except total attendance across all specialties (excluding maternity) with growth adjusted increase calculated per 100 persons. The 95% confidence interval (assuming Poisson variation) for all age bands are very small ranging from ± 0.015 per 100 persons for age 30-39 to ± 0.03 for the 80+ age band, I.e. all differences between age bands are significant.