Refereed papers

Is primary care ready to embrace e-health? A qualitative study of staff in a London primary care trust

Rishi Mannan BSc (Hons)
Fourth Year Medical Student (Intercalated BSc in Primary Health Care), Department of Primary Care and Population Sciences

Jeannette Murphy BSc (Hons)
Senior Lecturer in Health Informatics, Centre for Health Informatics and Multi-professional Education (CHIME)

Melvyn Jones MB BS MSc MRCGP
Senior Lecturer in General Practice, Department of Primary Care and Population Sciences
Royal Free and University College Medical School, London, UK

ABSTRACT

Objectives e-Health refers to the organisation and delivery of health services and information using the internet and related technologies. We investigated the perceptions of primary care staff towards e-health initiatives in the NHS Connecting for Health programme and whether front-line staff are ready to implement such changes.

Design Twenty participants from different professional groups were purposively selected for interview, based on their current computer usage. The same practice staff were subsequently observed in order to gain an insight into how they use computers.

Subjects Practice staff (doctors, nurses, practice managers and receptionists) who will be expected to use new information technology and primary care trust (PCT) staff who are involved in its implementation were selected to participate in this study.

Setting A north London PCT with 62 general practices. Four practices were selected for the study.

Results Analysis of the interviews and the observational data yielded six recurrent themes that have a bearing on readiness to use information and communication systems to support clinical care: perceptions of technology and NHS Connecting for Health; issues relating to resources; patient choice; matters relating to confidentiality and security; political pressures; and how information technology is currently used within primary care.

Conclusions At the time of the study the systems that form part of NHS Connecting for Health, apart from the Quality Management and Analysis System (QMAS), were not implemented across the PCT. All the practices in the study acknowledged the benefits new technology would bring to the workplace, but there were also some common concerns, which suggest that staff working in primary care practices are not ready for e-health. Successful implementation of the NHS Connecting for Health programme rests on identifying, acknowledging and overcoming these concerns. A different approach might be required for those practices that have made very little progress in using email or moving towards an electronic patient record. This study suggests that a mistrust of technology and fears as to the heavy initial workload involved in becoming fully computerised have dissuaded some practices from embracing e-health. If NHS Connecting for Health is to be a success, implementation teams might need to focus initially on practices that have been reluctant to use technology to support both clinical care and the day-to-day work of the practice.

Keywords: attitude to computers, computer systems development, primary care
Introduction

The area of e-health is potentially vast. For the purposes of this paper e-health will be defined as ‘the organisation and delivery of health services and information using the internet and related technologies’. The UK National Health Service (NHS) is convinced that information and communication technologies have a key role to play in the modernising of service delivery. Brennan insists that technology is a prerequisite for change in the health service. In the 1990s, two successive information strategies sought to embed technology into clinical practice. Following the publication of the 1998 strategy (Information for Health), various developments altered the policy context, most notably the NHS Plan (2000) and Wanless report (2002) on the future funding of the NHS. By 2002, concern about a lack of progress in meeting the published deadlines led to a change of approach and the launch of the National Programme for Information Technology (NPfIT). A Director General of IT was appointed and a much more top-down approach to procurement and implementation was adopted. In 2005 the Department of Health launched NHS Connecting for Health, which provides a framework for the future use of technology within the NHS. Box 1 outlines the core elements of this programme.

Although the government is committed to using information and communication technology to improve quality in the NHS, it is not clear whether all sectors of the health service are ready to embrace e-health. Many commentators feel that health care continues to lag behind other sectors when it comes to realising the benefits of computer technology. The greatest challenge is to persuade frontline staff that technology can help patients and lead to improvements in the way they work. Primary care should, in theory, be far more prepared for the coming changes than secondary care. Primary care computing in the UK has a long history stretching back over 25 years, and the systems used are more sophisticated than those used in many other countries. By the mid 1990s, around 90% of UK general practitioners (GPs) were using computers during their consultations.

However, despite this high level of computerisation, there are suggestions that the full potential of computer technology has only been realised by the dedicated few, with most practices still using the computer for basic data collection. As the deadlines associated with NHS Connecting for Health draw nearer, it is timely to conduct a study of the attitudes of primary care staff towards e-health initiatives and to explore how they are currently using technology. The findings from the study should be of interest to primary care trusts (PCTs) who are anxious to overcome the ‘Islands of Excellence’ dilemma, ensuring that all practices move from using the computer as an administrative tool to integrating it into clinical care.

The concept of ‘readiness’ for e-health

The concept of ‘readiness’ to implement technology is used as a shorthand term to cover a range of organisational dimensions. Related terms include ‘innovation’ and the ‘adoption of new technology’. The concept of innovation readiness has received limited attention in the general organisational change literature. However, with accumulating evidence about the failure rates of new IT systems in the healthcare setting, it is essential to have some indication as to whether organisations are ready to make effective use of technology. The US healthcare organisation failure rate for new IT implementations is estimated at around 50%. Snyder-Halpern argues that a primary reason for this high failure rate is the lack of assessment.

<table>
<thead>
<tr>
<th>Box 1 Key elements of NHS Connecting for Health</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 NHS Care Records Service (CRS) – Goal is to ensure that patient information is available electronically to professionals providing care, wherever and whenever treatment is occurring. Fifty million patient records in England are to be computerised.</td>
</tr>
<tr>
<td>2 Choose and Book – General practices will be able to book outpatient appointments for their patients online.</td>
</tr>
<tr>
<td>3 Electronic prescribing – Prescriptions generated by doctors will be sent to a patient’s preferred pharmacy via the internet.</td>
</tr>
<tr>
<td>4 QMAS (Quality Management and Analysis System) – Measures how well a practice is doing in relation to guidelines set out by the new GP (GMS II) contract.</td>
</tr>
<tr>
<td>5 Picture Archiving and Communication System (PACS) – Will allow images to be incorporated into a patient’s electronic record.</td>
</tr>
<tr>
<td>6 Secure clinical communication email service – To enable clinicians to relay information and queries between members of the healthcare professions.</td>
</tr>
</tbody>
</table>
of broader organisational risks associated with clinical IT innovation. Her research suggests that an important way to identify hazards associated with clinical systems innovation is to assess the readiness of healthcare organisations for these innovations.\(^1\)

In 1999, Denis Protti was commissioned to assess the state of readiness of the NHS for Information for Health.\(^2\) Based on an analysis of local implementation strategies, he identified 11 progress markers, together with nine key risks for the national strategy. Bend’s approach to assessing readiness for e-health was to identify significant barriers to the successful use of information and communication technologies which prevent the delivery of benefits.\(^2\) In 2004, the NHS Confederation carried out a study of NHS organisations to find out how managers were planning to implement NPfIT.\(^19\) Three-quarters of the organisations in the study either had conducted or were planning to conduct an assessment of their readiness for electronic booking and the NHS Care Record Service. A study currently being carried out at Glasgow University is seeking to develop a structured, predictive instrument to test the readiness of health professionals to use new e-health systems.\(^30\) The Royal College of Nursing has commissioned several studies to gain insight into the attitudes of nurses towards e-health initiatives which provide insight into their readiness to adopt new systems and new ways of working.\(^21,22\) By and large these studies of readiness for e-health focus on the organisational level, and involve analysis of policy documents, interviews with senior staff and managers, or large-scale surveys. There have been few qualitative studies exploring the perceptions, knowledge and expectations of primary care teams. A recent paper by Hendy et al studied the challenges in implementing the National Programme but the focus was on managers at an acute trust level.\(^23\)

Primary care clinicians’ views on NHS Connecting for Health

There is a substantial literature on the use of computers in general practice, starting from the pioneering work by Preece (1983).\(^24\) However, given the newness of NHS Connecting for Health, there have been relatively few studies on how primary care staff perceive the pending changes or their readiness to implement them. The main empirical evidence comes from the six Medix surveys, which investigate the views of doctors in England about the NPfIT. The latest (2006) Medix survey indicates that doctors are increasingly critical of the costs of the National Programme and the way it is being implemented. Fifty-six percent of the 1329 doctors surveyed had little or no information about the programme and few knew anything about the introduction of services that would affect them. Seventy-seven percent of GPs in the survey did not know when they were likely to be sending prescriptions electronically. There has been a sharp decline in the proportion of GPs who see the National Programme as an important priority for the NHS: a drop from 67% in 2003 to 38% in 2006. GPs expressed dislike of the electronic booking service and were worried that the NHS Care Records Service will lessen patient record confidentiality.\(^25,26\)

How computers are currently used in primary care: summary of literature

A search of bibliographic databases (Medline, Embase, HIMIC and Ulrich) was carried out to find studies on the implementation and use of technology in primary care. The following search terms were used: ‘General Practic* OR Primary Care OR Family Practic*’ AND ‘Information Technology OR Clinical Syste* OR Information Syste*’. Twenty-two articles were retrieved, four of which were deemed relevant to understanding the factors that make practices resistant to integrating computers into clinical care. Mitchell and Sullivan’s review identified five areas of concern that could impede the implementation of NHS Connecting for Health in primary care: privacy; doctor–patient relationships; cost; time and training.\(^27\) Training was also singled out as a critical factor in successful adoption of technology by Tai et al\(^28\) and Smith.\(^29\)

A recurrent theme in the literature is how computer use affects the consultation. A key feature of general practice is that it is patient-centred, and the worry many doctors have is that the computer takes their attention away from the patient.\(^30\) Although over 20 years old, Fitter and Cruickshank’s study\(^31\) of the different styles of computer usage in the consultation continues to influence research.\(^30\) Fitter and Cruickshank identified three patterns of computer use:

1. **Minimal users**, who only record at the end of the consultation after the patient has left
2. **Conversational users**, who record throughout the consultation, alternating between talking to the patient and recording
3. **Block users**, who interrupt the consultation to use the computer.

Robinson\(^15\) suggests that in the absence of computerised patient records in hospitals, early in their training doctors develop the habit of writing up their notes after they have seen the patient. When doctors enter general practice, they are inclined to cling to their earlier habits and use the computer to record information at the end of the consultation. While this strategy may have worked in the past, the expectation
is that in future doctors will need to make the computer part of the consultation. (Robinson describes this as the triadic consultation: the GP, the patient and the computer.)

There are problems in generalising from early studies of computer use in the consultation to present-day practice. Early studies looked at a relatively mechanical part of the consultation: the generation of prescriptions. By contrast, the use of electronic paper records and decision support tools in the consultation requires the clinician’s full attention. In using such tools, the clinician must engage with the computer during the main body of the consultation, instead of leaving it until the end. A number of recent investigations have explored the way in which GPs use computers with the aim of identifying ways to ensure the computer does not damage rapport. It is likely that in future these skills will be taught to all clinicians. Robinson suggests that there is a need for research to update our understanding of how computers are being used in real consultations.

Gaps in the literature

Our literature review did not identify any studies that specifically examined whether primary care clinicians are ready or willing to implement e-health initiatives. Another point, which emerged from a review of previous work, was that the views of members of the primary healthcare team other than GPs tend to be overlooked. The present study investigates the perceptions of front-line staff working in primary care settings in London PCTs with a view to understanding whether there are any common factors that lead staff to be unprepared for the developments that are taking place in the NHS.

Methodology

Preparatory study

Four members of staff from the Information Management and Technology (IM&T) department of a north London PCT involved in the implementation of the National Programme for IT participated in a 30-minute, semi-structured interview designed to explore their views on how the National Programme affected primary care. The results of these interviews were used to design a pro forma to guide semi-structured interviews with a sample of general practice staff in the same PCT.

Main study

All 62 general practices in the PCT were invited to participate in this study. A purposive sample of four practices was sought, taking into account the size of the practice and its degree of computerisation. The three indicators on the degree of computerisation were: (i) whether the practice was paperless; (ii) whether email was used for internal as well as external communication; and (iii) the availability of data regarding Parkinson’s disease (chosen as this is not a quality marker for the new GP contract). This yielded four strata (see Table 1).

We identified, but were unable to recruit, a large practice (B) with a low degree of computerisation into this study. Instead, a fourth practice was recruited (E) which differed from practice D in terms of the socio-demographic characteristics of the practice population (see Table 2).

A doctor, nurse, practice manager and receptionist from each of the recruited practices were individually interviewed. At the beginning of each interview, participants were shown a flash card outlining the main elements of the NHS Connecting for Health programme so that all participants had at least a basic knowledge of what the system entailed. A topic guide, derived from the preparatory study, was used to ensure the same general topics were explored with each interviewee. In order to ensure that the interviewer’s understanding was correct and reflected the views of the respondents, the interview concluded with the interviewer summarising the main themes expressed during the discussion to check for accuracy and allow for clarification.

This study was triangulated by observing practice staff to explore how actual computer usage related to staff views on e-health. Observations lasted for 30 minutes and field notes were taken on the layout of the

<table>
<thead>
<tr>
<th>Table 1 Practices sought for the study and practices recruited</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Small practice</td>
</tr>
<tr>
<td>Low degree of computerisation</td>
</tr>
<tr>
<td>High degree of computerisation</td>
</tr>
<tr>
<td>Large practice</td>
</tr>
<tr>
<td>Practice (B) – not willing</td>
</tr>
</tbody>
</table>
consultation room, the role of the computer during the consultation, and the participant’s interaction with patients and the IT system.

Data handling
Interviews lasting on average for 30 minutes were audiotaped, transcribed and independently checked for accuracy. Observational data were recorded in field notes and a research diary was kept throughout the study period.

Interview data were evaluated using thematic analysis. Transcriptions were read and re-read independently by two researchers. Emerging themes (and subthemes) were identified and discussed in light of the interviews and observational data. Any disagreements were mediated by the input of a third researcher. A consensus on the final themes and constructs was reached and transcripts were read a further two times to catalogue their occurrence. Sampling ceased after 20 interviews as saturation was reached.

Results
Table 2 describes the baseline characteristics of the four practices.

Themes
Six recurrent themes were identified during the analysis of interviews and observational data.

1 Perceptions of technology and NHS Connecting for Health (see Box 2)
Although participants’ perceptions of computer systems varied, in general they believed IT would improve efficiency, communication, accessibility and accuracy of data within the workplace. Contrary to what some analysts claim, participants from computerised practices were, on the whole, not averse to changing clinical systems as they felt they had transferable skills. However, practical problems such as potential data loss were cited as a disincentive to migrating to a new system.

In the non-computerised practice, a lack of confidence in IT and a belief that computers are liable to breakdown were given as reasons for resisting the move to computer-based ways of working. In only one case did a respondent disclose that the computerisation of the practice was linked to monetary reasons (the incentives in the new GMS contract).

2 Issues relating to resources (see Box 3)
A majority of practice staff expressed concerns relating to the possible impact of the National Programme for IT on workload and work patterns. A nurse in the paper-based practice had recently begun to input data onto the computer as well as in the paper records and this had increased his workload. Many participants felt that they had not received adequate training on their current system and believed training would be vital to the success of the National Programme. Interviewees drew attention to the costs associated with the National Programme for IT, and practice managers in particular felt that this may hinder its

<table>
<thead>
<tr>
<th>Table 2 Practice demographics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practice</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Number of patients (approx.)</td>
</tr>
<tr>
<td>Connection to Path Links*</td>
</tr>
<tr>
<td>Paperless, paper-light† or paper-based</td>
</tr>
<tr>
<td>Data readily available on Parkinson’s disease?</td>
</tr>
<tr>
<td>Email used for communication</td>
</tr>
<tr>
<td>The socio-demographic profile of local area</td>
</tr>
</tbody>
</table>

* ‘Path Links’ enables a practice to receive all pathology results via the internet.
† ‘Paper-light’ is where the practice is computerised but has not fully dispensed with paper records.
implementation. Many practice staff wanted more information on NHS Connecting for Health before any new systems were implemented. Furthermore, staff from both the PCT and the practices felt that doctors with no experience of computers could not be expected to learn and embrace new technology. They predicted that change would come more readily once this generation retired.

3 Patient choice (see Box 4)

Patient choice is at the heart of the NHS Connecting for Health agenda, principally through the ‘Choose and Book’ system, which gives patients a choice of up to five providers at the point of referral. Opinions from staff regarding the ‘Choose and Book’ system varied. Some felt it would result in increased choice, whereas others were doubtful. Furthermore, several clinicians did not see choice as an important NHS priority. Some primary care staff perceived that the demographics of their population (notably younger patients of a higher social class) were likely to lead to greater demands for choice.

4 Confidentiality and security (see Box 5)

Interviewees expressed conflicting views as to whether confidentiality and security would be safeguarded. Furthermore, concerns that unauthorised personnel would gain access to patient records were mirrored across practices and PCT staff.

5 Political pressure (see Box 6)

Respondents showed awareness of the political agenda behind NHS Connecting for Health. Knowledge of past IT failures led some respondents to be sceptical as to the likely success of the current programme. In addition, practice staff expressed fears that changes would be forced upon them. The timing of this study is important in that it was undertaken in the run-up to the 2005 UK general election when patient choice was high on all political agendas. Additionally, almost all practices were in the final stages of completing the Quality and Outcomes Framework (QOF) element of the new GMS contract, which has important implications for practice income and provided practices
Box 3  Issues relating to resources

a. Workload and work patterns

‘While the patient is here you can Choose and Book [appointment], give it to them and cut some [of] my work and probably some [of the] patient’s work as well. It saves me having to sit after the surgery writing the letter, or dictating the letter, then printing it, sending it to the hospital, etc., so it will cut down on all that.’

*Doctor from a small computerised practice*

‘I suspect that what is going to happen is that we will not do it ourselves [Choose and Book]. We will just tell patients to see another member of the practice. We will have to recruit someone new or [redeploy] an existing member of staff to new duties.’

*Doctor from a large computerised practice*

‘... I don’t know whether it’s actually going to mean that there are fewer jobs needed, whether more people will be made redundant ...’

*Member of staff from the PCT*

b. Training

‘In terms of making it easier, training would be important. They give you training dates then cancel them ... I’ve been here nearly a year and I’ve just been on my first training day for IT ... So if they are going to implement something, they are actually going to have to have the training before they implement it.’

*Nurse from a large computerised practice*

c. Cost and funding

‘We would need training to change systems. Obviously that needs to be funded. Training, computers: who would fund all that?’

*Manager from a small practice with limited computer usage*

d. The need for information

‘... we don’t feel we have much involvement in it, even though we’re the ones who will be helping to roll it out and use the system. It would be nice if the user were consulted.’

*Doctor from a large computerised practice*

e. Attitudes and values of the doctor

‘I think [NHS Connecting for Health] will push out anyone who doesn’t know anything about computers. Some of our GPs at the moment ... I don’t mean it badly, but we’re almost waiting for them to retire. Because they don’t use the computer at all and you know they are not prepared to [learn] anything about computers.’

*A member of staff from the PCT*

---

Box 4  Patient choice

‘... [the] concept is a good one. It is going to mean the patient is going to have the choice of times and dates ... Well, I don’t think it will provide better choice, as we’re not going to have any new hospitals to choose from. We might be electronically linked with some ... it may even be fewer because we’re not going to have links with every hospital that we may want to refer people to ...’

*Manager from a large computerised practice*

‘... this is a very deprived area. People don’t worry about choice; they simply want good quality care. They want to be seen quickly ... and they are happy to go locally if they are going to get a fast, efficient service ... This concept of choice is [a] politically driven issue.’

*A doctor from a large computerised practice based in a deprived area*

‘... “Choose and Book” will offer more patient choice as some of our patients will be willing to travel further afield. Obviously the elderly people like the local hospitals, whereas the younger/middle-aged people, they can get further out so they will be okay.’

*Manager from a small practice with limited computer usage*
with their first experience of NHS Connecting for Health.

6 Ways in which practices currently use information and communication technology

Unsurprisingly, staff in practices that make greater use of computers seemed more enthusiastic towards technology. All three styles of computer usage as described by Fitter and Cruickshank were observed. Individual doctors were seen to adopt different consultation styles depending on the patient, a point that has not been noted in other research. In general, during a routine consultation where the patient was well known to the doctor, a conversational approach was likely to be adopted. In a more complex consultation a block approach was utilised, whereby the doctor would intermittently stop the consultation to input data into the computer. Finally, for more sensitive consultations, the computer was not used and the patient was given the doctor’s full attention. This finding requires further investigation as it may have implications as to whether it is feasible or desirable to use a computer during stressful or pressured consultations.

Discussion

If the NHS is to reap the benefit of the large investment in information and communication systems, it is essential that all staff in general practice are ready and willing to use these technologies. There are fears that a national system will not meet the needs of end-users; to address this, developers need to understand the preferred ways of managing information. By taking into account the concerns of practice staff and PCT’s NHS Connecting for Health implementation teams can increase the readiness and willingness of practice staff to make effective use of technology.

Strengths of study

This study was very timely since it was undertaken during the implementation of the first year of the QOF measurements. The timing gave us a chance to observe clinicians having to deal with substantial changes to their working practices and working to national standards.
Unusually, we had the chance to directly observe front-line clinicians’ use of IT systems in clinical settings. This methodology therefore allowed us to triangulate interview data from a range of practice staff with this observational data. Independent development of themes from the results were used to identify key concerns. Development of the conceptual framework by a multidisciplinary team adds to the study’s robustness. Furthermore, the purposive sampling allowed us to capture a range of views from high to low IT users.

Limitations

Even though a purposive sample was sought, it is possible that those who responded to the invitation were more interested in e-health than non-respondents, and this may have biased the themes that emerged. We were unable fully to meet the intended purposive sample because a large non-computerised practice willing to participate in the study could not be recruited. Large practices are by their very nature likely to be more organised and more reliant on IT, so we were not surprised about the failure to fill this element of our purposive sample.

The relevance of the findings to primary care

This qualitative study has added to our knowledge of primary care staff’s perceptions on the use of technology, an area that has not been explored in past medical literature.

This project focused on a small sample of general practice staff in an urban primary care setting and caution is needed when trying to generalise these findings. However, the themes that emerged from the interviews and observations are likely to be relevant to other UK PCTs.

IM&T Directors in PCTs and those responsible for NHS Connecting for Health might wish to reflect upon some of the beliefs uncovered by this study in order to increase the likelihood of a seamless transition into the next generation of computerised general practice.

As technology becomes more widely used in primary care, the issues raised by respondents need to inform how systems are implemented. For example, understanding that people want ownership and involvement in the development of new systems, a point that has not been prominent to date in NHS Connecting for Health, needs to be given more importance as systems are rolled out.

Conclusions: is primary care ready for e-health?

Practice staff acknowledge the benefits of IT in the workplace in terms of improvements to the efficiency, communication, accessibility and accuracy of data within primary care.

Those already using computers believe they have transferable skills and therefore are able to adapt to new and ever-evolving clinical systems. Interestingly, opposing views have been expressed in the media.

The lack of trust in IT is a significant barrier to embracing the National Programme for IT. Implementation teams need to work towards transforming these practices’ beliefs, improving their confidence in technology and assisting them in terms of funding, training and staffing whilst they adapt to their new working styles. Similar provisions will also need to be made for relatively advanced practices. Comparable views have been mirrored in the respondents’ comments from the 2006 Medix Survey.25

Additionally, non-clinicians fear that some doctors, particularly if they are nearing the end of their medical careers, might choose not to engage with e-health initiatives, and computerisation may precipitate an early departure from the NHS.

Smith29 has shown that for a system to be implemented successfully, it needs to yield benefits for the users. The ‘Choose and Book’ system is an example of a system that benefits the health service but not the front-line user, and has resulted in low usage. Only 63 appointments were made with ‘Choose and Book’ by the end of 2004 whereas NHS Connecting for Health had forecast over 200,00032 (though it is fair to say that uptake has increased rapidly in the first half of 2006). In contrast, the QOF has been almost universally used due to its inherent financial incentives.33

Adequate incentives both in terms of clinical utility and financial reward will increase the chances of successful implementation of the NPfIT.34 However, if the national system were to become vulnerable to breaches of confidentiality, the professional obligations of doctors and nurses would mean they would very rapidly switch off or disconnect such systems.

ACKNOWLEDGEMENTS

We would like to thank the PCT and general practices who showed interest and participated in this study.

Ethical approval was gained from Barnet, Enfield and Haringey Research Ethics Committee.
REFERENCES

3 Brennan S. The Importance of Infrastructure. www.connectingforhealth.nhs.uk/worldview/comment_1
11 Protti D. The Benefits of Computer Technology can only be Realised when Systems of Work are Changed.2005.
12 Hayes GM. Foreword to: Shaw N. Better Information, Better Health
CONFLICTS OF INTEREST

None.

ADDRESS FOR CORRESPONDENCE

Melvyn Jones
Department of Primary Care and Population Sciences
Royal Free and University College Medical School
Archway Campus
2nd Floor, Holborn Union Building
Highgate Hill
London N19 5LW
UK
Tel: +44 (0)207 288 3474 Ext: 5737
Email: m.jones@pcps.ucl.ac.uk

Accepted April 2006