

LONDON
SCHOOL of
HYGIENE
& TROPICAL
MEDICINE



Hill, Z; Kirkwood, B; Kendall, C; Adjei, E; Arthur, P; Agyemang, CT (2007) Factors that affect the adoption and maintenance of weekly vitamin A supplementation among women in Ghana. *Public health nutrition*, 10 (8). pp. 827-33. ISSN 1368-9800 DOI: <https://doi.org/10.1017/S1368980007382554>

Downloaded from: <http://researchonline.lshtm.ac.uk/9170/>

DOI: [10.1017/S1368980007382554](https://doi.org/10.1017/S1368980007382554)

Usage Guidelines

Please refer to usage guidelines at <http://researchonline.lshtm.ac.uk/policies.html> or alternatively contact researchonline@lshtm.ac.uk.

Available under license: <http://creativecommons.org/licenses/by-nc-sa/2.5/>

Factors that affect the adoption and maintenance of weekly vitamin A supplementation among women in Ghana

Zelee Hill^{1,*}, Betty Kirkwood¹, Carl Kendall², Eunice Adjei^{3†}, Paul Arthur^{3‡} and Charlotte Tawiah Agyemang³

¹Department of Epidemiology and Population Health, London School of Hygiene and Tropical Medicine, Keppel Street, London WC1E 7HT, UK; ²Department of International Health and Development, Tulane University School of Public Health and Tropical Medicine, New Orleans, LA, USA; ³Kintampo Health Research Centre, Ghana

Submitted 2 November 2005; Accepted 1 August 2006; First published online 5 March 2007

Abstract

Objective: To identify regimen, individual, community and cultural factors that affect adoption and adherence to weekly vitamin A supplementation in Ghana.

Design: Fifty semi-structured interviews were conducted with women who would be eligible for vitamin A supplementation, 30 with husbands, and 13 with drug sellers, birth attendants and health workers. Six focus group discussions were also conducted with women. These interviews were followed by a 4-month capsule trial with 60 women. Data from a previously conducted communication channel survey of 332 women were also reviewed.

Setting: The study was conducted in Kintampo District in central Ghana.

Subjects: Participants for the semi-structured interviews and focus groups were selected from four villages and the district capital, and women in the capsule trial were selected at random from two villages.

Results: Knowledge of vitamins was low and taking 'medicines' for long periods and when healthy is a new concept. In spite of this, long-term supplementation will be accepted if motives are explained, specific questions answered and clear instructions are given. Potential barriers included the idea of 'doctor' medicines as curative, false expectations of the supplement, forgetting to take the supplement, losing the supplement, travelling, lack of motivation, perceived side-effects, concerns that the supplement is really family planning or will make delivery difficult, and concerns about taking the supplement with other 'doctor' or herbal medicine, or when pregnant or breast-feeding, or if childless.

Conclusion: Successful supplementation programmes require appropriately designed information, education and communication strategies. Designing such strategies requires pre-programme formative research to uncover barriers and facilitators for supplementation.

Keywords
Vitamin A supplementation
Adherence
Maternal mortality
Information, education
and communication
Ghana

There are approximately 529 000 maternal deaths worldwide each year and more than 1 million children are left motherless^{1–3}. The main burden (99%) of maternal mortality is in developing countries, and over half of the deaths occur in Africa¹. Vitamin A deficiency (VAD) is a well-recognised nutritional problem in children in many developing countries⁴ and it is well established that even moderate deficiency increases a child's risk of mortality and severe infection⁵. It is also possible that VAD contributes to maternal mortality. Evidence comes from a field trial in Nepal, which reported a 44% reduction in maternal mortality following weekly vitamin A or

β -carotene supplementation of women of reproductive age⁶, and plausible biological pathways have been identified⁷. If the Nepal finding is verified by trials in Bangladesh and Ghana, vitamin A supplementation (VAS) could become an important component of maternal health programmes such as The Safe Motherhood Initiative, particularly as current interventions are of questionable effectiveness^{8–10}. For example, data from the few developing countries with vital registration indicate no significant change in maternal mortality rates since the start of The Safe Motherhood Initiative in 1987⁹. VAS could therefore be a potential breakthrough in reducing maternal deaths.

Iron supplementation programmes have shown the need for culturally acceptable information, education and

†Current affiliation: Engender Health, Accra, Ghana.

‡Deceased.

communication (IEC) campaigns^{11–13}, especially those that focus on community perspectives, behaviour change and increasing demand^{13–15}, and have been criticised for only recognising the need for IEC after evaluations show they are ineffective¹⁵. Any Safe Motherhood VAS programme must learn from the lessons of iron supplementation and ensure that barriers and facilitators to VAS are explored prior to the initiation of programmes and that programmes include appropriate IEC strategies.

The present study aimed to identify regimen, individual, community and cultural factors that affect the adoption and maintenance of weekly VAS among women of childbearing age in Ghana. This formative research was done as a prelude to the implementation of a large-scale, randomised, double-blind, placebo-controlled field trial exploring the impact of vitamin A on maternal mortality in Ghana. The estimated maternal mortality ratio for Ghana is 549 per 100 000 live births¹.

Methods

The study was conducted in 2000 in Kintampo District, which is situated in the centre of Ghana and lies within the forest–savannah transitional ecological zone. Kintampo District has an estimated population of 147 000 people; the district is overwhelmingly rural and consequently farming is the most important economic activity. Only the district town and eight of the 149 villages have electricity, and few can be reached by paved roads. There is one district hospital, staffed by a clinical officer, and seven health posts staffed by nurses.

Data were collected through semi-structured interviews and focus group discussions (FGDs) followed by a pilot capsule trial. All data collection instruments were pre-tested and revised as needed. Informed consent was sought from all respondents. The semi-structured interviews and FGDs were conducted in Kintampo town plus four villages chosen purposively to reflect the district's range of health service accessibility, ethnicity, size of village and location (Table 1).

Several respondent groups were included, namely the potential target recipients of the VAS programme (women of reproductive age), gatekeepers (husbands and village leaders) and information providers (drug sellers, midwives, traditional birth attendants and health workers). A wide range of respondents were included in order to get a

broad picture of potential barriers and facilitators for VAS adherence. The sample size for each respondent group was determined using saturation sampling (i.e. respondents were interviewed until no new information was learnt).

Semi-structured interviews were conducted with 50 women aged 15–45 years and with 30 husbands. The women were selected purposively to reflect differences in age (≤ 20 , 21–35, 36–45 years), parity (0, 1–3, ≥ 4 children) and ethnicity (Northern tribe, Akan, Mo). Thirteen in-depth interviews were conducted with drug sellers, midwives, traditional birth attendants and health workers, all of whom were identified from the semi-structured interviews as being the most utilised in each village. Fieldworkers conducted an average of two interviews a day; they interviewed early in the morning when most people were at home. Fieldworkers entered compounds in different sections of the village and interviewed respondents who met their age, parity and ethnicity quota. During the interviews fieldworkers took field notes, which they converted to detailed English fairnotes on the day of the interview. Fairnotes were then transcribed into Microsoft Word[®].

Six focus groups were conducted with six to 12 women aged 15–45 years, stratified by age and ethnicity. Women were selected by asking a community leader to select talkative women who matched the specified age and ethnicity requirements. FGDs were recorded and then transcribed into English.

The information collected in the semi-structured interviews and the FGDs included perceptions of illness and prevention, knowledge and experiences of vitamins and vitamin A, adherence experiences, perceived barriers to adherence and community solutions, desirable and undesirable capsule characteristics, acceptability of distribution strategies, and exposure and experience with communication channels. The data were collected by five trained fieldworkers in the local languages. The transcripts were explored through multiple readings to ensure familiarity with the data. Key analytic categories (issues, concepts and themes) were then identified and the interviews and FGDs were indexed into the categories and interpreted.

The semi-structured interviews and FGDs were collected over 2 months; after they were completed, 60 women aged 15–45 years were randomly selected for the capsule trial. Women were selected in two of the villages

Table 1 Community characteristics of the study villages

	Kintampo town	Village 1	Village 2	Village 3	Village 4	Village 5
Main ethnic group	Mixed	Dagarti	Mo	Gonja	Akan	Akan
Population	14 892	831	664	2042	2751	867
Electricity	✓	×	×	×	×	×
Drinking water	Wells	Stream	River	Wells	Stream	River
Health post	1	–	–	–	–	1
Hospital	1	–	–	–	–	–

using the district's demographic surveillance database. Women who had responded to the semi-structured interviews were excluded. The aim of the capsule trial was to quantify the findings of the semi-structured interviews and to uncover any missed barriers. Each woman was visited at home and informed consent obtained and any questions answered. They were informed that we were planning to start a study exploring whether vitamin A is good for women's health and that we would like to understand the problems women are likely to have taking capsules. They were invited to help us identify any problems by taking a capsule each week so we could learn from their experiences. Each woman was given a small bag of low-dose cod-liver oil capsules (vitamin A capsules were unavailable), was instructed to take a capsule on the same day every week and told that the fieldworker would return in a month. Each month the fieldworker returned, distributed more capsules and administered a questionnaire about adherence, storage, reminding strategies and respondents' opinions of the capsules. The trial lasted 4 months and the response rate was 100%.

Data on availability and use of communication channels in the district were available from a Health Seeking Behaviour study conducted in the district in 1999¹⁶. The study included a health communication channel survey of 332 randomly selected women with children < 5 years of age in eight villages. Some of the information was dated by the time this adherence study was conducted, for example a new popular local radio station began operation in 2000; care was therefore taken with the interpretation of the original results.

Results

Knowledge of vitamins

In the semi-structured interviews and FGDs, few respondents, except the drug sellers and health workers, had heard of the word 'vitamin' or the conventional local language equivalent 'medicine from food'. Of those who had heard of vitamins, few could describe their function or purpose, despite the widespread use of vitamins and vitamin-based tonics as a treatment for common illnesses. Druggists reported that vitamins and tonics make up a large proportion of their business (B complex and multivitamins being their best sellers) and were sold to treat specific symptoms and illnesses. There was a high level of knowledge in all respondent groups that 'good-quality' foods such as beans, palm oil, meat and fish are important for health, but methods of preventing adult illness centred round avoiding behaviours linked to the perceived cause of an illness, such as working in the sun.

Adopting a new behaviour

Taking 'medicine' such as VAS to prevent illness or maintain health constitutes a new behaviour and some of

the women and the husbands said they could not see the importance of taking supplements when healthy. Taking a 'medicine' for long periods of time also constitutes a new behaviour as few women reported that they had ever taken 'medicine', even prenatal supplements, for longer than a month. Women reported that this new behaviour would be acceptable if they saw other women taking the supplement and were given detailed information before starting to take the supplement. This desire for information was in contrast to most women's experiences, as they were rarely told anything about the medicines or supplements they had taken. The information women said they would require (and in fact was frequently requested during capsule trial informed consent) included an explanation of why a healthy woman should take 'medicine' for a long time, what the supplement does, what illness it cures, whether it has side-effects, affects menstruation, has a 'scent' (bad taste) and costs anything, and what are the motives of the people supplying it.

Maintaining the behaviour

Despite the acceptability of taking 'medicine' for long periods and when not sick, a lack of motivation was identified by women in the semi-structured interviews and FGDs as a potential reason for non-adherence to VAS, as women would get weary of taking 'medicine' after a long period of time. The women also reported that forgetfulness would be an important reason for non-adherence; in the capsule trial 19% of women reported missing at least one capsule, the majority because they forgot due to being busy or having an unusual schedule that day. When women in the capsule trial missed one capsule they waited until the next dosing day or stopped completely due to concerns that the capsules must be taken exactly as prescribed, i.e. consistently every week. Women in the capsule trial used a variety of techniques to help them remember to take the capsules, such as storing the capsule with commonly used things (20% of women) and having someone remind them (47%).

It became evident that women in the capsule trial required information to be provided on an ongoing basis, as information given during the consent procedure was often forgotten or needed reinforcing if a woman's situation changed. For example, when women in the capsule trial became pregnant, delivered a baby or became ill they often stopped taking their capsules completely as they needed reassurance that the capsules were safe for their new condition. Other concerns about taking supplements during pregnancy, reported by women in the semi-structured interviews, FGDs and the capsule trial, were whether taking 'medicine' during pregnancy could make pregnancy-related nausea worse or make the baby grow big in the womb and cause a painful and difficult delivery. No concerns were raised about taking 'medicine' when breast-feeding. Husbands also reported concerns surrounding VAS and pregnancy,

as they were worried that the supplement may affect fertility or be a secret form of family planning. Husbands also wanted to know why the supplement is only for women.

Women in the semi-structured interviews and the FGDs reported that they would stop taking VAS if they had side-effects. They would also stop if they developed an illness whilst taking the supplement, as they would assume that the supplement either caused the illness or was ineffective in preventing it, or they would think that the illness was a side-effect of the supplement. They also reported that they would not want to mix the supplement with 'doctor' or herbal medicine. In fact, 16% of women in the capsule trial reported that the capsule had caused a bad effect (weakness, tiredness, sleepiness, dizziness) and 12% reported being worried about taking the capsules. Capsule sharing was not a problem, as 'medicines' were only considered safe for those to whom they were prescribed. No sharing was reported in the capsule trial, and women and husbands in the semi-structured interviews reported that they would not share medicine prescribed for someone else.

Logistical barriers

Logistical barriers were identified by all of the respondent groups in the semi-structured interviews and the focus groups. Respondents felt that women who travelled may forget to take their VAS with them or may run out of the supplement whilst away. Several women in the capsule trial missed doses because of travel.

Eighteen per cent of women in the capsule trial reported losing some of their capsules: children's curiosity and inadequate packaging were often implicated in the loss. However, only 12% of women reported storage as a problem and 91% kept their capsules in good condition (as observed by the fieldworker).

Distribution strategies

The husbands and the women in the semi-structured interviews and the focus groups reported that the way VAS was distributed would affect adherence. Women had a strong preference for the supplement to be distributed through monthly home visits by a non-community member. The reasons given were that they felt that it would be difficult to find time to go and collect the capsules from a central place, that it would be difficult to ensure they could be found at home on a weekly basis, and that community members may be too busy to act as distributors and would not be able to answer questions or give advice. There was also a unanimous preference for taking the capsule on the same day and at the same time, as it was felt this would foster social support, reduce forgetfulness and would also allow reminding activities to be focused on a single day. Sunday morning emerged as the preferred time and day since women are mostly at home.

Capsule formulation

The size, shape, form and colour of the proposed supplement (a small, transparent, honey-coloured gelatine capsule) was acceptable to women in the semi-structured interviews and FGDs because it was slippery, round, and looked easy to swallow without chewing. However, most women said they preferred taking red medicines as they associated red with blood. The perception of blood as a life force that is used up through work and illness, and restored through diet, rest and certain medicines, is widely held.

Communication channels

A variety of potential communication channels were explored in the interviews with all the respondents. The channels included community groups, churches and mosques, schools, print materials (pamphlets, calendars, posters, newspapers, billboards), mass media (radio, television, videos, movies, loudspeaker vans, market announcements), traditional channels (town criers, songs, theatre) and health channels (maternal and child outreach workers, antenatal care). Of these, the options respondents felt would be most effective were town criers, radio, posters, church, mosque and market announcements, loudspeaker vans and a song.

The coverage of potential channels was explored using the communication channel survey. Most villages had radio reception but only 54% of households owned a radio and only 36% of women reported listening to the radio in the last month. Women listened at specific times of the day and to specific programmes. The radio was considered a very credible source of information and respondents felt that radio messages would be passed around the community. The fact that radio stations often broadcast in only one local language was mentioned as a disadvantage. Literacy was low with only 9% of women able to read a sentence when tested, but respondents felt they could find somebody who could read for them (57% of women reported that somebody in their household could read). Women liked the idea of having a calendar or poster visible at home to help them remember to take the capsule. Respondents felt that the poster should be mostly pictorial with some writing to add credibility. Most women felt that involving the churches and mosques was a good idea, although they acknowledged that not all women attend regularly.

Discussion

To date, intervention studies that have examined how to enhance adherence in developing countries have focused on the treatment of acute illness, and have had varying success. They explored improving instructions, packaging, dosing or treatment formulation^{17–25}, but IEC activities were absent. Evidence from programme evaluations and observational studies of prenatal iron

supplementation indicates that there are many barriers to adherence that could be addressed through IEC^{11–15}. These include: a lack of knowledge of the supplement's purpose; low prioritisation of nutrient deficiencies; misunderstanding instructions; side-effects; frustration at having to take the supplement for a long time; forgetfulness; migration; concerns that the supplement causes excessive bleeding during birth; concerns around taking the supplement when pregnant; and concerns that the supplement will make the foetus big and delivery difficult^{11,14,26,27}. Most of these were also proposed by our respondents as being likely barriers to adherence to VAS, which suggests that prior to implementing any supplementation programme for women it would be important to explore these aspects through formative research. Respondents' concerns about taking the supplement with other 'doctor' or herbal medicine, and what to do if a dose is not taken at the prescribed time, may also be relevant for adherence in other supplementation programmes. Formative research should also address appropriate packaging to reduce capsule loss and favourable formulation such as capsule colour and size. For programmes that supplement non-pregnant women, also relevant for adherence are respondents' concerns that the supplement may affect menstruation, or is really family planning in disguise.

The study also identified the importance of an appropriate delivery system for the capsules, including special arrangements for women when they travel away from home. The experience of giving iron at antenatal care visits suggests that centralised distribution can be difficult^{11,26} and it is recognised that alternative delivery systems may be needed¹⁵. Women in the present study stated a preference for monthly home delivery of the supplement, but this may not be feasible in large-scale settings. Appropriate distribution systems provide an accessible, constant supply of the supplement, and development of suitable delivery systems needs to be a key concern in any future vitamin A maternal mortality programme. Intermittent supply has been a major barrier to adherence in many supplementation programmes^{11,12,26}.

The importance of formative research has been emphasised by others^{15,28,29}, and the present study benefited from the multiple methods used. The semi-structured interviews and the FGDs identified issues to be explored in the capsule trial and also allowed issues that could not be piloted, such as preferred communication channels, to be explored in depth. The capsule trial quantified the findings of the semi-structured interviews and FGDs and thus provided information about the relative importance of the barriers. The capsule trial also uncovered barriers to adherence that the community could not identify or predict, such as women stopping taking the supplement if they missed a dose. Formative research is, however, only the first step in developing an

IEC strategy. Programme planners need to ensure that knowledge gained from formative research is translated into appropriate actions and that communication experts are utilised in designing the IEC strategy.

For example, the IEC strategy for the subsequent vitamin A and maternal mortality trial in Ghana was developed in five steps. First, information from the formative research was presented at a workshop attended by project staff, communications experts and staff from the national vitamin A programme. The participants used the information to identify the aims of the IEC strategy: to allay fears, inform, motivate, remind, foster social support and reduce logistical constraints. Second, the workshop participants identified simple key messages (Table 2) to help achieve the IEC aims. Third, the participants used the communication information from the formative research to develop a multi-pronged IEC strategy (Table 3) that included appropriate communication channels for each message. Fourth, a creative brief detailing each proposed communication channel was developed and presented to advertising companies, communication experts, musicians and theatre directors. These experts developed a communication plan and put in tenders for material production. Fifth, the IEC materials were then developed with the input of the community and extensively pre-tested with the target populations.

The present paper describes research to uncover potential barriers and facilitators to weekly VAS of women. The information collected was used to design an IEC strategy to enhance adherence to the supplement. Although other studies have identified the need for IEC for effective prenatal iron supplementation^{11–13}, no rigorous

Table 2 Key messages for information, education and communication (IEC) activities, identified from the study findings

-
- Explain the use, importance and function of vitamins
 - Stress the importance of being pro-active to maintain health, and that women may need vitamins even if they feel healthy
 - Distinguish vitamins from curative 'doctor' medicines and do not give false expectations of what the supplement will do
 - Emphasise that women will continue to get sick when they are taking the supplement and the supplement does not cause any illness, or interact adversely with any medicine
 - Inform women of any potential side-effects before they start taking the supplement
 - Provide continuous information about the supplement, especially when women become pregnant or sick, etc., or if the information does not fit with local beliefs
 - Reassure women that the supplement is safe to take whilst pregnant, and as far as we know will not cause nausea or a difficult delivery
 - Include a motivational element in the IEC strategy
 - Explicitly discuss the perception of the supplement as family planning
 - Provide clear instructions about what to do when women miss a dose
 - Emphasise that other women in the community are taking the supplement
 - Give advice about choosing a storage place that would also serve as a reminder
-

Table 3 Information, education and communication (IEC) activities designed to support the Ghana vitamin A and maternal mortality trial

IEC activity	Purpose
Capsule brand name	Project identification
Logo	Project identification
Vitamin A day when all women will take the capsules (Sunday morning)	Remind and foster social support
Appropriate storage container (easy-to-close plastic vial)	Reduce capsule loss and spoilage
Train fieldworkers to communicate information about the capsule in their monthly data collection visits	Inform and motivate women and their families, and allay fears
Production of a 'frequently asked questions' book, to be used by fieldworkers, and to be distributed to health workers within the four trial districts	Inform women and their families, and allay fears
Formal launch in each district including a traditional durbar and community meetings	Project identification, inform, motivate and foster social support
Traditional town criers beat the 'gong-gong' each Sunday morning	Remind women to take the capsules
Vitamin A song	Inform, motivate, remind and foster social support
Radio talks/advertisements/drama (in multiple local languages)	Inform, remind, foster social support and allay fears
Loudspeaker vans drive around the areas with low radio coverage playing the radio messages	Inform, remind, motivate and allay fears
Posters in homes (showing capsules for a woman to cross off each week)	Inform, motivate, remind and foster social support
Health worker, healer and druggist training	Project endorsement, inform and motivate
Weekly church and mosque announcements	Project endorsement, remind and foster social support
Adherence and IEC monitoring	Indicate when IEC strategy needs modifying

evaluations were located. The findings of the present work, that formative research can identify potential supplementation barriers and can be used to inform an IEC strategy, must be followed by monitoring and evaluation of IEC strategies to show whether they are effective or not.

Acknowledgements

Sources of funding: This study was supported by the United States Agency for International Development (USAID) and the UK Department for International Development (DfID).

Conflict of interest declaration: None.

Authorship responsibilities: B. K., P.A., C.K. and Z.H. designed the study. Z.H., E.A. and C.T.A. were responsible for data collection and analysis. Z.H. wrote the first draft of the paper and all authors, except P.A. who sadly died before the paper was completed, commented on and revised the paper.

Acknowledgements: The authors would like to thank Dr Anne Roberts, Ms Esi Amoafu, Ms Nana Gabrah-Aidoo, Dr Kojo Yeboah-Antwi, Mrs Rosanna Agble, Dr Henrietta Odoi Agyarko, Mrs Mary Arday-Kotei and Dr Sam Adjei for their valuable contributions at the IEC workshop. We would also like to thank all the staff of Kintampo Health Research Centre and all of the community members who participated for their support during this research.

References

- World Health Organization (WHO). *Maternal Mortality in 2000: Estimates developed by WHO, UNICEF and UNFPA*. Geneva: WHO, 2004.
- United Nations Children's Fund (UNICEF). *Progress of Nations 1999*. New York: UNICEF, 1999.
- World Health Organization (WHO). *Safe Motherhood as a Social and Economic Investment*. Geneva: WHO, 1998.
- United Nations Children's Fund. *The State of the World's Children 1998*. New York: Oxford University Press, 1998.
- Beaton GH, Martorell R, Aronson KJ, Edmonston B, McCabe G, Ross AC, et al. *Effectiveness of Vitamin A Supplementation in the Control of Young Child Morbidity and Mortality in Developing Countries*. United Nations Administrative Committee on Coordination, Sub-committee on Nutrition State-of-the-art Series; Nutrition Policy Discussion Paper No. 13. Geneva: World Health Organization, 1993.
- West KP, Katz J, Khatry SK, LeClerq SC, Pradhan EK, Shrestha SR, et al. Double blind, cluster randomised trial of low dose supplementation with vitamin A or β carotene on mortality related to pregnancy in Nepal. The NNIPS-2 Study Group. *British Medical Journal* 1999; **318**: 570–5.
- Faisel H, Pittrof R. Vitamin A and causes of maternal mortality: association and biological plausibility. *Public Health Nutrition* 2000; **3**: 321–7.
- Luck M. Safe motherhood intervention studies in Africa: a review. *East African Medical Journal* 2000; **77**: 599–607.
- AbouZahr C, Wardlaw T. Maternal mortality at the end of a decade: signs of progress? *Bulletin of the World Health Organization* 2001; **79**: 561–8.
- Sloan NL, Winikoff B, Fikree FF. An ecologic analysis of maternal mortality ratios. *Studies in Family Planning* 2001; **32**: 352–5.
- Galloway R, McGuire J. Determinants of compliance with iron supplementation: supplies, side effects, or psychology? *Social Science & Medicine* 1994; **39**: 381–90.
- Mora JO. Iron supplementation: overcoming technical and practical barriers. *Journal of Nutrition* 2002; **132**: 853S–5S.
- Yip R. Iron supplementation: country level experiences and lessons learned. *Journal of Nutrition* 2002; **132**: 859S–61S.
- Ejidokun OO. Community attitudes to pregnancy, anaemia, iron and folate supplementation in urban and rural Lagos, south-western Nigeria. *Midwifery* 2000; **16**: 89–95.
- Griffiths M. Communication strategies to optimize commitments and investments in iron programming. *Journal of Nutrition* 2002; **132**: 834S–8S.

- 16 Hill Z, Kendall C, Arthur P, Kirkwood B, Adjei E. Recognizing childhood illnesses and their traditional explanations: exploring options for care-seeking interventions in the context of the IMCI strategy in rural Ghana. *Tropical Medicine and International Health* 2003; **8**: 668–76.
- 17 Helitzer-Allen DL, Macheso A, Wirima J, Kendall C. Testing strategies to increase use of chloroquine chemoprophylaxis during pregnancy in Malawi. *Acta Tropica* 1994; **58**: 255–66.
- 18 Ellerbeck E, Khallaf N, el Ansary KS, Moursi S, Black R. Caretaker compliance with different antibiotic formulations for treatment of childhood pneumonia. *Journal of Tropical Pediatrics* 1995; **41**: 103–8.
- 19 Qingjun L, Jihui D, Laiyi T, Xiangjun Z, Jun L, Hay A, *et al.* The effect of drug packaging on patients' compliance with treatment for *Plasmodium vivax* malaria in China. *Bulletin of the World Health Organization* 1998; **76**: S21–7.
- 20 Beard JL. Effectiveness and strategies of iron supplementation during pregnancy. *American Journal of Clinical Nutrition* 2000; **71**: 1288S–94S.
- 21 Young MW, Lupafya E, Kapenda E, Bobrow EA. The effectiveness of weekly iron supplementation in pregnant women of rural northern Malawi. *Tropical Doctor* 2000; **30**: 84–8.
- 22 Okonkwo PO, Akpala CO, Okafor HU, Mbah AU, Nwaiwu O. Compliance to correct dose of chloroquine in uncomplicated malaria correlates with improvement in the condition of rural Nigerian children. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 2001; **95**: 320–4.
- 23 Ansah EK, Gyapong JO, Agyepong IA, Evans DB. Improving adherence to malaria treatment for children: the use of pre-packed chloroquine tablets vs. chloroquine syrup. *Tropical Medicine and International Health* 2001; **6**: 496–504.
- 24 Yeboah-Antwi K, Gyapong JO, Asare IK, Barnish G, Evans DB, Adjei S. Impact of prepackaging antimalarial drugs on cost to patients and compliance with treatment. *Bulletin of the World Health Organization* 2001; **79**: 394–9.
- 25 Hyder SM, Persson LA, Chowdhury AM, Ekstrom EC. Do side-effects reduce compliance to iron supplementation? A study of daily- and weekly-dose regimens in pregnancy. *Journal of Health, Population, and Nutrition* 2002; **20**: 175–9.
- 26 Galloway R, Dusch E, Elder L, Achadi E, Grajeda R, Hurtado E, *et al.* Women's perceptions of iron deficiency and anemia prevention and control in eight developing countries. *Social Science & Medicine* 2002; **55**: 529–44.
- 27 Winichagoon P. Prevention and control of anemia: Thailand experiences. *Journal of Nutrition* 2002; **132**: 862S–6S.
- 28 Blum L, Pelto G, Kuhnlein H, Pelto P. *Guidelines for Conducting CommunityBased Ethnographic Studies of Vitamin A Consumption*. Boston, MA: International Nutrition Foundation for Developing Countries, 1997.
- 29 Ghanekar J, Kanani S, Patel S. Toward better compliance with iron-folic acid supplements: understanding the behaviour of poor urban pregnant women through ethnographic decision models in Vadodara, India. *Food and Nutrition Bulletin* 2002; **23**: 65–72.