

The public's attitudes to and compliance with antibiotics

Clodna A. M. McNulty^{1*}, Paul Boyle², Tom Nichols³, Peter Clappison^{4†} and Peter Davey⁵

¹Health Protection Agency Primary Care Unit, Microbiology Department, Gloucestershire Royal Hospital, Great Western Road, Gloucester GL1 3NN, UK; ²School of Geography and Geosciences, University of St Andrews, Irvine Building, North Street, St Andrews KY16 9AL, UK; ³Statistics Unit, Health Protection Agency Centre for Infections, London NW9 5EQ, UK; ⁴Department of Health, Quarry House, Quarry Hill, Leeds LS2 7UE, UK; ⁵University of Dundee, Health Informatics Centre, The Mackenzie Building, Kirsty Semple Way, Dundee DD2 4BF, UK

Although a third of the public still believe that antibiotics work against coughs and colds, simply getting the public to believe otherwise may not be enough to reduce the level of prescribing. The large Department of Health sponsored household survey demonstrated that those with a greater knowledge about antibiotics were no less likely to be prescribed an antibiotic, and although those with increased knowledge about antibiotics were more likely to complete a course they were also more likely to self-medicate and to keep left-over antibiotics. Future campaigns that are aimed at reducing the level of prescribing should be focused towards those more likely to be prescribed antibiotics at present: younger women and those with a lower level of education. They should also examine and consider modifying consultation behaviour and other behavioural components involved in patient expectations for antibiotics. This should include delayed antibiotic prescriptions. The easiest way to reduce the use of left-overs may be to shorten the course of antibiotics prescribed to 3 or 5 days. We should also promote a 'Do not recycle antibiotics' message towards the more highly educated, young women who are more likely to store, take and share antibiotics without advice.

Keywords: antibiotic, resistance, public knowledge, education campaigns

Introduction

As 80% of human prescribing is in the community, the UK Department of Health (DH) Standing Medical Advisory Committee on Antimicrobial Resistance (SMAC) in 1998 recommended an education campaign for professionals and the public aimed at rationalizing community antibiotic use.¹

One of the most important determinants of an antibiotic prescription when a patient visits their doctor is prior attendance at the surgery and previous prescriptions for that condition. Patients who were prescribed antibiotics immediately for a sore throat stated that they were more likely to consult a health professional to request antibiotics the next time they developed a sore throat.² Presumably patients believe that antibiotics aided their recovery, and therefore need to attend the surgery for antibiotics the next time they get the same condition. Clinicians report that they often prescribe antibiotics because they perceive that patients want them.³ However, this demand may be overestimated, as clinicians do not usually discuss patients' demands and expectations for antibiotics directly, and the demand is often assumed.⁴

Breaking this chain of clinicians' and patients' beliefs about the expectations for and effectiveness of antibiotics for minor illness is a key factor in controlling the unnecessary use of antibiotics. A pan-European telephone survey of patients' attitudes to antibiotics and antibiotic use in respiratory tract infections indicated that the UK population treated antibiotics more respectfully and were more rational with their antibiotic use compared with other European countries.^{1,5,6} However, the numbers of respondents in the UK part of this survey were not great enough to determine if certain groups of the population were less rational about their antibiotic use.

General practice consultation data indicate that young women have a higher practice consultation rate than other groups of patients.⁷ In a bid to reduce the patient expectation for antibiotics, in the autumn of 1999, the DH launched a National Public Awareness Campaign on antibiotic resistance targeted particularly at these young women and mothers. The public information campaign aimed to support health professionals by reducing expectations for an antibiotic prescription, by raising awareness about the problem of antibiotic resistance, to increase understanding about

*Corresponding author. Tel: +44-8454-225061; Fax: +44-1452-526197; E-mail: clodna.mculty@hpa.org.uk or jill.whiting@hpa.org.uk
†Present address. Southwold Surgery, York Road, Southwold IP18 6AN, UK.

the appropriate use of antibiotics and, in particular, to increase understanding about when antibiotics will not do any good. The campaign was personalized by the creation of *Andybiotic*, a character symbolizing antibiotics in animated form, and expressing the words ‘*Don’t wear me out*’ to introduce the topic of sensible use of antibiotics.⁸ The campaign included posters in general practice surgeries and public places, and patient information leaflets to be given to patients instead of an antibiotic prescription.

An unpublished 1999 DH survey showed that immediately after the campaign there was more public awareness of antibiotic resistance and the public were less likely to expect to receive antibiotics from their GP. Therefore, the campaign was repeated in spring 2002.

To inform ongoing publicity campaigns, to which The Specialist Advisory Committee on Antimicrobial Resistance (SACAR) was committed, in 2003 the DH funded a large antibiotic survey of British households. The aims of the survey were to:

- Determine the public’s awareness of good antibiotic use and relate this to household characteristics.
- Identify respondent characteristics that explain variation in attitudes to antibiotics.
- Determine the impact of the *Andybiotic* campaigns.

The data on public awareness of good antibiotic use can be used to determine the effectiveness of the recent education campaigns and to inform and target future campaigns to control the use of antibiotics. As the 1998 SMAC report also highlighted patients’ use of ‘left-over’ antibiotics as a concern, but reported that there was little data enumerating the extent of the practice,¹ the DH-funded survey also aimed to determine the prevalence of retained antibiotics. Identifying subgroups of the population who are more likely to retain antibiotics and use left-over antibiotics may help future interventions to be targeted appropriately.

How many respondents were prescribed an antibiotic?

Thirty-eight per cent of the 7120 respondents in the survey reported that they had been prescribed an antibiotic in the last year.⁹ In agreement with consultation data, those respondents more likely to be prescribed an antibiotic in the last year were younger women, and those with a lower level of education (Figure 1a and b). These data support the target group for the recent DH educational campaigns and suggest that future campaigns at reducing antibiotic use should also be aimed at those with a lower level of education.

What did respondents know about antibiotic resistance, activity and prudent use?

In the survey, respondents were asked whether they agreed or disagreed with 11 statements about antibiotic use, antibiotic resistance and activity. The sample mostly knew that overuse of antibiotics increased resistance, and that antibiotic resistance is increasing. Only 8% of respondents did not agree with the statement that ‘If taken too often antibiotics are less likely to work in

the future’, 16% did not agree that ‘Bacteria are becoming resistant to antibiotics’ and only 19% did not agree that ‘antibiotic resistant bacteria could infect me or my family’. Respondents also knew the principles of prudent antibiotic use, as only 3% did not agree with the statement ‘A course of antibiotics should always be completed’ and the same percentage did not agree that ‘Antibiotics should not be taken unnecessarily’.

Respondents were less knowledgeable about whether antibiotics were active against coughs and colds, viruses, bacteria and our normal flora. Thirty-two percent of respondents incorrectly agreed that ‘Antibiotics work on most coughs and colds’ and 43% incorrectly agreed that ‘Antibiotics can kill viruses’ (Figure 1c). This indicates that there is a substantial group of the British public who believe that antibiotics will be of value when they have a cough or cold and are therefore still likely to request antibiotics from clinicians when they have these conditions. The survey also revealed a lack of understanding about the differences in activity of antibiotics against bacteria and viruses. In fact a fifth of respondents did not agree with the statement ‘Antibiotics can kill bacteria’ (Figure 1c). In any future antibiotic educational campaigns, it will be important to explain the difference between viruses and bacteria, or discuss the need for antibiotics in relation to the severity of infection or syndrome, rather than the type of microbe responsible.

The SMAC report recommended that the public should be educated about the value of their normal flora.¹ Normal flora did not feature in the *Andybiotic* Campaign, and the survey revealed a lack of public understanding in this area; 42% of respondents did not agree with the statement ‘Bacteria that normally live on the skin and in the gut are good for your health’ and 43% of respondents did not agree that ‘Antibiotics can kill bacteria that normally live on the skin and gut’ (Figure 1c).

Those less knowledgeable about antibiotics were typically less well educated. For each of the 11 statements, respondents with no formal qualifications were about twice more likely to respond incorrectly than respondents with a degree level of education. On multivariable analysis, lower educational qualifications were the greatest determinant of lack of knowledge about antibiotics ($P < 0.0005$; Figure 1f). Other subgroups less knowledgeable about antibiotics were the young (16–24 years) and the old (>75 years).⁹ This information indicates, like the prescription and consultation data, that educational campaigns aimed at improving knowledge about antibiotics should be targeted at these less knowledgeable groups. However, it is not this simple! A greater knowledge about antibiotics and when you should use them was not associated with a lower likelihood of being prescribed an antibiotic in the last year. And those who knew to disagree with the statement that ‘Antibiotics work on most coughs and colds’ were about as likely to be prescribed an antibiotic as those who did not know to disagree (Figure 1d).

Did respondents take their antibiotic as prescribed?

The majority of respondents prescribed an antibiotic in the last year completed the course; however, 11.3% reported that they did not finish their last antibiotic course as prescribed.⁸ When asked why they did not finish the course, 65% reported that it was because they felt better or forgot to take them (Figure 1e). Two per cent did not start the course at all, 2% reported that they did not work and 19% stopped them because of side

The public's attitudes to and compliance with antibiotics

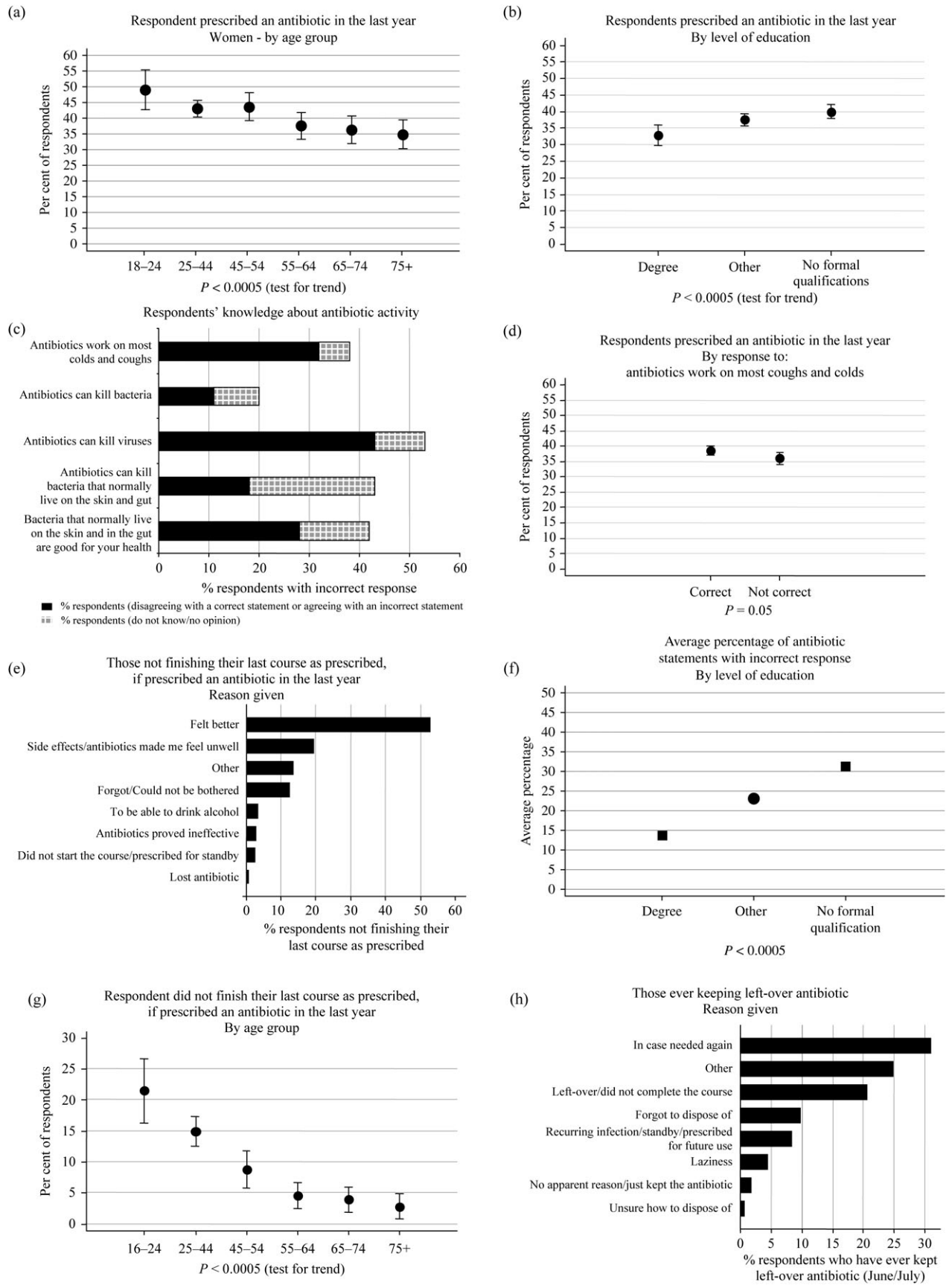


Figure 1. Respondents' knowledge and use of antibiotics.

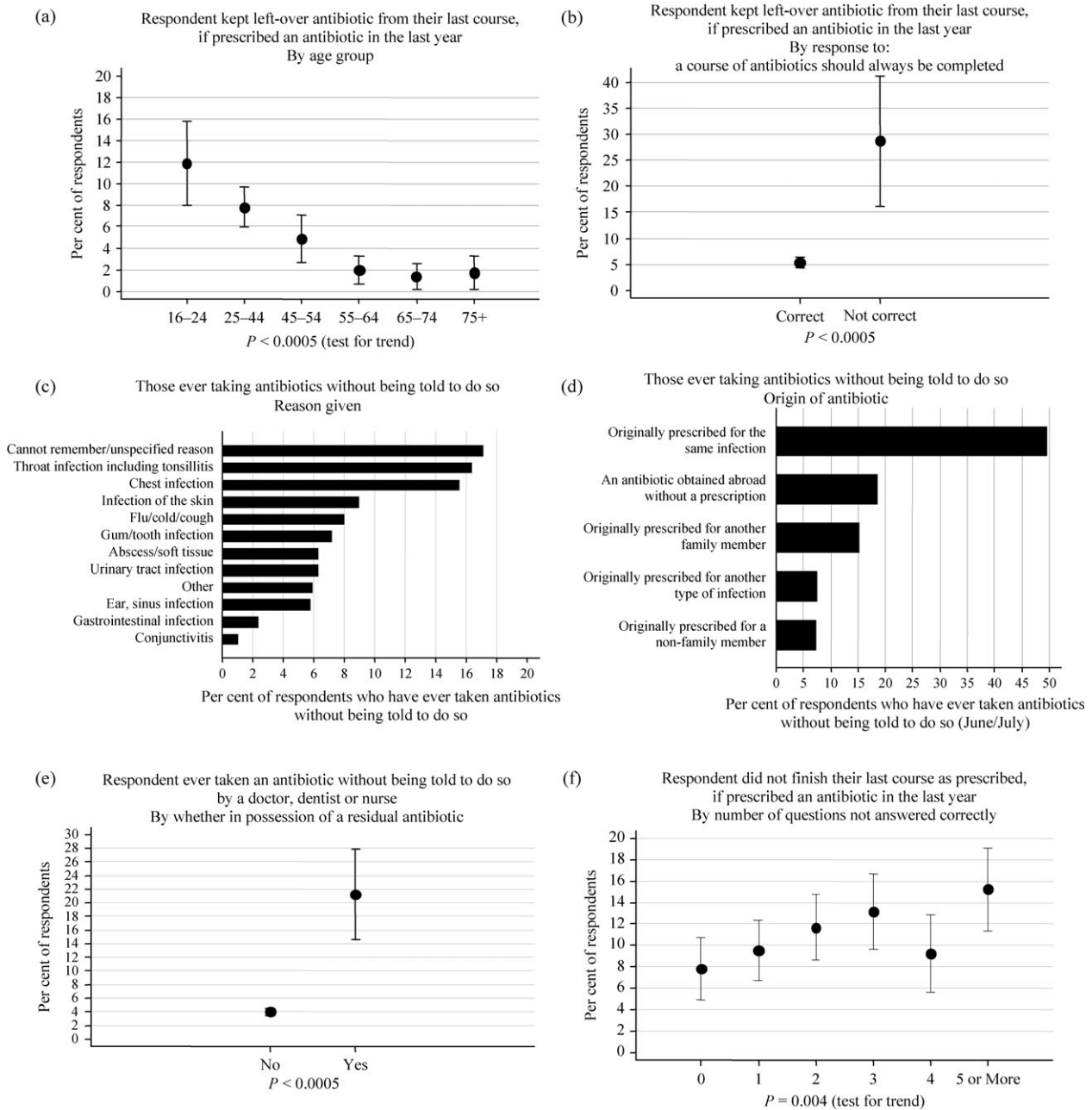


Figure 2. Respondents' use of antibiotics.

effects. Respondents who did not complete the course were younger (22% of 16–24 year olds compared to 4% of all respondents over 55 years) (Figure 1g). Interestingly, 87% (CI 82–91) of respondents who did not complete their last course also said that a course of antibiotic should always be completed. This suggests that most of those who did not complete their course did so knowing that they should have done.

What did respondents do with left-over antibiotics?

Almost 16% (15.8%, CI 14.3–17.4) reported that they had ever kept an antibiotic; 31% in case they needed them again and 8% in

case the same infection recurred (Figure 1h). Six per cent of respondents prescribed a course of antibiotics in the past year said they kept left-over antibiotics from their last course, and 44% of these respondents reported they kept them in case of future need. Respondents who reported keeping left-over antibiotics tended to be younger (12% of 16–24 year olds kept left-over antibiotics from their last course, compared to 2% of all those over 55 years old) (Figure 2a). Of those who were prescribed an antibiotic in the last year and who did not agree with the statement ‘A course of antibiotics should always be completed’, 29% reported keeping left-over antibiotic from their last course (compared with only 5% of respondents who were prescribed an antibiotic in the last year and who agreed with the statement) (Figure 2b).

The public's attitudes to and compliance with antibiotics

This reported behaviour about compliance with prescribed antibiotics concurred with the antibiotic audit, in which we found that 4.3% (CI 3.5–5.3) of those prescribed an antibiotic in the last year had a residual antibiotic in the household which had been prescribed for them in the last year. In the audit, respondents were asked to show the interviewer all antibiotics and antifungals in the household (regardless of for whom they were prescribed, format, or time elapsed since prescription). Of the 6983 households, 19% had an antibiotic or antifungal. Of all antibiotics, almost half were not currently in use, 31% were reported by respondents to be left-over and 18% were kept for standby use. Almost half of left-overs had more than half of the original prescription remaining and 38% were prescribed more than 1 year earlier.¹⁰

Do respondents take left-over antibiotics in the home?

Almost 5% of respondents (4.8%, CI 4.3–5.4) reported that they had at some time in the past taken an antibiotic without advice from a doctor, nurse or dentist. Many of these antibiotics were taken for respiratory infections (46%, Figure 2c) and 49% were taken for the same infection for which they were originally prescribed (Figure 2d). Of those with a left-over antibiotic in the house, 21% had taken antibiotics without advice compared to 4% without left-overs (Figure 2e). Being more educated and being more knowledgeable about antibiotics were independently associated with keeping left-overs and taking antibiotics without advice.

Did respondents know about the Andybiotic Campaign?

In the survey respondents were finally shown the Andybiotic Campaign patient information leaflet and asked if they had seen the leaflet or seen or heard anything about the Andybiotic Campaign. Penetration of this campaign was poor, as only a fifth of English respondents and only 25% of respondents who had been prescribed an antibiotic in the past year, had seen or heard of the campaign. This is disappointing as the campaign was concentrated in GP surgeries. The 1999 campaign was accompanied by DH public statements and advertising, but the later campaigns were lower key and restricted by financial constraints. Experience with social marketing for other health issues such as alcohol and driving shows that campaigns must be sustained over several years and include television slots to have a prolonged impact.¹¹

So how should the survey influence the education subgroups of SACAR?

Although a third of the public still believe that antibiotics work against coughs and colds, simply getting the public to believe otherwise may not be enough to reduce the level of prescribing. We have shown that those with a greater knowledge about antibiotics are no less likely to be prescribed an antibiotic. And in respect of how the public use the antibiotics they are prescribed, sometimes increased knowledge is associated with more prudent use [more likely to complete a course (Figure 2f)] and sometimes it is associated with less prudent use (more likely to

self-medicate and to keep left-over antibiotic).⁹ Future campaigns that are aimed at reducing the level of prescribing should be focused towards those more likely to be prescribed an antibiotic at present: younger women and those with a lower level of education. They should also examine and consider modifying consultation behaviour and other behavioural components involved in patients expectations for antibiotics. This should include delayed antibiotic prescriptions.^{2,12,13}

Greater knowledge about antibiotics was associated with a greater tendency to keep left-over antibiotics and use them without advice from a clinician. Unnecessary use of left-over antibiotics may increase antibiotic resistance in the community's commensal flora by exerting a selective pressure in the gut, skin and upper respiratory tract, favouring bacteria resistant to the antibiotics. This audit showed that 10% of households have access to left-over or standby antibiotics or antifungals. Perhaps, the easiest way to reduce the use of left-overs is to shorten the course of antibiotics prescribed to 3 or 5 days. A recent International survey showed that respondents living in countries that dispensed antibiotics in set pack sizes were more likely to have left-over antibiotics and use them without advice than respondents living in countries where antibiotic courses were dispensed according to the number of days stated by the clinician (P. Kardas, J. C. Pechere, D. A. Hughes *et al.*, submitted for publication). Alternatively, we could focus a 'Do not recycle antibiotics' message towards the higher educated, young women who are more likely to store and take antibiotics without advice.

Transparency declarations

Dr Cliodna McNulty's department received payment from Leo Pharma-ceuticals for advice on mecillinam and is involved in the development of antibiotic guidance for general practitioners. In the past 3 years, Peter Davey has received fees for consultancy and/or speaking from Pfizer and Wyeth. The other authors do not have anything to declare.

References

1. Standing Medical Advisory Committee Sub-Group on Antimicrobial Resistance 1998. *The Path of Least Resistance*. www.advisorybodies.doh.gov.uk/smac1.htm (12 February 2007, date last accessed).
2. Little P, Gould C, Williamson I *et al.* Re-attendance and complications in a randomized trial of prescribing strategies for sore throat: the medicalising effect of prescribing antibiotics. *BMJ* 1997; **315**: 350–2.
3. Coenen S, Michiels B, Renard D *et al.* Antibiotic prescribing for acute cough: the effect of perceived patient demand. *Br J Gen Pract* 2006; **56**: 183–90.
4. Altiner A, Knauf A, Moebes J *et al.* Acute cough: a qualitative analysis of how GPs manage the consultation when patients explicitly or implicitly expect antibiotic prescriptions. *Fam Pract* 2004; **21**: 500–6.
5. Branthwaite A, Pechère JC. Pan-European survey of patients' attitudes to antibiotics and antibiotic use. *J Int Med Res* 1996; **24**: 229–38.
6. Finch RG, Metlay JP, Davey PG *et al.* Educational interventions to improve antibiotic use in the community: report from the International Forum on Antibiotic Resistance (IFAR) colloquium, 2002. *Lancet Infect Dis* 2004; **4**: 44–53.

7. General Practitioner Workload, April 2004. RCGP Information Sheet No. 3. Royal College of General Practitioners, London, 2004.
8. Woodhead M, Finch R. Public education—a progress report. *J Antimicrob Chemother* 2007; **60** Suppl. 1: i53–i55.
9. McNulty C, Boyle P, Nichols T *et al.* Don't wear me out—the public's knowledge of and attitudes to antibiotic use. *J Antimicrob Chemother* 2007; **59**: 727–38.
10. McNulty C, Boyle P, Nichols T *et al.* Left-over antimicrobials in the home, who keeps them and why? *Emerg Infect Dis* 2006; **12**: 1523–6.
11. Goossens H, Guillemot D, Ferech M *et al.* National campaigns to improve antibiotic use. *Eur J Clin Pharmacol* 2006; **62**: 373–9.
12. Little P, Gould C, Williamson I. Pragmatic randomised controlled trial of two prescribing strategies for childhood acute otitis media. *BMJ* 2001; **322**: 336–42.
13. Dowell J, Pitkethly M, Bain J *et al.* A randomized controlled trial of delayed antibiotic prescribing as a strategy for managing uncomplicated respiratory tract infection in primary care. *Br J Gen Pract* 2001; **51**: 200–5.