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Trends in English PCT Programme Budget expenditure – More questions than answers

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Key Words: health care cost cycles, programme budgets, infectious disease outbreaks, NHS, England, PCT, GP Commissioning, mental health, neonates, cancers

Key Points

- The cost of health care expenditure in England shows a time pattern consistent with that seen in the USA
- The broad PCT programme budget sub-categories conforming to the time pattern account for around 45% of total health care expenditure
- Analysis of the shifts in expenditure appear to suggest that the pattern is related to a biological phenomena such as a disease outbreak
- The outbreak appears to have a general northern aspect, however, travel to popular holiday locations during the summer of 2007 appears to be involved in the most recent outbreak
- The effect of this phenomena on health care expenditure is profound with a 15% to 40% step-like increase in costs for particular broad disease categories

Abstract

Each year Primary Care Trusts (PCTs) in England provide a breakdown of their expenditure into programme budgets covering 23 different categories of disease such as cancer, mental health and circulatory disease. Analysis of changes in these costs over the past six years confirms that at a national level the costs follow a pattern over time consistent a similar pattern seen in the components of health care cost in the USA. A key event appears to have occurred across England in 2007 which affected specific programme categories to a different extent. Categories most affected appear to be related to mental health, neonates, particular cancers, respiratory and social care costs. A regional pattern is also associated with this event. Possible causes are discussed.

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Introduction

The increase in medical emergency admissions has been an intriguing feature of health care for the past three decades. A recent series in BJHCM sought to categorise the different mechanisms which may be involved in the growth in emergency admissions and hence on the financial pressure associated with commissioning in health care (Jones 2009a-d). In the medical specialties a curious repeating pattern of step-like increases in admissions was highlighted. This step-like increase in medical admissions was first noted in 1993 (Jones 1996,1997) although it would appear that this was not the first instance of this phenomena. Based on further analysis It has been proposed that outbreaks of a new type infectious disease may be acting to increase hospital admissions for a range of diagnoses consistent with impairment of immune function, i.e. an increase in susceptibility to infection and inflammation, and to increase wider health care costs (Jones 2009a-c, 2010a-j). These outbreaks have been characterised in the UK, USA and Canada (Jones 2010f) and also appear to affect attendance at accident and emergency (Jones 2010m). In contrast, a study conducted by the Nuffield Trust using data over the period 2004 to 2009 proposed that the effect may be due to increasing acute efficiency which leads to greater capacity to admit more patients (Blunt et al 2010).

Whatever the cause each cost cycle commences with an approximate 10% step-like increase in mainly emergency admissions to a range of diagnoses within medicine and mental health. The last two of these outbreaks occurred around September in 2002 and 2007 in the UK, i.e. at month six in the financial year, although a slightly earlier date may apply to Scotland and a slightly later date to Wales (Jones 2010h,j). Considerable granularity appears to exist at a local level. At a local level the 10% step increase appears to continue for about three years and is then followed by a decline until the next outbreak. At national level the initial outbreak is followed by several years of growth as additional local outbreaks appear to continue after the initial outbreak clusters. If this is the work of an infectious agent a reasonable assumption would be that densely populated areas will be the most likely early loci for infection, but this may be complicated by holiday travel patterns. In this respect the summer school holidays in the UK extend from mid-July to early September.

Based on an analysis of health care cost cycles in the USA the total cost of health care should decline to a 'minimum', or more correctly show an inflection point, before the next outbreak repeats the cost cycle. Such a resulting cycle in cost pressures has been inferred to occur in the UK based on changes in bed occupancy and a cycle in financial surplus and deficit seen in the NHS concomitant to the last three outbreaks in 1996, 2002 and 2007 (Jones 2010a-d). The full financial impact appears to occur in the second year after each outbreak and hence the outbreak in late 1996 led to significant cost cutting in 1998, etc. However to fully prove this cycle requires access to detailed cost data at a local level. This has only recently been available in England.

Since 2003/04 Primary Care Trusts (PCTs) in England have been required to provide a breakdown of total expenditure against 23 different disease categories (plus additional sub categories) known as programme budgets (Department of Health 2010). Each category is based on disease areas broadly conforming to the International Classification of Diseases (ICD) and covers inpatient, outpatient, accident & emergency, drug and community costs. If an unknown infectious disease does exist then it's effects should be evident in the categories of disease expenditure most likely to be influenced by the specific mode of action.

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This study will investigate changes in programme budget expenditure in the period 2003/04 to 2008/09 to investigate if an inflection point can be seen to occur in the 2006/7 financial year which represents the financial year immediately prior to the proposed outbreak occurring toward the middle of 2007/08, i.e. where a part-year effect upon costs will be seen followed by a full-year effect in 2008/09.

Methods

Programme budget data for English PCTs was obtained from the Department of Health, Programme Budgeting Tools and Data website (http://www.dh.gov.uk/en/Managingyourorganisation/Financeandplanning/Programmebudgeting/DH_075743).

The data was aggregated to give national totals for each of the categories and sub-categories over the years 2003/04 to 2008/09. Each category was then investigated to see if there was a specific and large increase in total costs in 2007/08 and 2008/09 relative to 2006/07.

Numbers of males and females over the age of 65 by Strategic Health Authority as at April 2008 was obtained from the NHS Information Centre website

http://www.ic.nhs.uk/statistics-and-data-collections/population-and-geography/population/attribution-dataset-gp-registered-populations-2008

Results

Table 1 presents the growth in expenditure by category and sub-category for the whole of England over the period 2006/07 to 2008/09. The high growth areas are roughly consistent with the lists of medical and mental health diagnoses identified to be associated with the proposed immune function disturbance (Jones 2010h,i). A basket of 'high growth' categories (growth >15%) which accounts for approximately 50% of PCT expenditure was created from Table 1 and used for further study. Category 12 (Dental Problems) was excluded from this basket due to a possible confounding effect resulting from specific issues relating to NHS dentistry. Figure 1 shows the presence of the expected inflection point occurring in 2006/07 in the costs for this 'high growth' basket.

Table 2 presents the relative growth for a basket of high growth programme categories in each of the Strategic Health Authority (SHA) areas in England. Over this period PCT funding grew by an average of 14.9% and relative to this figure it can be appreciated that particular SHA's will have experienced far greater cost pressures than others. It has recently been proposed that this new disease may have a greater impact on elderly females (Jones 2010g) and correlation of the percentage growth in Table 2 against the proportion of females to males for the over 65's gives a line with a positive slope (Fig. 2) indicating that the proposed association appears to exert some effect . The scatter around this trend line indicates that specific factors which may relate to disease spread are involved. In this respect the South West is a clear outlier against a general northern disposition to higher growth (northern SHAs above the trend line).

Table 3 investigates the possibility of particular outbreak loci by selecting those PCTs with the highest growth in 2007/08, i.e. the first year of the outbreak. Given the summer nature of the outbreak it is interesting to note the high proportion of holiday locations in this list, namely; Devon,

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Cornwall, Isle of Wight, London, etc. Such a pattern is consistent with the known role of travel in the spread of infectious epidemics (Viboud et al 2006). Hence a pattern consistent with a genuine infectious outbreak is emerging from the programme cost data.

Were a disease to exist that impaired general immune function, it could be expected to influence costs relating to neonates via a combination of infection and inflammation in both the mother and the developing foetus. Figure 3 explores this possibility by taking the ratio of the cost for neonates relative to costs for maternity. This ratio is an attempt to factor out the possible confounding effect of changes in the number of births from one year to the next. As can be seen there is evidence that neonatal costs in 2007/08 and 2008/09 were indeed higher than may otherwise be expected.

As can be seen in Fig. 4 the trend over time for various high growth categories demonstrates that the proportion of expenditure relative to the total follows an expected cyclic pattern with a minimum spend in the year prior to the outbreak. Note that 2003/04 is the first full year after the 2002 outbreak. The high growth category group identified above was first used to demonstrate that the pattern existed. Individual categories were then tested to see if they conformed to the expected shape of the trend over time. Those which conformed to this shape were aggregated into the group labelled 'Shape' in Fig. 4 (categories 2-6, 8-9, 11, 15, 19) while all sub-categories showing high growth were aggregated into the 'Sub-category' group. A full breakdown of expenditure at sub-category level was only initiated in 2006/07 and hence it is not possible to test which members of the sub-category group follow the expected shape over time. However this analysis does demonstrate that somewhere around 45% of total health care expenditure is sensitive to the wider effects of each outbreak.

Discussion

The above results appear contrary to the proposed increase in organisational efficiency hypothesis. Firstly the ability to admit via increased efficiency will not simultaneously affect A&E attendance and will not produce regional patterns. The alternative hypotheses must therefore be considered. In this respect over the past two decades our understanding of the central role of immune function in health has expanded dramatically. The discovery of HIV/AIDS and its central effects against immune function has probably been one of the key driving forces behind immune research (Gottleib et al 1981, Brown 2001). Of relevance to the high ranking of a number of mental health conditions in Table 1 is the now irrefutable weight of evidence that immune function and mental health are intimately related (Dantzer et al 2008).

The wider and profound role of immune function can be discerned from even a small selection of studies. What became known as the 'Gulf War Syndrome' is associated with a complex immune impairment (Whistler et al 2009). A higher susceptibility to pneumococcal disease, bacteraemia, tuberculosis, malaria, etc has been shown to be related to genetic-based variants in immune function (Khor et al 2007, 2010) and genetic variation in the HLA region of the human genome points to a primary immune basis for late onset Parkinsons (Hamza et al 2010). Issues specific to the proposed new infectious disease have been presented elsewhere (Jones 2010h-j), however, the key point is that the expenditure effects are far wider than just emergency medical admissions to hospital, as has been identified in the USA (Jones 2010f) and has been reinforced by this study. It must be noted that this study is not suggesting that every diagnosis in the identified high growth

categories is affected in the same way but that sufficient are affected in order to drive a substantial marginal increase in costs.

The presence of particular cancers in Table 1 is consistent with the evidence that immune impairments due to AIDS, immune suppressing drugs or specific infectious agents leads to higher incidence of particular types of cancer (Grulich et al 2007, De Martel and Franceschi S 2008). In this instance a particular immune impairment could hasten the development of already existing cancers or act to make therapy more difficult and costly. The potential impact on neonates is a logical outcome of immune related inflammation, however the preliminary cost-based evidence presented here will require additional research to establish a definitive linkage.

Given the immune related nature of this new disease it is important to remember that there are a range of nutritional factors specifically relevant to particular vulnerable groups. Factors such as iron deficiency in home-bound elderly women can lead to substantial impairment in immune function (Ahluwalia et al 2004). Both type 1 and 2 diabetes mellitus are known to increase the risk of a range of common infections by greater than 30% depending on the type of infection (Muller et al 2005) and malaria by 46% (Danquahl et al 2010) which is an example of another immune impairment. Multivitamin and mineral supplementation in individuals with type 2 diabetes leads to a significant reduction in common infections (Barringer et al 2003). Of particular relevance to the UK where the soil is known to be generally deficient in selenium is the observation that this mineral plays a critical role in immune function in the elderly (Wardwell et al 2008, Mocchegiani et al 2009, Papp et al 2010) and both decreases the viral load and increases CD4 cell count in those suffering from HIV/AIDS (Hurwitz et al 2007). Selenium supplementation of deficient UK residents also resulted in enhanced ability of the immune system to clear poliovirus (Broome et al 2004).

Likewise there is a growing problem relating to vitamin D deficiency among the elderly in the UK (McKenna et al 1992, Hirani et al 2009). There is mounting evidence for the central role of this vitamin in immune function with linkages to adverse events in pregnancy (Lapillonne 2010), female acute hospital admissions (DeLappe et al 2006), deafness (Brookes & Morrison 1981), adult respiratory tract infections (Sabetta et al 2010), cancers (Hayes 2010) falls and fractures (Bischoff-Ferrari et al 2010), HIV/AIDS (Mueller et al 2010) and allergy (Zittermann et al 2009). All of which have direct relevance to particular categories identified in Table 1, i.e. a deficiency in this vitamin among vulnerable groups may be acting to facilitate or magnify the outbreaks of this new disease. Of relevance to the geographic distribution of this new disease it is of interest to note that the distribution of vitamin D status and accompanying diseases is known to vary with geography (Barker & Gardner 1974, McKenna 1992, Hayes 2010) and the distribution of Paget's disease as noted by Barker & Gardner (1974) has remarkable similarities with the ranking of SHA's seen in Table 2. This possible association will require further investigation.

Conclusions

Evidence has been presented to show that the cost of health care in England behaves in a way consistent with a proposed outbreak of an as yet unidentified infectious disease, possibly aided by regional variation in vitamin D status. Considerable further research is required to build upon these findings and identify the exact causative agent. The implications to the cost of health care in general

are profound and this disease may explain why emergency medical admissions have risen in a manner which is far above that expected from population demography over the past three decades.

This study lends support to the recent observation that the NHS funding formula is fundamentally flawed given its basic assumption that all health care costs arise from person- and population-based factors, i.e. the role of the environment and infectious outbreaks are ignored (Jones 2010l). Likewise the fundamental assumption behind all UK health resource forecasting, namely that demographic factors are responsible for future growth is also shown to have serious flaws (Jones 2010k). Indeed the so-called benchmarking of emergency admissions in different locations may be yielding results which are nothing other than a test for the presence of absence of the new disease.

It would appear that efforts to contain rising health care costs may be better focussed on identifying this agent and developing an effective vaccine or alternative anti-infective therapies. Other explanations may exist and hence urgent national and international research is required to explore all possible alternatives.

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Table 1: Growth in expenditure by programme sub-category

Category	Growth	Sub-Category	Description	Growth
01: Infectious diseases	14%	01a	HIV & AIDS	42%
02: Cancers & tumours	17%	02b	Upper GI cancer	19%
		02c	Lower GI cancer	17%
		02d	Lung cancer	17%
		02f	Breast Cancer	28%
		02x	Other cancers & tumours	21%
03: Disorders of blood	19%	3	Disorders of blood	19%
04: Endocrine, nutritional & metabolic	20%	04a	Diabetes	24%
		04b	Endocrine	16%
		04x	Nutritional & metabolic	16%
05: Mental Health	17%	05a	Substance misuse	31%
		05b	Organic mental disorders	24%
		05c	Psychotic disorders	43%
06: Learning Disability	18%	6	Learning Disability	18%
07: Neurological & Pain	24%	07a	Chronic pain	20%
		07x	Neurological	27%
08: Problems of vision	24%	8	Problems of vision	24%
09: Problems of hearing	33%	9	Problems of hearing	33%
10: Problems of circulation	8%	10b	Cerebrovascular disease	22%
		10c	Problems of rhythm	18%
11: Respiratory problems	22%	11a	Obstructive airways disease	21%
		11b	Asthma	23%
		11x	Other Respiratory problems	21%
12: Dental problems	22%	12	Dental problems	22%
13: Gastro Intestinal System	8%	13c	HepatoBiliary	16%
14: Problems of Skin	16%	14x	Skin problems (excl burns)	17%
15: Musculoskeletal	21%	15	Musculoskeletal	21%
17: Genito Urinary System	9%	17c	STD	29%
19: Conditions of neonates	33%	19	Conditions of neonates	33%
20: Adverse effects & Poisoning	27%	20a	Unintended effects of treatment	25%
		20b	Poisoning	39%
21: Maintaining healthy individuals	35%	21a	NSF prevention programme	113%
		21b	Mental health prevention	176%
		21x	Healthy Individuals	27%
22: Social Care Needs	23%	22	Social Care Needs	23%
23: Workforce & Miscellaneous	10%	23x	Miscellaneous	23%
All Categories	15%		All Categories	15%

Footnote: Growth is over the period 2006/07 to 2008/09, only sub-categories with growth over 15% are shown.

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Table 2: Cost increase for a basket of 'high growth' categories

Strategic Health Authority	Growth
South West	26%
North East	25%
North West	24%
West Midlands	24%
Yorkshire & the Humber	23%
England Average	**21%**
South East Coast	20%
East Midlands	18%
London	17%
South Central	16%
East of England	14%

Footnote: Growth is over the period 2006/07 to 2008/09

Table 3: PCTs showing highest growth in 2007/08

SHA	PCT	Increase
South West	Devon	35%
North East	Redcar and Cleveland	33%
West Midlands	Solihull Care Trust	33%
Yorkshire	Calderdale	30%
North West	Tameside and Glossop	30%
Yorkshire	Leeds	29%
East of England	South West Essex Teaching	29%
South East Coast	West Kent	27%
London	Waltham Forest	25%
North West	Bolton	24%
North West	Halton and St. Helens	24%
South West	Cornwall and Isles Of Scilly	24%
South Central	Isle of Wight Healthcare	24%
South West	Bristol Teaching	23%
Yorkshire	North East Lincolnshire	23%
London	Richmond and Twickenham	22%
London	Westminster	21%

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Figure 1: The trajectory in costs for the 'high growth' categories.

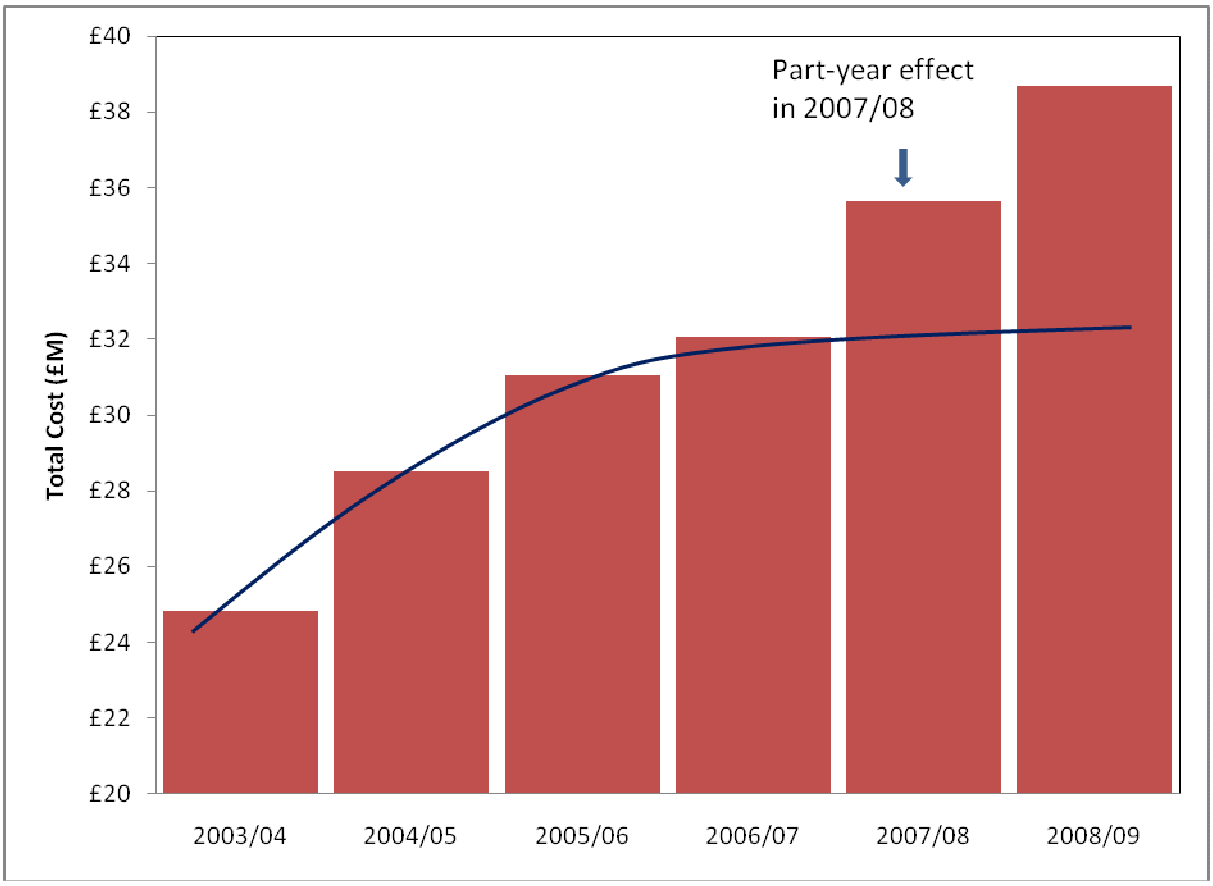

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Figure 2: Growth in expenditure and proportion of elderly females

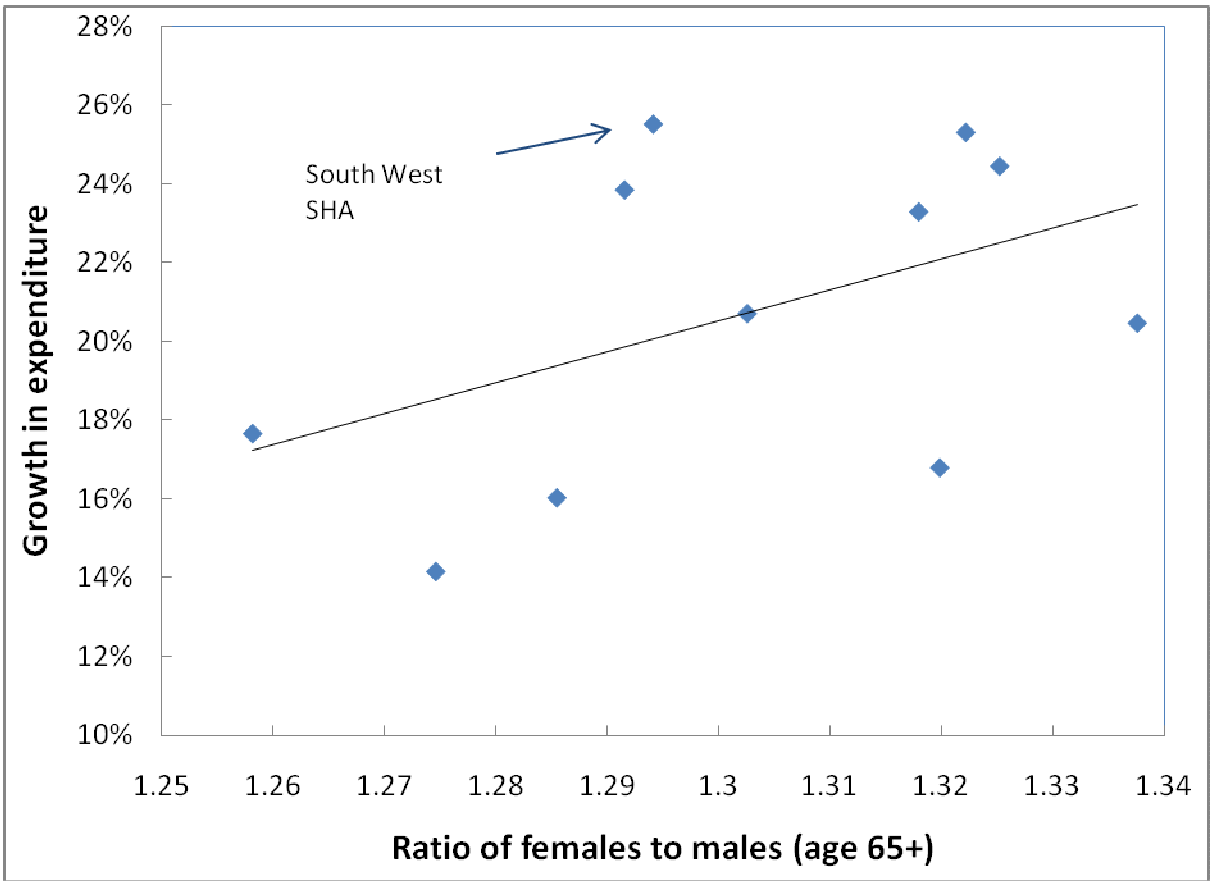

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Figure 3: Expenditure on neonates relative to maternity

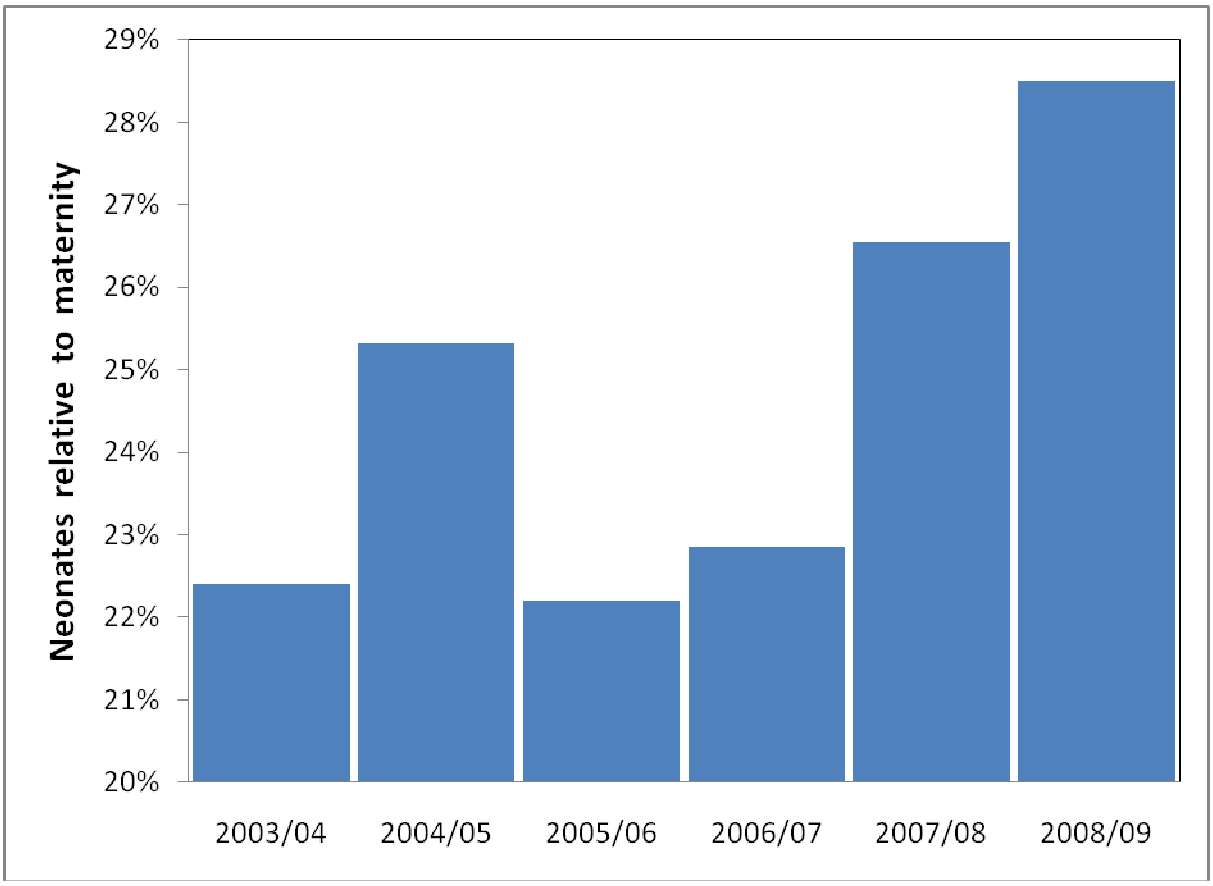

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Figure 4: Proportion of total spend affected by the outbreak