Acknowledgements

The authors wish to acknowledge the indispensable assistance of Dr Richard Laing, Associate Professor at the Boston University School of Public Health (BUSPH), who assisted in the writing of the original proposal and this paper. The authors would also like to thank Sarah Richards of BUSPH, who was instrumental in choosing, designing and undertaking research with the Cameroon Baptist Convention (CBC), and Lucy Honig for all her help in writing this report. At the CBC, the authors thank Pius Muffih Tih, Director of Health Services, as well as Richard Tambe, Head Pharmacist, and Kathy Kroll, Head Nurse, without whose suggestions and support the results of the study would have been negligible. Thanks are due to Dr Davidson Hamer of the Harvard Institute for International Development and New England Medical Center who donated immunizations to the authors and Ralph Timperi, Assistant Commissioner of the State Laboratory Institute, Department of Public Health, Massachusetts, who donated several computers and other equipment to the CBC. And we should like to express our deep gratitude to the personnel of the CBC health facilities who accommodated us in their facilities, their offices and their homes.

Finally we wish to thank Daphne Fresle and Hans Hogerzeil of WHO’s Action Programme on Essential Drugs (DAP) for their very helpful comments on earlier drafts of this report and to Kath Hurst (DAP) for final editing and seeing it to press.
## Contents

Executive summary ................................................................. v  
Background ............................................................................. v  
Methodology ............................................................................ v  
Key findings ............................................................................... v  
Conclusion ................................................................................ vii  

1. Introduction ............................................................................ 1  
2. Background ............................................................................ 3  
3. Literature review ................................................................. 6  
4. Objectives and significance ................................................... 12  
   4.1 Study objectives ............................................................... 12  
   4.2 Significance ....................................................................... 12  
5. Overall approach and design ............................................... 15  
   5.1 Study design and study population .................................. 16  
   5.2 Variables .......................................................................... 16  
   5.3 Sample size and power calculations ................................ 18  
   5.4 Sampling frame and data collection methods .................. 18  
   5.5 Data processing and analysis ........................................... 21  
   5.6 Pilot test ........................................................................... 21  
   5.7 Limitations of data ............................................................ 21  
6. Results ................................................................................... 23  
   6.1 Drug indicators ............................................................... 23  
   6.2 Patient care indicators .................................................... 24  
   6.3 Health facility indicator .................................................. 27  
   6.4 Prescriber characteristics ................................................. 20  
   6.5 Dispenser characteristics ................................................ 29  
7. Analysis .................................................................................. 31  
   7.1 Correlations of drug indicators and independent variables .... 31  
   7.2 Correlation of patient care indicators with independent variables .... 35  
8. Discussion ............................................................................. 38  
   8.1 Drug indicators ............................................................... 38  
   8.2 Patient care indicators .................................................... 40  
   8.3 Diagnosis and treatment ................................................ 41  
   8.4 Consulting time ............................................................... 41  
   8.5 Dispensing time ............................................................... 41  
   8.6 Patient knowledge ........................................................... 42  
   8.7 Adequate labelling ........................................................... 44  
9. Recommendations .............................................................. 45  
   9.1 Education and training .................................................... 45  
   9.2 Supervision ....................................................................... 45  
   9.3 Other recommendations and suggestions for further research .... 46  

Promoting appropriate drug use in missionary health facilities in Cameroon
10. Conclusion ............................................................................................................................... 47

11. Appendices ............................................................................................................................. 49
    Appendix 1. Characteristics of individual Cameroon Baptist Convention facilities ................ 50
    Appendix 2. List of antibiotics ................................................................................................. 50
    Appendix 3. Key essential drugs for Cameroon Baptist Convention ...................................... 51
    Appendix 4. Case scenarios ..................................................................................................... 52
    Appendix 5. Acceptable answers for case scenarios ............................................................... 52
    Appendix 6. Structured provider interview ............................................................................ 54
    Appendix 7. Structured dispenser interview .......................................................................... 58
    Appendix 8. Structured patient interview .............................................................................. 61
    Appendix 9. Operational definitions ...................................................................................... 62
    Appendix 10. Results of indicator study for individual facilities ............................................ 63

References ..................................................................................................................................... 67

Abbreviations

BBH  Banso Baptist Hospital
CBC  Cameroon Baptist Convention
CDC  Centers for Disease Control
CFAF  Communauté Financière d’Afrique franc
DAP  Action Programme on Essential Drugs
EDP  Essential Drugs Programme
IHC  integrated health centre
INRUD  International Network for Rational Use of Drugs
LAP  Life Abundant Program
MBH  Mbingo Baptist Hospital
ORF  oral rehydration fluids
RDU  rational drug use
WHO  World Health Organization
Executive summary

Background

For the last several decades, ensuring the availability of an adequate quantity and quality of pharmaceuticals has been one of the objectives of improving health care in developing countries. Now, with the proliferation of greater quantities and varieties of pharmaceuticals in developing countries, promoting their appropriate use has become a priority. To address this issue, the World Health Organization (WHO) established indicators to systematically describe drug use in health facilities. Studies using these indicators have explored educational, supervisory and regulatory measures to encourage appropriate drug use. However, which of these measures or combination of measures is most effective has yet to be established.

In Cameroon, the Cameroon Baptist Convention (CBC), a missionary provider of health care, employs a variety of educational, supervisory and regulatory strategies to promote appropriate drug use in its 17 health facilities. There is, however, considerable variation between facilities in the strategies employed. Not all facilities receive the same type or the same degree of training or supervision. This allowed the researchers to identify which of the strategies most directly correlated with prescribing and dispensing behaviour.

Methodology

A comparative cross-sectional study was conducted between January and March 1997 at 14 of the 17 CBC health facilities. Core, complementary, and modified WHO drug and patient care indicators, as well as new indicators to identify current prescribing and dispensing practices, were used. CBC personnel were interviewed to gain information on their training, supervision, previous education, experience and other potentially relevant characteristics. Patient records, observation of patient-personnel encounters, patient interviews, interviews with CBC outpatient personnel and case scenarios were used to collect the data.

In addition to the core WHO indicators, the study used modified and new indicators. These included compliance with "standard treatment guidelines", "average cost per prescription" and "dispensary waiting times". "Patient knowledge of drug regimen" was expanded to include name, purpose and side-effects of drugs dispensed. "Laboratory referral rates" was a new indicator. These indicators were correlated with independent variables such as environment and personnel-related characteristics, number of outpatients seen, number of personnel, and prescriber/dispenser education, experience, training and supervision.

Key findings

The average number of drugs prescribed by staff at CBC facilities was 2.8 drugs per prescription, with considerable variation between facilities (range 2.0-3.7 drugs).
Factors found to correlate with a lower average number of drugs per prescription
Executive summary

included supervision and prescribers’ level of education, training, and years of experience. Specifically, prescribers at facilities with on-site supervision and/or bimonthly supervision by doctors prescribed significantly fewer drugs per prescription. Prescribers at facilities where the majority had completed at least a six-week training course, in comparison to either four-days or one-week’s training, or no training at all, prescribed fewer drugs per prescription. Facilities where the mean years of prescribing experience was greater than nine were also found to have a lower average number of drugs per prescription, as were facilities where the majority of prescribers had university-level education.

The average antibiotic prescription rate at CBC facilities was 33.8%. There was significant variation between facilities (range 26.1-50.6%). Prescribers at facilities that received at least bimonthly supervision by doctors prescribed significantly fewer antibiotics. So did prescribers at facilities where the majority had participated in at least a six-week training course.

The total number of patients seen at a facility and number of personnel, indicators not previously examined, did not correlate with either drug or patient care indicators. Busy facilities did not prescribe a significantly different number of drugs or antibiotics. Busy facilities did not have significantly different consulting, dispensary waiting or dispensing times. Neither did the average number of drugs per prescription affect consulting, dispensary waiting or dispensing times. The only variable that correlated to significantly reduced patients’ dispensary waiting time was off-site supervision. Time spent dispensing drugs was longer in facilities where the majority of dispensary personnel had at least secondary schooling. However, neither patient knowledge nor the amount of education, training or supervision of dispensing personnel correlated with the length of time spent dispensing drugs.

The average cost per prescription, also a previously untested complementary indicator, was CFAF1968 (US$3.94) for CBC facilities. Prescription cost did not correlate with any of the variables examined, including average number of drugs per prescription and antibiotic prescription rate. Neither did the drug indicators correlate with laboratory referral rates.

In addition, standard treatment guidelines (STGs) were found to have little influence on prescribing practices. Only 11.3% of the treatments prescribed in case scenarios administered to prescribers were in accordance with the STGs. This was further corroborated by chloroquine, quinine and Fansidar prescription rates, which suggested that quinine, not the Fansidar regime recommended in the STGs, was being prescribed for chloroquine-resistant Plasmodium.

Conclusion

This study contributes to the growing body of literature which suggests that training and supervision are effective methods of promoting appropriate drug use. While standard treatment guidelines and essential drugs lists are an important step, this research corroborates the proposition that these measures by themselves are insufficient to reduce inappropriate prescription practices. The study goes a step further than previous studies and begins to identify characteristics of effective supervision and training. Specifically, on-site supervision and regular supervision by
doctors were more effective methods. Training prescribing personnel for at least six weeks and dispensing personnel for at least one week also correlated with more appropriate drug use. At least six weeks of training seemed particularly effective in influencing complex prescribing behaviour such as antibiotic prescription. Replication of this study in other environments would be necessary to confirm these findings.
1. Introduction

With the increasing quantity and variety of pharmaceuticals available today in both developed and developing countries, their potential inappropriate use is a growing concern. Not only the health risks associated with inappropriate drug prescription but also the economic cost to facilities and patients must be considered. As a result, strategies to identify, resolve and prevent inappropriate pharmaceutical use have been the topic of numerous articles, conferences and studies (Ross-Degnan et al 1997). This paper is a summary of a study completed in Cameroon in 1997 that attempted to identify inappropriate prescribing and dispensing practices, and to correlate these practices with existing training, education and supervision of personnel. The study not only contributes to the existing literature that attempts to identify reliable indicators of inappropriate drug use, but also characterizes the environment in which inappropriate drug use occurs. Finally, this paper suggests strategies that encourage the appropriate use of drugs. Thus the paper is of interest and utility to health care professionals working in developed or developing countries who are concerned with the promotion of appropriate drug use and, in particular, with effective education, training and supervision of prescribers and dispensers in the work place.

This study takes as an example a mission organization that provides primary, secondary and tertiary health care in Cameroon. For CBC facilities, ensuring the appropriate use of drugs is a priority, now that a reliable drug supply has been established. While inappropriate drug use at the CBC has been considered a potential problem and preventative regulatory measures taken, no actual study had been completed to determine if and to what extent drugs are nevertheless being inappropriately prescribed and dispensed. Consequently, the CBC expressed interest in conducting research that would describe their drug prescription and dispensing patterns, and evaluate present efforts to promote appropriate drug use, with a view to better meeting the needs of its catchment area (a population of over 600,000).
2. Background

Since the early 1980s, strategies throughout Africa for sustaining failing government-sponsored health care systems have included the institution of drug and user fees. In 1989, in Cameroon, when the budget of the Ministry of Health was reduced from 5.2% of the national budget to 4.4%, drug and user fees were implemented to recover recurrent costs in public health care facilities (Sauerborn 1995). In addition, public health facilities were to be responsible for the purchase, provision and management of their own pharmaceutical supply. Given the environment in which pharmaceuticals are prescribed and dispensed or otherwise obtained, the prescription of medicines is feared to be increasingly inappropriate. One result has been a perceived decrease in the quality of health care provided in public health care facilities (World Bank 1995). However, because private and missionary facilities do not rely on government funds to function, and often have an altruistic motive for providing their services, these facilities are perceived by Cameroonians to be a more reliable source of both pharmaceuticals and health care. This has had the effect of accelerating the transition from government-sponsored to private and missionary health care facilities (World Bank 1995).

In 1996, the CBC, with facilities in the Northwest, Southwest and Central provinces of Cameroon, provided outpatient and inpatient health care to over 420,000 people. Of more than 300,000 outpatient visits, 54% were patients visiting the CBC for the first time (CBC 1996).

CBC health facilities include two hospitals, 15 integrated health centres (IHCs), and 37 Life Abundant Program (LAP) posts (community-based primary health care). Banso Baptist Hospital (BBH) and Mbingo Baptist Hospital (MBH), staffed with doctors, state registered nurses, and a number of auxiliary staff, supervise the 15 IHCs, which are managed in turn either by a state registered nurse or nurse auxiliary and staffed with other auxiliaries. LAP posts, supervised by the closest IHC, are community-initiated and staffed with a village health worker. Services include outpatient and inpatient departments at hospitals, inpatient beds in rural clinics, eye and dental care at hospitals and busier clinics, and antenatal care and maternity care at all facilities. Recurrent costs are funded primarily by payments from patients for services, including drugs. The patient purchases a patient card during the first annual visit for CFAF500 (US$1) which allows unlimited consultations at the outpatient department. The patient pays for laboratory tests, drugs and other supplies as needed. The Central Pharmacy also produces IV solutions and eye ointments that it then sells to CBC and non-CBC health facilities.

With the exception of the doctors, the CBC hospitals, health centres, and LAP posts are staffed by local personnel trained by the CBC itself. Most of the doctors at the CBC are Cameroonian, and received their medical training in either Cameroon or another African country. In addition, there are 3-5 doctors from the USA and Canada. The Private Training School, located at BBH, is licensed to train nurses, nurse aides, breveté nurses (nursing assistants), midwives and "screening nurses," who are responsible for the outpatient department and patient referrals to doctors or hospitals. In addition, the Central Pharmacy, also located at BBH, offers general pharmacy training in compounding and dispensing. Most of the staff have worked their way up to their
current positions. Many start as cleaners or ward auxiliaries and by successfully
passing an exam, obtain entrance to the Training School where they receive further 
training. Eventually, they are promoted to a position with more responsibility and 
better pay. In this way a janitor becomes a ward auxiliary, a ward auxiliary becomes a 
nurse aide, a nurse aide becomes a nursing assistant, etc. All permanent employees are 
Baptists and expected to behave consistently with Christian doctrine. In addition, 
there is a continuous stream of medical and public health students and professionals 
from other countries, including Canada, the USA, United Kingdom, and other African 
countries, who are involved in training CBC personnel, assisting in the provision of 
health services and conducting research.

Within the CBC, supervision is hierarchical with the Director of Health Services, 
Director of Medical Services, Director of Nursing Services, and the Head Pharmacist 
responsible for annual formal evaluations of personnel and occasional visits to IHCs. 
Doctors from the hospitals also play a supervisory role at each IHC, visiting the clinics 
either monthly, bimonthly, semi-annually, or annually depending on the patient load 
and the geographic location of the clinic. During the doctor's visit, they are available 
not only to see patients but also to consult the personnel of the clinic regarding 
diagnostic, prescription or other problems. At an IHC itself, the chief of post is 
responsible for weekly or monthly meetings with personnel. However, the chief of 
post is not solely an administrator. He/ she is also responsible for seeing patients. In 
addition, announcements are made and concerns addressed every morning at prayers, 
that all employees of the IHC attend. The Ministry of Public Health also supervises 
CBC facilities with consistency varying from region to region. For the purpose of this 
study, supervision from the directors and government is considered "off-site". Periodic 
visits to the clinic by the doctors are considered "doctors' visits" and supervision from 
the chief of post is considered "on-site". (See Appendix 1 for detailed description of 
supervision at each facility).

Notwithstanding its highly organized structure, training and supervision, the CBC is 
still subject to influences that would promote inappropriate drug prescription (Laing 
1990). Recognizing this possibility, the CBC formulated and implemented an essential 
drugs list and standard treatment guidelines in 1989. These are subject to regular 
revision. In addition to these regulatory measures, the CBC Director of Health Services 
periodically sends memoranda reminding prescribers that "the fewer the drugs, the 
better the treatment" and encouraging prescribers in each facility to meet at least once a 
week to discuss difficult cases and prescribing practices. The effectiveness of these 
measures, however, has not been evaluated. Therefore, this study attempted not only 
to evaluate existing regulatory, training and supervisory strategies to promote 
appropriate drug use, but also to identify other influences which may contribute to 
appropriate prescribing and dispensing in CBC health care facilities.
3. Literature review

Drugs are a valuable resource in developing countries and in view of their scarcity, often considered an indicator of quality of care. Worldwide, the reliable supply of pharmaceuticals alone is often used as a criterion for quality of care. Obviously, the reliable supply of pharmaceuticals, implying effective management of drug supply should not be the only indicator that characterizes a high standard of care. Without an evaluation of the actual use of the pharmaceuticals the indicator is incomplete. In fact, critics assert that the failure to recognize and appreciate the appropriate use of drugs by both the patient and the provider will undermine any positive effect that a reliable supply of drugs may have (Laing 1989, Hogerzeil et al 1989, WHO 1994, Ross-Degnan et al 1992). Consequently, the Action Programme on Essential Drugs (DAP) at the WHO and the International Network for the Rational Use of Drugs (INRUD) have collaborated on methods to systematically identify inappropriate drug use and implement and evaluate interventions to promote appropriate drug use (WHO 1993).

The inappropriate use of drugs is characterized by the use of drugs when no therapy is indicated, the use of the wrong drug for a specific condition requiring drug therapy, the use of drugs with doubtful/unproved efficacy, the use of drugs of uncertain safety status, failure to provide available, safe and effective drugs, and the use of correct drugs with incorrect administration, dosages and duration (Ross-Degnan et al 1992, WHO 1994, Hogerzeil 1995). The criteria used to determine appropriate drug use include:

- Appropriate indication
- Appropriate drug
- Appropriate patient
- Appropriate information
- Appropriate monitoring

Previous studies in Malawi, Nigeria, Tanzania and Uganda provide a possible range of values for "drug indicators"; indicators determined by DAP/WHO and INRUD as reliable measurements of appropriate drug use (Walker et al 1990, Hogerzeil et al 1993). Nigeria, when compared to other African countries such as Malawi, Tanzania, and Uganda appears to prescribe an excessive number of drugs, including antibiotics, per prescription (Table 1). However, Nigerian prescribers spend considerably more time with their patients. Interestingly, dispensing times, short in Nigeria yet relatively long in Tanzania, do not appear to correlate with patient knowledge of drug regimen. This is a small sample of indicator studies, however, and serves only as an example for comparison. In addition, without knowing disease prevalence it is difficult to estimate the appropriateness of drug prescription, especially when considering antibiotic rates.

Table 1. Drug indicator studies in Africa

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Malawi</th>
<th>Nigeria</th>
<th>Tanzania</th>
<th>Uganda</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of drugs prescribed</td>
<td>1.8</td>
<td>3.8</td>
<td>2.2</td>
<td>1.9</td>
</tr>
<tr>
<td>Number of antibiotics prescribed</td>
<td>34%</td>
<td>48%</td>
<td>39%</td>
<td>56%</td>
</tr>
<tr>
<td>Consultation time</td>
<td>2.3 min</td>
<td>6.3 min</td>
<td>3.0 min</td>
<td>N/A</td>
</tr>
<tr>
<td>Dispensing time</td>
<td>N/A</td>
<td>12.5 sec</td>
<td>77.8 sec</td>
<td>N/A</td>
</tr>
<tr>
<td>Patients knew drug regimen</td>
<td>27%</td>
<td>81%</td>
<td>75%</td>
<td>N/A</td>
</tr>
</tbody>
</table>
N/A = not available
To the authors’ knowledge no studies to date have explored WHO complementary indicators such as prescriber compliance with standard treatment guidelines, average cost of prescription or average dispensary waiting times. Neither have there been studies examining prescriber utilization of diagnostic tools (i.e. laboratory referral rates) nor a modified patient knowledge of drug regimen that includes the name, purpose and side-effect of drugs dispensed.

Of the many factors that can contribute to inappropriate drug use, in both developed and developing countries, the poor prescription practices of health care providers have received considerable attention. Designing effective interventions that necessarily imply prescriber behaviour change in order to improve prescribing practices, is critical now that more countries are seeking ways in which to stop this potentially dangerous and costly phenomenon. To date, strategies and interventions designed to address prescribing practices have included: information/education (the distribution of printed materials, group education, feedback on prescribing patterns, and face-to-face outreach), management (structured supervision) and regulation (development of protocols and guidelines) (Oxman et al 1995, Ross-Degnan et al 1997).

As poor prescription practices were originally attributed to a lack of prescriber information, the majority of interventions focused on providing up-to-date information regarding appropriate prescription. In a comprehensive review by Oxman et al (1995) of 102 studies designed to promote better practice in developed countries, those interventions found to be most effective were face-to-face visits or academic detailing (McConnell et al 1982, Avorn & Soumerai 1983, Avorn et al 1992, Soumerai et al 1993), patient-mediated interventions wherein the patient, once educated, demanded a specific treatment (Vinicor et al 1987, Cohen et al 1989, Cummings et al 1989), objective needs assessments and corresponding marketing (White et al 1985, Jennett et al 1988), audit and feedback (Gehlbach et al 1984) and any combination of the above (Putnam & Curry 1989). Those interventions found to be not at all or less effective were the distribution of educational materials without discussion and follow-up (Avorn & Soumerai 1983, Evans et al 1986), conferences that were didactic and not necessarily interactive, and reminders. The effectiveness of using local opinion leaders was also evaluated but without concluding whether or not the method was effective (Stross & Bole 1983, 1985, Stross et al 1986).

A similar review by Ross-Degnan et al (1997) of studies done in developing countries reiterates Oxman’s findings. The study found that educational interventions, i.e. workshops or training courses (Angunawela et al 1991, Gani, Tangkilisan & Pujilastary 1995, de Vries et al, 1995), and community case management (Delacollette et al 1996, Fauveau et al 1992) were the most frequently used methods of promoting appropriate drug use. Administration (group processing, norm setting or performance review) (Guiscard et al 1988, Guiterrez et al 1994, Agyepong et al 1996), supervision (audit and feedback) (Chowdhury et al 1996), and regulatory measures (Essential Drugs Programme) (Christensen et al 1990, Chalker 1995, ZEDAP 1996) were used less frequently. Those interventions evaluated as most effective were repeated, focused, multiple modality (lectures, group problem-solving, role-playing) workshops and courses that were done on-site and using opinion leaders or supervisors as trainers (Bexell et al 1995, Kafuko et al 1996, Gonzalez Ochoa et al 1996, Thomas 1996). Supervision, monitoring, regular audit and feedback were considered to have a moderate effect. However, it still has not been established if these methods are necessarily effective when considering a variety of problem practices (Kafle et al 1995,
Sunartono & Darminto 1995, Chowdhury et al. 1996). As found in Oxman's study, the
distribution of educational materials without any complementary intervention was ineffective (Ross-Degnan et al 1997).

To the authors’ knowledge, there have been few or no studies to date that examine the effectiveness of varying lengths of training, non-health-related formal education, off-site versus on-site supervision, doctor’s supervision of prescribers and the corresponding frequency of different types of supervision. Nor have there been any studies that examine the context in which a prescription is written or dispensed, including average outpatient visits per day and number of prescriber/dispensers.

What has been established, however, is that inappropriate drug prescription is affected by a variety of complex, underlying factors which can be categorized as deriving from patients, prescribers, facility administration, supply system, regulation, drug information and/or misinformation (Ross-Degnan et al 1992, WHO 1994, Hagerzeil 1995). Globally, regulation through the implementation of protocols (standard treatment guidelines and essential drug lists), as the CBC has done, has been one of the most popular methods of counteracting these forces. However, while this method may initially reduce inappropriate drug use, the effect has not been shown to be sustainable. Okwaare et al’s (1994) study of three interventions concluded that standard treatment guidelines alone were insuffient in affecting change in areas such as generic drug use and patient treatment for malaria and diarrhoea. Hagerzeil (1994), who corroborated this finding, has stated that:

"Treatment guidelines developed without wide consultation, distributed without proper introduction and training, not accompanied with a system to make the same drugs available in the health system, and without mechanism for continuous supervision and medical audit are unlikely to have an impact on prescribing".

Other factors identified as contributing to inappropriate drug prescription include: lack of training combined with poor prescriber supervision and monitoring (Bapna, Shewade & Pradham, 1994), drug availability (Hagerzeil & Walker 1989, Chowdhury 1994, Ofori-Adeji 1994), patient expectations and beliefs, (Homedes & Ugalde, 1993, Wolff, 1993), and prescriber beliefs and attitudes (Hamm, Hicks & Bemben 1996). Given the diverse influences on inappropriate drug use, a mixture of the strategies mentioned earlier is needed to promote appropriate drug use among prescribers (Soumerai, McLaughlin & Avorn 1989, Greco & Eisenberg 1993, Guiterrez et al 1994).

Of the various strategies used to address inappropriate drug use, improved prescriber supervision and monitoring is receiving increasing attention, with particular interest in the development of tools for self-monitoring within health centres. An intervention in the Gunungkidul District in Java, Indonesia, identified self-learning and active participation by prescribers as instrumental in changing prescribing practices (Sunartono & Darminto 1995). Using baseline drug use indicators to identify problem areas, the research team worked with local staff to develop and implement appropriate tools for self-monitoring in the health centres. Subsequent district-wide implementation of self-monitoring produced considerable decreases in polypharmacy (26% reduction), antibiotic use (51% reduction) and injection use (74% reduction), and an overall 17% reduction in the number of drugs ordered.
In Cameroon, drug use and misuse has best been described by Sjaak Van der Geest, a Dutch anthropologist, who wrote extensively on pharmaceutical use in the South West Province in the 1980s. He attributed the inappropriate use of drugs in Cameroon to the poor example of formal health care in government-run health care facilities (Van der Geest 1982a, 1982b, 1987a, 1987b, 1987c). Government health care facilities at that time were considered by the Cameroonians to be under-staffed due to "frequent absences of health workers," under-supplied, "characterized by bureaucratization and poor management," and constantly short of drugs (Van der Geest 1987c). Furthermore, the financial incentive to prescribe greater quantities of drugs, as well as the relative convenience of informal sources of drugs prescribed, were undermining health services delivered through government channels. By 1995, a World Bank report noted that instead of going immediately to the formal sector when ill as was the practice before 1987, Cameroonians chose to first self-medicate. Other options included visiting a "quack doctor", street vendor, traditional or faith healer and often, only when very ill would people resort to the hospital, (World Bank 1995). Each of these factors has exacerbated inappropriate drug use in Cameroon.

Fortunately, alternative sources of formal health care are still an attractive option for Cameroonians. In fact, since 1987 there has been a steady increase in the number of outpatients seen at the CBC (CBC 1996). The CBC contributes to maintaining the trust between the formal health care facility and the people. Subsequently, ensuring appropriate prescribing and dispensing practices within the CBC is a step towards ensuring quality health care for Cameroonians.
4. Objectives and significance

4.1 Study objectives

Although policies to promote appropriate drug use in the CBC facilities have been in place since 1990, no systematic study had been completed to assess actual prescription practices. The general objective of this study was to describe current prescribing and dispensing practices in CBC facilities, identifying strengths, weaknesses and possible areas for intervention. In doing so, this study established baseline prescription and dispensing practices to evaluate the effectiveness of future interventions and identify possible tools for self-monitoring. More importantly, this study characterized training, supervision and other environmental and personnel-related factors, and determined which of these factors most closely correlated with appropriate prescribing and dispensing practices in CBC health facilities.

4.2 Significance

Although the CBC currently employs regulatory, supervisory and training strategies in all of its facilities, the implementation of these strategies varies between clinics. For example, although most clinics receive some supervision, the type and frequency of supervision differs in each facility. This variation, and the fact that education, training and supervision could be controlled for, enabled the authors to identify which of the strategies correlated with prescribing and dispensing behaviour. By correlating training and supervision with drug prescribing and dispensing, this study does more than contribute to the growing body of literature that suggests that these methods are the most effective means of promoting appropriate drug use. It goes a step further and through original analysis begins to identify the specific characteristics of effective supervisory and training methods.

Specific independent and dependent variables examined in this study can be categorized as training, education, experience and supervision. For non-medical doctor prescribers, training included either a three-month, six-week, one-week or four-day course on diagnosis and prescription. For dispensers, training was a one-week course in dispensing. Education was considered non-health-related formal education; primary, secondary, high school and university. Experience was both number of years experience with the CBC and number of years experience at present job. Supervision was categorized as either off-site or on-site, or specifically doctors’ supervision of prescribers. Not only the type of supervision was examined but also the corresponding frequency: daily, weekly, monthly, bimonthly, semi-annually or annually.

This study also considered indicators of the environment in which a prescription was written and dispensed, including average outpatient visits per day and number of prescribers/dispensers. Complementary WHO drug and patient indicators were tested: prescription in accordance with standard treatment guidelines, average drug cost per encounter and dispensary waiting times. Other indicators were modified such
as patient knowledge, to include not only regimen but also name, purpose and side-
effects of the drug prescribed. New indicators were tested which looked at accurate
diagnosis based upon etiology described in standard treatment guidelines, utilization of diagnostic tools such as laboratory referral rates, and chloroquine: quinine prescription rates. This information was gathered not only at the CBC’s request, but also because it is potentially important to all individuals, organizations, institutions and governments concerned with improving drug use.
The geography of the Northwest Province in Cameroon is mountainous with altitudes ranging from 1200 to about 5500 feet, covering land from low-lying tropical forest to high savanna grasslands. The roads that exist are of laterite, making travel during the rainy season very difficult. During the dry season, from mid-November until late March, the Province is dry and dusty. The Health Board of the CBC is in Kumba, 60km from Bamenda, the Provincial capital. All IHCs are within three days drive on unpaved roads from Bamenda. The primary languages spoken in the health centres are English and Pidgin English. In Etoug-Ebe and Nyamboya, French is also spoken. Figure 1 uses a map of the Northwest Province with the locations of the IHCs and hospitals to illustrate the study area.

Figure 1. Study area

Health centres and hospitals n = 14
CBC health facilities vary greatly in their capacity to recognize, diagnose and treat different illnesses. Considering that the location, number of patients seen on a daily basis, number of personnel, extent of personnel education and training, and disease patterns may partly explain the discrepancy in prescription patterns, it is important to note the differences from clinic to clinic. In particular, some clinics have an on-site doctor or at the very least, a regular doctor’s visit. Other facilities have less highly trained personnel and less frequent doctor supervision. Some facilities are very busy in comparison to others, seeing over 100 patients a day, others less than 30. Furthermore, some clinics have extensive diagnostic capabilities, such as laboratory tests and ultrasound. The tables in Appendix 1 describe in detail the characteristics of the hospitals and IHCs.

5.1 Study design and study population

The study is a comparative, cross-sectional study, with patients (and their records) and personnel of CBC outpatient departments serving as the study population. The study describes those persons working at or frequenting 14 of the 17 CBC outpatient facilities in Cameroon.

5.2 Variables

In order to produce representative and comparable statistics of appropriate prescribing and dispensing, the authors used indicators defined by WHO in How to investigate drug use in health facilities: selected drug use indicators (WHO/DAP 1993). In addition to “core drug indicators”, “complementary indicators” were also used. As suggested by the DAP manual, modifications were made to existing indicators and new indicators were developed.

The WHO “core drug indicators” included: average number of drugs per encounter, percentage of encounters with an antibiotic prescribed (see Appendix 2 for a list of pharmaceuticals considered as antibiotics) and percentage of encounters with an injection prescribed. Also considered a “core indicator” in this study, although not included in the WHO manual, was the percentage of encounters in which chloroquine and quinine were prescribed. This information was collected because of the CBC’s interest in the prevalence of chloroquine-resistant Plasmodium. Specifically, the CBC was concerned about the inappropriate prescription of chloroquine and quinine, and the effectiveness of previous attempts to educate prescribers regarding the appropriate prescription for chloroquine-resistant malaria.

WHO “core patient care indicators” including: the average consultation time, average dispensing time, percentage of patients with adequate prescription knowledge, and percentage of adequately labelled drug packages (Appendix 8) were also used. Adequate prescription knowledge included not only knowledge of drug regimen but also the name, purpose and side-effects of the drug prescribed. The average amount of time patients waited at the dispensary to have a prescription filled was also measured in order to correlate characteristics of dispensing personnel with the efficiency of the dispensary.

In order to determine if drug supply contributed to inappropriate drug prescription or dispensing, i.e. if the appropriate drug was unavailable, and a less appropriate drug had been prescribed in lieu, the WHO “core health facility indicator” (an inventory of
key essential drugs) was also completed. (See Appendix 3 for drugs considered essential by the CBC).
Promoting appropriate drug use in missionary health facilities in Cameroon

Previously untested indicators, noted by WHO to be potentially useful, were also incorporated into the study. These included compliance with standard treatment guidelines, diagnosis and prescription for selected diagnoses, and average cost per prescription. With the assistance of the Head Pharmacist and the Director of Health Services, four common illnesses seen at CBC facilities were described. Diagnosis and drug regimens were then requested from each prescriber working in outpatient departments. The illnesses chosen were chloroquine-resistant malaria, dehydration due to diarrhoea, uncomplicated gonorrhoea and hypertension. Case scenarios were written and included in the structured prescriber interviews (see Appendices 4 and 5 for case scenarios). Prescribers were allowed to use any materials normally available to them, including the standard treatment guidelines themselves. Complementary qualitative data were also obtained from interviews by asking hypothetical questions on patient demand. Finally, data on laboratory rates were collected to determine the extent to which prescribers used the diagnostic resources available to them.

In order to correlate the above indicators with characteristics of training, prescribers were interviewed to determine the method, frequency, duration and perceived usefulness and relevance of any training on screening (diagnosis and prescription) and the use of the standard treatment guidelines. Dispensers were likewise interviewed to determine the effect of dispensary training on drug dispensing. Similar questions were asked regarding both formal and informal supervision. In addition to training and supervision, the interviews also covered other personnel-related factors that could influence prescribing and dispensing patterns such as the age, experience and educational background of prescribers and dispensers (see Appendices 6 and 7 for personnel interviews).

5.3 Sample size and power calculations

Estimations of the necessary sample size of retrospective data were done using EpiInfo 6.03 STATCALC (CDC/WHO 1996). It was assumed that there would be 99% accuracy in obtaining and recording answers, 95% confidence and 80% power. Using previously estimated rates of antibiotic prescription (25%), and wanting to detect an inappropriate antibiotic prescription rate of at least as low as 35%, a random sample of 348 retrospective records from each facility was necessary to ensure statistical significance (Hogerzeil et al 1993). To control for seasonal variation, a six-month period including both dry and rainy seasons was selected. Sixty records from each month were then collected for a total of 360 retrospective records per facility. Total retrospective sample size was 5040 records. In addition, 100 or 30 prospective records (busier facilities and less busy facilities, respectively) were collected for each facility, for a total prospective sample size of 856. While insufficient to compare between facilities, the total prospective sample size was sufficient to compare antibiotic prescription rates in 1996 and 1997. The sample size of 30 patient interviews and 30 prescriber/dispenser encounters at each facility was based upon WHO recommendations (WHO/DAP 1993).

5.4 Sampling frame and data collection methods

The study included Banso Baptist Hospital, Mbingo Baptist Hospital and 12 of the 15 CBC IHCs: Nkwen, Mutengene, Etoug-Ebe, Kumba, Ashong, Ndu, Ngounso, Bangolan, Kouhouat, Jikijem, Akeh, Nyamboya (n = 14). Three IHCs were not included in the data collection: Allat, Belo and Mbem. One served as the pilot test site.
and transportation to the other two was difficult to obtain. Each facility was visited and the data collected over a period of two to three days, from January to March 1997.
A combination of retrospective and prospective records was examined in each facility. Retrospective data were collected using the dispensary register. Records from January to June of 1996 were reviewed and for each month 60 records were randomly selected. A total of 360 records per facility was collected. The total retrospective sample size was 5040 retrospective records. This information was used to determine average number of drugs per prescription, average cost of prescription, antibiotic, quinine and chloroquine prescription rates, and the top 10 drugs prescribed.

In addition to retrospective records, prospective data consisting of prescriptions, consulting, dispensary waiting and dispensing times, and personnel interviews were collected. One hundred prescriptions in busier facilities and 30 prescriptions in less busy facilities were collected. Thirty dispensary waiting times, dispensing times and interviews were collected in all of the facilities. In those facilities which saw fewer than 30 patients during the data collection period the authors included as many prescriptions, times and interviews as was possible (range 0–35) (Appendix 10, Tables 4-6). Prospective prescriptions were collected on the day of the facility visit and used to calculate injection rates, percentage of patients referred to the laboratory or doctor and other referrals (ultrasound, eye department, dentist, physical therapist, etc.). The total prospective record sample size was 856 prescriptions.

Thirty patient consultation times, defined from the moment the patient entered the consultation room until the patient left the consultation room, were collected in each facility on the day of the facility visit. Only initial consultations were included. Patients returning with laboratory test results, X-rays or ultrasound results were not part of the sample. The total sample size was 348 consultation times.

Thirty dispensary waiting times were also measured at each facility on the day of the facility visit in order to estimate the average length of time patients waited to have a prescription filled. With a stopwatch, the authors noted the time when the patient left their card at the dispensary window and the time when the patient returned to the window for their prescription. Thirty dispensing times were also recorded. Dispensing times were taken similarly, taking note of the time when the patient returned to the window for the prescription and when the patient left the window with the prescription. In all 314 waiting times and 314 dispensing times were collected.

Thirty patient interviews were conducted at each facility to determine the level of patient knowledge. The drug packages of these patients were examined to see if they were clearly labelled. Personnel from the facility, trained by the authors, conducted patient interviews in the patient’s language. The total sample size was 338 patient interviews.

At each facility, the authors interviewed dispensing and prescribing personnel in English, with the exception of two dispensing interviews. One dispensing interview was completed in French and another was completed in Pidgin English with a translator. After the interview all prescribers received a paper with four case scenarios. They were asked to diagnose and then prescribe. Interviews and case scenarios remained confidential. After the initial interview, no names were used and all of the questionnaires were coded. All prescribers were told they could use any resources normally available to them and had as much time as necessary to complete the case scenarios. The total number of prescribers interviewed was 44. The total number of dispensers interviewed was 38. The total number of case scenarios completed was 34.
With a checklist of 20 essential drugs furnished by the Central Pharmacy of the CBC, on the day of the facility visit, a drug inventory was done for a total of 14 stock inventories. A summary of data collected is presented in Table 2.

### Table 2. Total sample size

<table>
<thead>
<tr>
<th>Drug indicators</th>
<th>Retrospective data</th>
<th>Patient care indicators</th>
<th>Prospective data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average number of drugs prescribed</td>
<td>5040 patient records</td>
<td>Average consulting time</td>
<td>348 consultations</td>
</tr>
<tr>
<td>% of prescription with antibiotics</td>
<td>&quot;</td>
<td>Average waiting time</td>
<td>314 dispensary visits</td>
</tr>
<tr>
<td>% of prescription with quinine</td>
<td>&quot;</td>
<td>Average dispensing time</td>
<td>&quot;</td>
</tr>
<tr>
<td>% of prescription with chloroquine</td>
<td>&quot;</td>
<td>% of drugs adequately labelled</td>
<td>&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% of drugs prescribed in</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>accordance with standard</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>treatment guidelines</td>
<td></td>
</tr>
<tr>
<td>% of prescription with injection</td>
<td>856 patient cards *</td>
<td>% of treatment carried out</td>
<td></td>
</tr>
<tr>
<td>% of prescription with referral</td>
<td>&quot;</td>
<td>in accordance with standard</td>
<td></td>
</tr>
<tr>
<td>Average cost per prescription</td>
<td>&quot;</td>
<td>treatment guidelines</td>
<td></td>
</tr>
<tr>
<td>Facility indicators</td>
<td>Prospective data</td>
<td>Patient knowledge*</td>
<td>338 patients interviewed</td>
</tr>
<tr>
<td>Stock availability of essential drugs</td>
<td>14 facilities visited</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prospective data</strong></td>
<td></td>
<td><strong>Personnel characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Prescriber interviews</td>
<td>44 prescriber interviews</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dispenser interviews</td>
<td>38 dispenser interviews</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*See section 5.7 for discussion of incomplete data collection for specific facilities

### 5.5 Data processing and analysis

Quantitative data was processed and analysed using EPIinfo Version 6.03 (CDC/ WHO 1996) and presented using Excel, Data collection forms. Personnel interviews were reviewed after each facility visit for consistency and accuracy. The Check Program within EPIinfo was used to validate the data entry. Analysis included calculation of frequency tables, t-, Chi-square, Fisher’s Exact tests, correlation and regression (Glenberg 1988).

### 5.6 Pilot test

A pilot test of all data collection forms, data entry and data analysis (Appendices 4-8) was conducted at the Banso Baptist Hospital, the largest facility in the study population, and Belo, an IHC. Patients and personnel used in piloting questionnaires were excluded from the study sampling frame. Structured observations were also carried out before the study and the data not included in the analysis.

### 5.7 Limitations of data

Although the sample size of the prospective data is large enough to permit comparisons between past and current prescribing practice, the prospective data sample sizes for the individual facilities are too small to allow for cross-facility comparison. Furthermore, because the prospective data was taken from one day, it may not be representative. Market day, doctor’s clinic, antenatal clinic and political unrest, were impossible to control for and may have affected the prescribing patterns for that day.

Occasionally due to weather, market day or the limited time available for data collection, it was not possible to collect the entire sample of 30 prospective patient records, consulting times, dispensary waiting times, dispensing times, and patient interviews during the two-three day facility visit. This may have influenced correlation statistics. Fortunately, the 360 retrospective records required only one
evening to collect and were consistently available and reliable for each facility. Therefore, retrospective data were used to calculate the indicators.

Consulting, dispensary waiting times and dispensing times, because they were also gathered in one day, may also be inaccurate because of circumstances such as personnel on leave or otherwise absent. However, it is interesting that in one of the busiest clinics the average dispensary waiting time was significantly lower in comparison with other clinics, even with one person on leave.

While the authors tried to eliminate prescription refills and chloroquine given as prophylaxis to pregnant mothers from the retrospective data collection, it was not always possible to do so. This may have resulted in underestimation of the number of drugs per prescription and overestimation of chloroquine prescription rates. Although drug shortages and stock-outs were controlled for in the prospective data collection, they could not be controlled for in the retrospective data. To our knowledge, there were no drug shortages for the CBC as a whole during the months of January-June 1996.

A different interviewer at each facility administered the patient interview. This may have resulted in questions and answers being interpreted differently. The authors’ attempt to control for variation by training and observing the interviewer as well as using a structured questionnaire with only five questions. However, individuals as different as college-educated pharmacy students and semi-literate janitors administered the questionnaires.

Finally, because prescriber-specific prescriptions were not available retrospectively, and prospective data samples were too small, the authors were unable to perform prescriber-specific analysis. Therefore, facility averages for the indicators of age, educational level and length of time trained were used in correlation calculations.
6. Results

The following section summarizes the results of the drug and patient care indicators, CBC averages, as well as the range of values for individual facilities. General personnel characteristics including average age, level of education attained, CBC and job-specific experience, training and supervision are also indicated. Averages for the CBC were based on the total sample. Graphic representation of the variation between clinics has been included for comparison. Detailed findings for each facility can be found in Appendix 10.

6.1 Drug indicators

CBC staff prescribed an average of 2.8 drugs per prescription (Nigeria 3.8 and Tanzania 2.2). However, there was considerable variation between facilities. On average, hospital staff prescribed fewer drugs than IHC staff. Hospital staff prescribed 2.2 and 2.4 drugs per prescription while staff at a moderately busy IHC prescribed 3.7 drugs per prescription (Fig. 2). Antibiotic prescription rates varied similarly. The CBC average rate of antibiotic prescription was 33.8%. Hospital and busy IHC staff prescribed antibiotics less often than the CBC average, range 26.1-34.2%, while the prescribers at the same moderately busy IHC prescribed antibiotics significantly more often than the CBC average (50.6%) (Fig. 3) (Nigeria 48% and Tanzania 39%).

Figure 2 - Average number of drugs per prescription

Figure 3 - Antibiotic prescription rate

Qualitative analysis of the personnel interviews demonstrated that personnel often felt compelled by the patient to prescribe drugs even when the need for drugs was not indicated, particularly if the patient had invested considerable time and money to visit the health facility. As stated by one of the BBH staff, “We don’t want our patients to leave without at least a prescription for multivitamins. Otherwise they may spend
more time and money to go to another hospital that may give them even more expensive and less necessary drugs.”

On average CBC staff prescribed quinine and chloroquine equally. Although in one IHC located at more than 3500ft, chloroquine was still prescribed more often than quinine (1:11.3, quinine: chloroquine). However, in four IHCs at altitudes below 1000ft, quinine was prescribed from three to 10 times more often than chloroquine. While the variation in chloroquine prescription was consistent with established chloroquine-resistant Plasmodium patterns in Cameroon, because the CBC standard treatment guidelines prescribe a Fansidar regimen for suspected chloroquine-resistant malaria, the increased prescription of quinine was unexpected (Brasseur et al 1992). Qualitative analysis of prescriber interviews revealed that there was a tendency to prescribe quinine for suspected chloroquine-resistant malaria regardless of the standard treatment guidelines, described in greater detail in 7.2. In fact, from 1996 to 1997, there was a 2.8% decrease in chloroquine prescription and a 0.8% decrease in Fansidar, prescription, while there was a 0.9% increase in quinine prescription.

In general, if the facility had a laboratory it was utilized in at least one-third of the cases seen (33.9%). However, there was considerable variance in laboratory referral rates (16.7%-44.9%). Facility average cost per prescription varied from CFAF1414 (US$ 2.80) to CFAF 2668 (US$ 5.34). It was impossible to determine injection rates because of the quality of data. Drug indicators for the CBC and the range of results are summarized in Table 3 and presented in full in Appendix 10.

**Table 3. Drug indicators**

<table>
<thead>
<tr>
<th>CBC health facilities overall average in 1996</th>
<th>Average number of drugs prescribed*</th>
<th>Average rate of antibiotic prescription</th>
<th>Quinine to chloroquine ratio prescription rate</th>
<th>Percentage of laboratory referrals**</th>
<th>Average cost of prescription ***</th>
</tr>
</thead>
<tbody>
<tr>
<td>highest</td>
<td>3.7</td>
<td>50.6</td>
<td>1:11.3</td>
<td>49.5</td>
<td>CFAF2668</td>
</tr>
<tr>
<td>lowest</td>
<td>2.0</td>
<td>26.1</td>
<td>1:0.1</td>
<td>16.7</td>
<td>CFAF1414</td>
</tr>
</tbody>
</table>

*Results are from retrospective data unless otherwise noted.
**Prospective data used. ***CFAF500 =US$1.

### 6.2 Patient care indicators

In general, prescribers’ diagnoses of the four case scenarios were fairly accurate (67.9% diagnosed all four correctly). However, not a single prescriber prescribed a treatment for all four illnesses which was consistent with standard treatment guidelines. Overall only 11.3% of the treatments prescribed were in accordance with standard treatment guidelines. Examples included: not prescribing Fansidar for chloroquine-quinine resistant malaria before resorting to quinine and not prescribing oral rehydration solution for dehydration. Dosage, especially for quinine, was calculated inconsistently or incorrectly. Few prescribers included the total number of tablets needed and often the regimen was given using 250mg tablets, while the dispensary only stocked tablets of 200mg or 300mg. There was also considerable variation in the case scenarios with regards to the regimen prescribed (e.g. ½ tablet two or three times a day, etc.) further indicating that not all prescribers were prescribing in accordance with the standard treatment guidelines. A copy of the appropriate diagnosis and treatment for the case scenarios is included for further clarification (Appendices 4 and 5).
6. Results
As mentioned previously, qualitative results from the prescriber interviews provided insight into the presumably inappropriate prescribing for malaria. Prescribers mentioned that they were taught to always consider the economic position of a patient before prescribing. Therefore, they would often prescribe the least expensive antimalarial, quinine, and not chloroquine, followed by Fansidar. Prescribers stated that not only was quinine less expensive, but that it was more likely to cure the patient the first time, potentially saving more time and money in the long run.

The average amount of time a prescriber at the CBC facilities spent with a patient before either writing a prescription or referring the patient to the doctor, hospital or laboratory was 5.5 minutes (Nigeria 6.3 min; Tanzania 3.0 min). There was considerable variation among facilities (3.5-8.0 min). Doctors spent slightly less time with patients (3.4 min) than did screening nurses. An indicator not previously studied, dispensary waiting times, also varied. At the hospitals, patients waited on average 21.3 and 29.4 minutes for a drug prescription to be filled, while at equally busy outpatient departments patients waited only 10.7 and 10.3 minutes (Fig. 4). The shortest dispensary waiting time (5.4 min) was at a moderately busy facility. Dispensing times also varied between facilities. The CBC average dispensing time was 1.1 minutes, with a range of 0.6 to 1.9 (equally busy out-patient departments), (Nigeria 12.5 seconds; Tanzania 77.8 seconds, see Fig. 5).

Patients knew how and when to take their medication 84.9% of the time (range 48.3-100%) Nigeria 84.8%; Tanzania 75%). However, they knew the name, purpose, regimen and precautions only 38.4% of the time (range 0-88.9%).

On average, drug packages were adequately labelled with the name of the drug and regimen 92.1% of the time, with some variation between facilities (range 77.4-100%). Drug packages were considered adequately labelled if they contained the name of the drug and the regimen. These findings are summarized in Table 4 and presented in full in Appendix 10.
Table 4. Patient care indicators

<table>
<thead>
<tr>
<th>Average time (min):</th>
<th>Nurse consultation</th>
<th>Doctor consultation</th>
<th>Waiting time</th>
<th>Dispensing time</th>
<th>% of patients who knew regimen</th>
<th>% of drug packages adequately labelled</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBC health facilities overall average</td>
<td>5.5</td>
<td>3.4</td>
<td>16.4</td>
<td>1.1</td>
<td>84.9</td>
<td>92.1</td>
</tr>
<tr>
<td>Range of data collected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>highest</td>
<td>8.0</td>
<td>5.0</td>
<td>29.9</td>
<td>1.9</td>
<td>100.0</td>
<td>77.4</td>
</tr>
<tr>
<td>lowest</td>
<td>3.5</td>
<td>2.2</td>
<td>5.4</td>
<td>0.6</td>
<td>48.3</td>
<td>100.0</td>
</tr>
</tbody>
</table>

6.3 Health facility indicator

When drug stocks were counted on the day of the clinic visit, 100% of the 20 essential drugs of interest to the Central Pharmacy were in stock at all clinics. An interview with the Head Pharmacist of the Central Pharmacy concerning drug availability during the period of January to June 1996 confirmed that to his knowledge there were no shortages of essential drugs during that time.

6.4 Prescriber characteristics

In general, CBC prescribing personnel, “screening nurses” and doctors were young and relatively well educated. The average age of CBC prescribing personnel was 38.5 years. Nearly 70% had at least a secondary school education. However, there was a marked difference between the mean age of staff in hospitals and busy clinics, and in less busy clinics. At the hospitals and busy clinics the average age of prescribing staff was 41.2 years, while in less busy rural clinics the average age of prescribers was 33.2 years. In those clinics with a younger staff there was a higher level of formal education; the majority of prescribers at the less busy rural clinics had at least a secondary school education.

Prescribers had worked with the CBC in various capacities on average for 15 years. Those prescribers who had worked with the CBC for a longer time were located in hospitals and busier clinics. For example, prescribers at one busy clinic had 25.2 years on average with the CBC, while in two less busy clinics personnel had only 7.0 average years. Regarding job-specific experience, prescribers had at least 9.0 years experience “screening” patients. Again, the most experienced prescribers were located in the hospitals and busier clinics (13.4 years), and the less experienced prescribers located in less busy clinics (0.4 years).

Fifty-six percent (56.8%) of CBC prescribing personnel had participated in a “screening course”. The screening courses offered by the CBC were a three-month, six-week, one-week or four-day course on history taking, physical examination, diagnosis and prescription for common illnesses. CBC personnel had an average of 6.1 weeks of training on diagnosis and prescription (excluding doctors) and had received that training 66.7 months (more than five years) ago. Excluding the hospitals, busy clinics on average had more personnel with training in diagnosis and prescription. In the three busiest clinics (seeing more than 100 patients per day) all prescribing staff had taken a screening course with the CBC. In contrast, in less busy clinics (seeing less than 30 patients per day) only half of the prescribing staff had taken the screening course. In general, personnel who participated in training reported being very satisfied with the...
amount and relevancy of knowledge gained from the training (average 6.6 on a scale of 1-7). Findings are summarized in Table 5 and given in detail in Appendix 10.
6. Results

Table 5. Prescriber characteristics

<table>
<thead>
<tr>
<th></th>
<th>Average age</th>
<th>% with secondary schooling</th>
<th>Average years screening experience</th>
<th>% of personnel with screening course*</th>
<th>% of personnel with standard treatment guidelines course</th>
<th>Average weeks training**</th>
<th>Average months since training</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBC health facilities overall average</td>
<td>38.5</td>
<td>68.2</td>
<td>9.0</td>
<td>56.8</td>
<td>52.3</td>
<td>6.1</td>
<td>66.7</td>
</tr>
<tr>
<td>Range of data collected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>highest</td>
<td>47.7</td>
<td>100</td>
<td>13.4</td>
<td>100</td>
<td>100</td>
<td>13.0</td>
<td>131.0</td>
</tr>
<tr>
<td>lowest</td>
<td>27.0</td>
<td>0</td>
<td>0.4</td>
<td>0</td>
<td>0</td>
<td>0.0</td>
<td>24.0</td>
</tr>
</tbody>
</table>

*Includes doctors. **Excludes doctors.

Most prescribers reported receiving at least some supervision (54.5%), but stated that they received on-site or off-site supervision only as needed (as determined by the prescriber), and not regularly (yearly, monthly, weekly, etc.). Supervision was considered less helpful than training, receiving 5.8 on a scale of 1-7. A more useful source of supervision mentioned was doctor’s clinics. Depending on the facility, doctor’s visits were daily (in hospitals), monthly, bimonthly or twice annually. In general, hospitals and busy clinics had more frequent doctor’s visits while isolated rural clinics, both moderately busy and less busy, received less frequent visits.

6.5 Dispenser characteristics

In general, people dispensing drugs in CBC facilities were younger than their prescribing colleagues and less educated. The average age was 30.6 years with only 52.6% of dispensing personnel having completed a secondary school education. Forty-seven percent (47.4%) of dispensing personnel had only a primary school education. None of the dispensers had been to high school (post-secondary school) or university. The average number of years dispensing experience was 3.6. As with CBC prescribers, older, less formally educated yet more experienced dispensers worked in the dispensaries of hospitals and busier clinics. For example, Banso Baptist Hospital personnel were on average 39.0 years old, with an average of 6.3 years dispensing experience, and 20% had received a secondary school education. In contrast, dispensing personnel in a less busy, rural clinic were on average 22.3 years old, with an average of 2.3 years dispensing experience, while 33.3% of the dispensing staff had completed secondary school.

In comparison to prescribers, dispensers received substantially less job-specific training at the CBC Training School. Only 31.6% had ever received a dispensary course. The hospitals and busier clinics had more highly trained staff. All five of the facilities classified as “busy” had at least one dispenser who had received dispensary training (11 people trained out of 15). In contrast, only one dispenser out of 22 working in the moderately and less busy facilities had received dispensary training. The average number of weeks of dispensary training for CBC dispensing personnel was 2.5. The average time elapsed since the most recent training was 31.5 months (2.6 years). Results are summarized in Table 6 and given in full in Appendix 10.
Table 6. Dispenser characteristics

<table>
<thead>
<tr>
<th></th>
<th>Average age</th>
<th>% with secondary schooling</th>
<th>Average years dispensing experience</th>
<th>% of personnel with dispensing course</th>
<th>Average weeks of training</th>
<th>Average months since training</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBC health facilities</td>
<td>30.6</td>
<td>52.6</td>
<td>3.6</td>
<td>31.6</td>
<td>2.5</td>
<td>31.5</td>
</tr>
<tr>
<td>overall average</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range of data collected</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>highest</td>
<td>39.2</td>
<td>100.0</td>
<td>7.5</td>
<td>100.0</td>
<td>10.2</td>
<td>108.0</td>
</tr>
<tr>
<td>lowest</td>
<td>22.3</td>
<td>0.0</td>
<td>1.5</td>
<td>0.0</td>
<td>0.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

In general, most dispensers (86.8%) stated they received on-site supervision and were satisfied: 6.2 on a scale of 1-7. Off-site supervision, defined as a visit from the Head Pharmacist of the CBC or a government official, was reported by only 19.4% of dispensers. However, it was perceived as being more useful: 6.6 on a scale of 1-7.

In summary, CBC average drug and patient indicators compared favourably to other indicator studies in Africa. Within the CBC, hospitals and busier clinics prescribed fewer drugs per prescription and had lower antibiotic prescription rates. Chloroquine prescription rates corresponded with established chloroquine-resistant Plasmodium patterns. However, quinine was prescribed more often than was expected given the protocol in the standard treatment guidelines. In regard to patient care indicators, doctors spent slightly less time with patients than did screening nurses. Patients spent less time waiting for drugs in busier clinics. There was no noticeable trend in dispensing times. However, there was considerable variation between clinics in regard to all times (consulting, dispensary waiting and dispensing). Personnel in hospitals and busier clinics had a tendency to be older, have more CBC and job-specific experience and training, and less non-health-related formal education. This was true for both prescribers and dispensers.
7. Analysis

The following is the correlation of dependent variables with independent variables. The dependent variables discussed are drug and patient care indicators. Drug indicators include average number of drugs per prescription, antibiotic prescription rates, and average cost per prescription. An analysis of patient indicators, consisting of consulting, dispensary waiting times and dispensing times, and patient knowledge of drugs prescribed, follows drug indicators. Independent variables correlated with dependent variables included work environment, such as number of outpatients seen, and personnel characteristics including prescriber and dispenser age, education, experience, training and supervision. Those relationships that are significant, \( p < .05 \), are mentioned here. Also included are those independent variables which, contrary to the authors’ expectations, did not correlate significantly to the drug and patient care indicators studied. A summary of findings with means, difference and p-values is included in Tables 7 and 8.

7.1 Correlations of drug indicators and independent variables

7.1.1 Total outpatients seen – The average number of drugs per prescription, antibiotic prescription rates, average cost per prescription and quinine : chloroquine prescription rates were compared in facilities which saw more than 20,000 outpatients in 1996 (\( n = 5 \)) and in facilities which saw less than 20,000 outpatients (\( n = 9 \)). There was no significant difference between the average of any of the drug indicators listed above and the two types of facilities, indicating that patient volume did not affect these drug indicators.

7.1.2 Prescriber age – Facilities with a mean prescriber age greater than 35 years (\( n = 8 \)) had a significantly lower number of drugs per prescription than facilities with a mean prescriber age less than 35 (\( n = 6 \)) (2.5 compared to 3.2 drugs per prescription, respectively). Facilities with a mean prescriber age greater than 35 also had a significantly lower antibiotic rate than facilities with a mean prescriber age less than 35 (31.4% compared to 36.9%, respectively). However, when education and years prescribing experience were controlled for, the relationship was no longer significant.

7.1.3 Prescriber experience – There was no significant relationship between the mean number of years prescribers had worked at the CBC and either the average number of drugs per prescription or the antibiotic prescription rate. Neither was there a relationship between the mean number of years of prescribing-specific experience and antibiotic rate. However, there was a significant relationship between mean number of years of prescribing-specific experience and drug average per prescription. Those facilities with prescribers who had been prescribing on average more than 9 years (\( n = 6 \)) had a drug average of 2.5, as opposed to 3.0 drugs in facilities where prescribers had less than 9 years prescribing experience (\( n = 8 \)). This difference of 0.5 drugs was significant at \( p < .03 \).

7.1.4 Prescriber education – Facilities where at least one prescriber had a high school or university education (\( n = 5 \)) had a drug average of 2.4, significantly lower than those facilities where prescribers had only secondary or primary schooling (\( n = 9 \)), drug
average 3.0. This difference of 0.6 drugs was statistically significant, p < .03. There
was no significant relationship between prescriber education and antibiotic prescription rates.

7.1.5 Screening course - There was no relationship between antibiotic prescription rates and facilities where the majority of the prescribers had received the screening course. However, in facilities where more than 50% of the prescribers had received the screening course, drug averages were lower. Those facilities where 50% or more of the prescribers had received the screening course (n = 7) had a drug average of 2.6, compared to 3.0 in facilities where less than 50% of prescribers had taken a screening course (n = 7). This difference of 0.4 drugs was not significant with this data sample (p < .07). However, given that the number of facilities was only 14, if the sample size were to increase, it is likely that the screening course would prove more instrumental in changing average number of drugs per prescription. In addition, when comparing the drug averages and antibiotic prescription rates in clinics where prescribers received more than six-weeks prescription training, in comparison with facilities where personnel had participated in courses lasting less than six-weeks, drug averages and antibiotic rates were significantly lower. This is discussed in more detail in 7.1.6.

7.1.6 Total time of prescribing specific training - While analysis was done in terms of “weeks of training”, weeks of training corresponded to different screening courses. To facilitate interpretation of results, the corresponding screening courses are explained. “One week” of training includes the four-day intensive and one-week screening course. “Six weeks” corresponds to the six-week screening course and “more than six weeks” corresponds to the three-month screening course. Therefore, “six weeks or more” corresponds to either the six-week or the three-month screening course.

Facilities where the majority of the prescribers had participated in at least six weeks of prescribing training (n = 9) had a significantly lower number of drugs per prescription (2.54 drugs) in comparison to facilities where the majority of prescribers had only one week of prescribing training (n = 5) (3.22 drugs). This difference of 0.68 drugs was significant at p = .002. In facilities where the majority of prescribers had more than six weeks of prescribing training (n = 5) the number of drugs per prescription dropped even further, to 2.50 drugs (Fig. 6). However, this comparison is not significant, (p = .067), most likely because of a small sample size. Facilities where the majority of the prescribers had six weeks or more prescribing training also had significantly lower antibiotic prescription rates when compared to facilities where the majority of prescribers had only one week prescribing training (30.6% compared to 39.4%) (p=.015).
7.1.7 Prescriber supervision – In facilities where the majority of the prescribers reported receiving on-site supervision (n = 11) there was a significant difference in the average number of drugs prescribed per prescription. The average number of drugs was 2.3 in facilities where 60% or more of the staff reported receiving on-site supervision compared to 3.0 in facilities where less than 60% prescribers reported receiving on-site supervision; a difference of 0.7 drugs (p < .007). Reported on-site supervision did not correlate with the antibiotic prescription rate. Reported off-site supervision had no significant effect on average number of drugs per prescription or antibiotic prescription rates.

7.1.8 Prescriber formal evaluation – Facilities where prescribers reported receiving a formal evaluation did not have drug averages or antibiotic prescription rates that were significantly different from facilities where prescribers reported not receiving a formal evaluation.

7.1.9 Doctor’s visit – IHCs which received at least a monthly doctor’s support visit had a lower number of drugs per prescription than those facilities which had less frequent doctor’s visits. Clinics receiving monthly doctor’s support visits (n = 8) had a drug average of 2.5 drugs per prescription, compared to 3.1 drugs per prescription in clinics with less frequent doctor’s visits (n = 6), a difference of 0.6 drugs at p < .002. Facilities that received a doctor’s visit at least every two months also had a lower antibiotic prescription than facilities that received less frequent doctor’s visits. Those facilities which received a doctor’s visit at least every two months (n = 10) had an antibiotic prescription rate of 30.5%. Facilities with less frequent doctor’s visits (n = 4) had an antibiotic prescription rate of 41.9%. The 11.4% difference was highly significant (p < .001). Results of correlations between the drug indicators and independent variables are summarized below in Table 7.
Table 7. Correlation of drug indicators and independent variables

<table>
<thead>
<tr>
<th>Drug indicators</th>
<th>Magnitude</th>
<th>Difference</th>
<th>p – value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost of prescription</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total outpatients seen</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+9 years experience screening</td>
<td>2.5-3.0 drugs</td>
<td>0.5 drugs</td>
<td>p = .029</td>
</tr>
<tr>
<td>Higher education</td>
<td>2.4-3.0 drugs</td>
<td>0.6 drugs</td>
<td>p = .021</td>
</tr>
<tr>
<td>At least 6 weeks screening course</td>
<td>2.5-3.2 drugs</td>
<td>0.7 drugs</td>
<td>p = .002</td>
</tr>
<tr>
<td>+50% personnel with screening course</td>
<td>2.6-3.0 drugs</td>
<td>0.4 drugs</td>
<td>p = .065</td>
</tr>
<tr>
<td>On-site supervision</td>
<td>2.3-3.0 drugs</td>
<td>0.7 drugs</td>
<td>p = .007</td>
</tr>
<tr>
<td>Formal evaluation</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At least monthly doctors clinic</td>
<td>2.5-2.9 drugs</td>
<td>0.46 drugs</td>
<td>p = .002</td>
</tr>
<tr>
<td>Experience screening</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher education</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At least one personnel with screening course</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At least 6 weeks screening course</td>
<td>30.6-39.4%</td>
<td>8.8 %</td>
<td>p &lt; .015</td>
</tr>
<tr>
<td>On-site supervision</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Formal evaluation</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average number of drugs per prescription</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antibiotic rate</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Higher education</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+ 9 years’ experience screening</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At least 6 weeks screening course</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>+50% personnel with screening course</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>On-site supervision</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
<tr>
<td>At least monthly doctors clinic</td>
<td>not significant</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.2 Correlation of patient care indicators with independent variables

7.2.1 Total outpatients seen – Consultation, dispensary waiting times and dispensing times for facilities which saw more than 20,000 outpatients in 1996 (n = 5), were not significantly different from those facilities which saw less than 20,000 outpatients in 1996 (n = 9). (These factors had not been previously examined in any study known to the authors). While average dispensary waiting time was higher in those facilities with an outpatient load of more than 20,000, it was not significantly different from those facilities that saw fewer patients.

7.2.2. Total number of personnel – The total number of prescribers and dispensers did not correlate with consulting, waiting or dispensing times. Nor did the number of dispensers correlate with adequate labelling.

7.2.3 Average number of drugs per prescription – There was no significant relationship between a facility’s average dispensary waiting time and the facility’s average number of drugs per prescription.

7.2.4 Prescriber education, experience, supervision and training - Prescriber education, experience, training and supervision did not correlate with consulting times or patient knowledge of drug regimen.

7.2.5 Dispenser experience – There was no relationship between the mean number of years worked at the CBC or the mean number of years dispensing and the time a patient spent waiting at the dispensary for a drug prescription to be filled. Neither was there a relationship between dispenser experience and time spent dispensing the drugs, or how well a patient knew drug name, regimen, purpose and side-effects.
7.2.6 Dispenser education - There was no significant relationship between dispensary waiting time and dispensers' non-health-related formal education. However, facilities where at least two-thirds of the dispensers had secondary schooling (n = 5) spent significantly longer time dispensing drugs than those facilities where less than two-thirds of the dispensers had secondary education (n = 9). Mean dispensing time for those facilities where at least two-thirds of dispensers had secondary schooling was 1.57 minutes, compared to 0.98 minutes for those facilities where less than two-thirds of the dispensers had secondary schooling. This difference of 0.59 minutes was significant at p = .021. Unfortunately, this did not translate to greater patient knowledge, as there was no significant relationship between dispenser education and training, time spent dispensing drugs and patient knowledge.

7.2.7 Dispensing-specific training - There was a slightly positive relationship between dispensers who had taken a dispensing-specific training and dispensing times. However this relationship was not significant. There was no relationship between dispensing training and dispensary waiting time and patient knowledge.

7.2.8 Dispenser supervision - Those facilities which reported receiving off-site CBC supervision (n = 5) had a significantly lower average dispensary waiting time than those facilities which did not report receiving off-site supervision (n = 9). Average dispensary waiting time in facilities that receive off-site supervision was 10.86 minutes, compared to 20.04 minutes average waiting time in facilities without off-site supervision. The difference of 9.18 minutes was significant at p = .04. Results are summarized in Table 8.

**Table 8. Correlation of patient care indicators and independent variables**

<table>
<thead>
<tr>
<th>Patient care indicators</th>
<th>Magnitude (min)</th>
<th>Difference</th>
<th>p – value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average consulting time with patient</td>
<td>Total weeks dispensary training</td>
<td>not significant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total outpatients seen</td>
<td>not significant</td>
<td></td>
</tr>
<tr>
<td>Average dispensary waiting time for patient</td>
<td>Total weeks dispensary training</td>
<td>not significant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total outpatients seen</td>
<td>not significant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total number of dispensers</td>
<td>not significant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Off-site supervision</td>
<td>10.9-20.0</td>
<td>9.18 min</td>
</tr>
<tr>
<td>Average dispensing time per patient</td>
<td>Total weeks dispensary training</td>
<td>not significant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total outpatients seen</td>
<td>not significant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total number of dispensers</td>
<td>not significant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>+ 66% personnel with secondary school</td>
<td>.98-1.57 min</td>
<td>0.59 min</td>
</tr>
<tr>
<td>Patient knowledge</td>
<td>Total weeks dispensary training</td>
<td>not significant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average dispensing time</td>
<td>not significant</td>
<td></td>
</tr>
</tbody>
</table>

In summary, there was a positive relationship between a lower average number of drugs per prescription, prescribers' age, experience, education and training, on-site supervision, and frequency of doctor's visits. There were fewer significant relationships between antibiotic prescription rates and the independent variables examined. Only prescriber training and frequency of doctor's visits correlated with a lower antibiotic prescription rate. There were no significant correlations between average cost per prescription and any of the independent variables examined. Neither did the number of outpatients seen correlate with any of the drug indicators examined.
There was a positive relationship between shorter dispensary waiting times and longer dispensing times with off-site supervision and dispenser education, respectively. There were no significant correlations between average consulting times, patient knowledge and percent of drug packages adequately labelled and any of the independent variables examined. Finally, the number of outpatients seen did not correlate with average consultation times, dispensary waiting times or dispensing times.
8. Discussion

The discussion details the more interesting findings of the study, focusing specifically on the effect that training and supervision had on appropriate drug use as demonstrated by the range of drug and patient care indicators in each facility. Both significant and less statistically significant findings are discussed as the latter are often equally as important. The explanations offered are based on previous research studies done in the field and insights shared by CBC personnel during a discussion of the results. They are meant to stimulate further research into the methods and means of most effectively and efficiently promoting appropriate drug use, considering the basic parameters of training and supervision proposed here.

8.1 Drug indicators

Drug indicators such as the average number of drugs per prescription, antibiotic prescription rates, injection rates, average cost of prescription and drug-specific prescription rates (in this case, chloroquine and quinine), are significant indicators of appropriateness of prescribing. And while the indicators are important, what are more important are those factors that significantly effect a change in the indicators. Training and supervision previously mentioned in the literature and substantiated here in the authors' research, positively influenced the average number of drugs per prescription (Guiscafre et al. 1988, Angunawela, Diwant & Tomson 1991, Gutierrez et al. 1994, Chowdhury et al. 1995, de Vries et al. 1995, Gani, Tangkilisn & Pujilestary 1995, Sunartono & Darminto 1995, Chowdhury et al. 1996). In facilities where the majority of prescribers had received some formal training in diagnosis and prescription, specifically training of at least six weeks, the average number of drugs prescribed was significantly lower. In facilities where prescribers received on-site or monthly doctor's supervision the average number of drugs prescribed was lower. In addition, in facilities where average prescribing experience was more than nine years and where at least half of the screeners had received high school or university education, the average number of drugs prescribed was also significantly lower.

Periodic modifications in the length of the screening course at the CBC Training School provided an opportunity to compare the average number of drug per prescription rates between facilities staffed by personnel attending different screening courses. Originally three months, the standard course had been shortened over the years and at the time of the study was only six weeks. In addition, due to lack of time and resources, some prescribers had received only an "intensive" four-day or one-week course on prescribing drugs. Some prescribers had received no training at all. Results indicate the longer the period of training, the more likely a prescriber would prescribe fewer drugs. However, while at least six weeks of prescribing training was sufficient to effect a positive change in prescribing habits, a training course of three months was not necessarily better. In facilities where the average number of weeks trained was more than seven (the three-month training course for example), the average number of drugs prescribed dropped only by another 0.04. Furthermore, the statistical significance was weaker.
Perhaps one of the most interesting findings concerned the effectiveness of supervision. While the findings of this study reiterate the findings of previous studies (Guiscafre et al 1988, Guiterrez et al 1994, Agyepong et al 1996, Chowdhury et al 1996) which suggest that supervision is an important component in promoting appropriate drug use, this study revealed a more specific relationship between the type of supervision and prescribing behaviour. On-site supervision and supervision by visiting doctors at least once every two months were found to significantly reduce the average number of drugs prescribed per prescription. However, formal written evaluations conducted once a year, usually by an off-site supervisor, were found to have no significant effect on prescribing. This finding was corroborated by the qualitative data collected in which many prescribers suggested that peer evaluations and supervision from on-site supervisors were more helpful than the yearly formal evaluations. While monthly doctor’s visits and on-site supervision were an opportunity to discuss problems regarding prescription, formal evaluations, it was felt, focused less on job performance and more on appearance and conduct. This has important implications for organizations like the CBC that use supervision as a way to promote appropriate drug use.

Other factors that may have contributed to lower drug averages in hospitals and busy clinics were the dental and eye care they provided there. Prescriptions given to patients often contained only one or two drugs.

To reiterate the findings of the prescriber interviews mentioned in 7.1, it is important to note that prescribers felt that drugs were not only curative but also have an important psychological role. Prescribers stated that many patients felt they needed drugs in order to feel better, even if medically the need for medication was not indicated. This perception is similar to findings in Hadiyono et al’s 1996 study. Further research at the CBC is needed to establish if this is in fact true or merely a misconception by health facility personnel as was found in Hadiyono et al’s research.

One in three prescriptions filled at CBC facilities contained an antibiotic. The rate was significantly higher in those facilities where prescribers had on average less than six weeks of training on prescribing and where doctors visited less than once every two months.

It appears more difficult to effect a change in antibiotic prescription rates than to reduce the average number of drugs prescribed. While the average drug prescription rate correlated with the extent of formal education, the screening course and mean years of experience prescribing, (i.e. the more education, training and experience the prescriber had, the fewer drugs he/ she prescribed), antibiotic prescription rates did not. Furthermore, there was no significant relationship between antibiotic prescription rates and on-site supervision (excluding doctors’ visit) or between antibiotic prescription and the formal evaluation.

Quinine and chloroquine prescriptions for the CBC in general were 1:1. However the ratio varied considerably from facility to facility. Reasons for the variation may include the differing prevalence of chloroquine-resistant Plasmodium in each region. In vivo studies completed in Yaoundé (Central Province), Limbe and Douala (South Province) have established chloroquine-resistant Plasmodium in these regions (Brasseur et al 1992). It was therefore expected that the clinics in Kumba, Mutengene and Etoug-Ebe would have lower chloroquine prescription rates.
That quinine rates were comparable to chloroquine rates was a cause of concern for the authors of the standard treatment guidelines, who recommended prescribing Fansidar as the first alternative for chloroquine-resistant Plasmodium. A factor that may have resulted in comparably high quinine prescription rates was the importance CBC personnel placed on considering the economic position of patients. Prescribers stated they would often prescribe the least expensive anti-malarial which is most likely to cure the patient the first time, thereby incurring less cost in the long run. This is corroborated by the finding that from 1996 to 1997 there was a decrease in the chloroquine prescription rate, corresponding to a subsequent increase in quinine prescription rates. However, because the CBC standard treatment guidelines recommend Fansidar as the first line of treatment against chloroquine-resistant malaria, the authors expected to see a corresponding increase in Fansidar, not quinine, when chloroquine prescription rates dropped. However, perhaps reflecting the prescribers' concern for the economic situation of their patients, Fansidar prescription actually decreased from 1996 to 1997. Fansidar is more expensive than quinine. This is substantiated by the results of the case scenarios wherein not a single prescriber considered Fansidar as the first line of treatment in chloroquine-resistant malaria. A detailed discussion of adherence to standard treatment guidelines is discussed below.

Before concluding the discussion regarding the effect that environment and personnel characteristics, training and supervision had on drug indicators, it is equally important to mention those findings which were insignificant. Neither the number of outpatients seen nor number of personnel correlated with either a higher average number of drugs per prescription or with antibiotic rates. Similarly, the duration of consulting time did not correlate with drug indicators examined. The authors expected to see a relationship; a clinic seeing more patients per day would prescribe more drugs per patient in an effort to compensate the patient for waiting longer and spending less time with the consulting nurse. Of the remaining complementary indicators, two previously untested, average cost per prescription and laboratory referral rates did not correlate with average number of drugs prescribed or antibiotic prescription rates. Therefore it was not shown that average cost was a useful indicator of the inappropriateness of drug prescription. Finally, considering the effect the independent variables examined had on the drug indicators, there would have presumably been an effect on injection rates. However, injection rates were impossible to calculate given the quality of the data.

### 8.2 Patient care indicators

Patient care indicators studied included diagnosis and treatment in accordance with standard treatment guidelines, average consulting time, average dispensary waiting time, average dispensing time, patient knowledge and adequate labelling of drug packages. In previous studies these indicators have described the type of environment that may contribute to the inappropriate use of drugs, including prescribing, dispensing, and actual patient use. However, in this study there were few correlations between the drug indicators, average number of drugs prescribed per prescription, antibiotic prescription rates and the patient care indicators. There were also few correlations between work environment or personnel characteristics and patient care indicators. Only off-site supervision correlated with a more efficient dispensary as indicated by a lower dispensary waiting time. And there was a positive relationship between high school education and longer dispensing times. However, a longer dispensing time did not correlate with a higher degree of patient knowledge. The results are discussed in detail below.
8.3 Diagnosis and treatment

Although case scenarios were not clearly defined, and therefore were not necessarily indicative of prescriber knowledge, they did raise some concerns. While all CBC prescribers should have access to a copy of the standard treatment guidelines and were told they could use any available resource to complete the case scenarios, many prescribers did not prescribe a treatment in accordance with the guidelines. This confirms Hogerzeil’s 1994 findings that the existence of standard treatment guidelines is not in itself an effective tool in influencing prescribers’ behaviour.

Another concern was how the dosage, especially for quinine, was written. As mentioned earlier, few prescribers included the total number of tablets needed and often the dosage did not correspond to a dosage stocked in the pharmacy. This raises the concern that dispensers who may not have appropriate training, are left to calculate the proper strength and quantity of tablets to give to the patient.

Despite the questionable reliability of the results of the case scenarios, feedback from prescribers indicated that the case scenarios method is a useful way of determining adherence to standard treatment guidelines, particularly when substantiated by drug indicators such as chloroquine and quinine prescription rates. Periodic testing using case scenarios may also serve as a reminder to prescribers to use the standard treatment guidelines as well as indicate discrepancies between the guidelines and common practices among prescribers. It is also important to note that in this study the WHO complementary indicator “prescription in accordance with standard treatment guidelines” was modified to also include diagnosis.

8.4 Consulting time

The patient care indicator “average consulting time” did not correlate with any of the independent variables included in this study. This included number of outpatients seen and number of personnel. It appears that clinics adapted to the demands being made of them.

8.5 Dispensing time

Average dispensary waiting time was a patient care indicator that had not previously been suggested by WHO but that was considered to be interesting and relevant to our study of dispensary practices. Waiting times were defined as beginning the moment the patient left his/her card at the dispensary and ending when the dispensing of drugs began. Many patients would not leave their card if there was no one in the dispensary, or waited until the pharmacist personally took the card. Therefore, waiting times may actually be longer than recorded. Notably, the amount of time a patient waited for a drug was not affected by the number of outpatients seen at the clinic or the number of drugs in a drug package. In fact, busier clinics (excluding the hospitals) tended to have shorter waiting times. The only factor found to significantly affect wait times was off-site supervision. Facilities that received some off-site supervision had shorter waiting times. This is perhaps because off-site supervisors are able to objectively observe the dispensary and how it functions and hopefully provide useful insight into problems. The dispensary staff, because of their proximity to the situation, may not be able to see where problems exist.
A factor that may have contributed to shorter waiting times, especially in some of the busier facilities, was the pre-packaging of commonly prescribed drugs, such as regimens of chloroquine: quinine, paracetamol, etc. However, hospitals and busy clinics, such as MBH and Mutengene, which had significantly longer waiting times, did not appear to pre-package their drugs.

The patient care indicator "average dispensing time" presumably corresponds to the time that the dispenser spends explaining to the patient the drug regimen, side-effects, precautions and other important information regarding the drug. Consequently, a longer dispensing time corresponds to a better explanation. Of the variables studied, only secondary education correlated significantly with dispensing times. It is important to note that secondary education was the highest level attained by any CBC dispenser. Facilities where two-thirds or more of the dispensers had a secondary level education had longer dispensing times.

Another explanation offered for the variation in dispensing times between clinics, not examined in the study, is the problem of language. In clinics where patients come from a wide catchment area, or where many different languages are spoken, it may be more difficult for the patient and the dispenser to communicate. Those dispensers with a secondary level education may have an advantage as they will have studied more English and, more importantly, French. An alternative explanation is that when a language barrier exists, dispensers may take less time to explain. For example, BBH has one of the shortest dispensing times. At BBH, only 20% of the staff have a secondary level education, while BBH patients are a diverse group of people speaking many languages not common to the NSO area. Whether the short dispensing time is due to the lower level of formal education among the dispensers or the language barriers posed by the diversity of the patients is unclear. Maybe more important to note is that a longer dispensing time did not significantly correlate with increased patient knowledge.

Similar to consulting and waiting times, neither the number of patients seen by the facility per day, number of dispensing personnel, nor the number of drugs per prescription affected dispensing times.

8.6 Patient knowledge

For the purposes of this study, the criteria for patient knowledge, defined by WHO as knowledge of the drug regimen, was expanded. In our research, patient knowledge was defined as the patient knowing the purpose for the drug (to treat e.g. high blood pressure, pain), how and when to take the drug, and the precautions (e.g. eat before taking, no alcohol). Not a single factor studied significantly affected patient knowledge.

Some prescribers and dispensers expressed dissatisfaction with the criteria for patient knowledge. Many felt that it was more important to know only the drug regimen and precautions. Personnel at the CBC felt that for a patient with little or no education, knowing what the drug was for could cause confusion. When only drug regimen and precautions are considered as total patient knowledge, the percentage of patients who had adequate patient knowledge increases dramatically (mean CBC average jumps from 38.4 % to 85%). Reasons for low patient knowledge of drug purpose may also have been because patients were reluctant to describe their ailments to the interviewer
and preferred to say they did not know the purpose of the drug rather than divulge their illness.
8.7 Adequate labelling

None of the variables explored, including number of patients seen per day, number of dispensing personnel, their education or experience affected the labelling of drug packets. However, from observation, it seems that having the appropriate packaging materials may have improved how drug packages were labelled. Those facilities that had a supply of drug bags had a higher percentage of adequately labelled drug packages when compared to those facilities without drug bags. Facilities without drug bags were forced to improvise using pages from books, magazines and newspapers.
9. Recommendations

Results were sent to each facility included in the study and a presentation of the findings was held at Banso Baptist Hospital. The presentation was well attended by CBC staff, many of whom had participated in the study. Following the presentation, discussion of the findings with CBC personnel provided insight and led to possible explanations for some of the results. The discussion also generated many of the recommendations made below. In fact, the CBC staff suggested the majority of the recommendations listed. While some of these recommendations are specific to CBC facilities, many address the basic issues faced by health care facilities everywhere and could be applied generally.

9.1 Education and training

1. In order to promote appropriate drug prescription and dispensing, individuals with preferably at least a secondary education should be employed.

2. Irrespective of employee’s prior education, it is recommended that employers provide more than one week of prescribing or dispensing training to ensure improved prescribing and dispensing practices. However, training lasting longer than six weeks is not necessarily better.

3. It is recommended that employers invest in current employees’ education and training, as the more experience an employee has the better their performance.

9.2 Supervision

1. Case scenarios, as used in this study, are an effective way to assess prescriber knowledge, compliance with standard treatment guidelines, and the appropriateness of such guidelines given local circumstances and common practices. Many prescribers supported the idea of a periodic re-examination of their knowledge using this format.

2. Outcome measures should be determined and criteria developed to monitor the appropriateness of prescribing and dispensing practices. In addition, personnel interviewed stated that workers tend to perform more effectively and efficiently if they are aware of how they are being evaluated.

3. For prescribers, specific methods of supervision that correlated to improved prescribing performance included doctor’s visits and on-site supervision. This corroborates literature which indicates that face-to-face education is one of the most effective means of improving prescription patterns (Soumerai, McLaughlin & Avorn 1989, Anderson & Lexchin 1996).

4. For dispensers, off-site supervision is encouraged, as new methods of dispensing may be suggested or learned. Rotating dispensary personnel between dispensaries also provides this opportunity.

5. Frequency of supervision is also important. Monthly or bimonthly visits by doctors significantly improve prescriber performance. They are also an opportune time to discuss prescribing practices, disseminate new drug information, and maintain or improve the doctor-screening nurse relationship.
6. Evaluation should emphasize clinical job performance, not just moral and attitudinal performance. In fact, in lieu of a formal evaluation by off-site supervisors, peer review was felt by CBC personnel to be more relevant to daily practice.

9.3 Other recommendations and suggestions for further research

1. While it was established that more frequent, job-specific, on-site supervision and evaluation of performance correlated with improved prescriber performance, specific characteristics of supervision have yet to be detailed. Characteristics to be examined include duration of supervision, topics discussed, methods of evaluating performance, whether it is one-on-one or in a small group, and whether supervision by a non-medical supervisor would have the same effect.

2. Patient expectation and patient education are areas that deserve more research since they have implications for the kinds of treatment prescribers think the patient expects and demands, ultimately influencing prescribing patterns. There is cause to believe that prescribers mistakenly attribute a demand for drugs to patients (Hadiyono et al 1996). And while more training of prescribers and dispensers is essential, it is also important to keep in mind that the patient plays a major role in the appropriate use of drugs.
10. Conclusion

The results of this study complement and clarify research already done in the area of improving prescribing practices in both developed and developing countries. While standard treatment guidelines and essential drugs lists are an important step, this research corroborates the proposition that these measures in themselves are not sufficient to reduce inappropriate prescription (Hogerzeil 1994, Okwaare et al 1994). Of the other strategies suggested by the literature and that correlate with improved prescribing behaviour, it appears that training and supervision are the most effective means of encouraging clearly defined and simple prescribing objectives, i.e. fewer drugs per prescription.

Specifically, this study identified methods of supervision that appear to most effectively promote appropriate prescription and dispensing: frequent on-site supervision and supervision by doctors for prescribers, and off-site supervision for dispensers. As shown in this study, however, promoting more complex behaviour changes such as decreasing antibiotic prescription rates or promoting Fansidar prescription as the first line of treatment in established chloroquine-resistant malaria requires more than supervision and regulation. A combination of strategies as suggested by previous studies would presumably be more effective (Güterrez et al 1994, Guiscafre et al 1995, Anderson 1996).

The authors believe that at least six weeks prescribing training, one-on-one, job-specific supervision and periodic examination (using a format similar to that of the case scenarios used in this study) would be an effective combined strategy in changing simple and complex prescriber behaviour thereby promoting the appropriate use of drugs.
11. Appendices

Appendix 1  Characteristics of individual CBC facilities
Appendix 2  List of antibiotics
Appendix 3  Key essential drugs for the CBC
Appendix 4  Case scenarios
Appendix 5  Acceptable answers for case scenarios
Appendix 6  Structured provider interview
Appendix 7  Structured dispenser interview
Appendix 8  Structured patient interview
Appendix 9  Operational definitions
Appendix 10 Results of indicator study for individual facilities
Appendix 1. Characteristics of individual Cameroon Baptist Convention facilities

Table 1. Busy facilities (patients per day > 100)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Climate</th>
<th>Location</th>
<th>Doctor’s visit</th>
<th>Inpatients</th>
<th>Laboratory</th>
<th>Dental</th>
<th>Eye clinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBH</td>
<td>Cool and dry, high altitude</td>
<td>Urban</td>
<td>N/A</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MBH</td>
<td>Cool and dry, high altitude</td>
<td>Semi-urban</td>
<td>Twice a month</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Nkwen</td>
<td>Cool and dry, high altitude</td>
<td>Urban</td>
<td>Once a month</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Mutengene</td>
<td>Hot and humid, low altitude</td>
<td>Urban</td>
<td>Once a month</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Etoug-Ebe</td>
<td>Hot and humid, low altitude</td>
<td>Urban</td>
<td>Once a month</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Note: Only hospitals have on-site doctors and offer X-rays, ultrasound and physical therapy.
N/A Not applicable

Table 2. Moderately busy facilities (30 < patients per day > 100)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Climate</th>
<th>Location</th>
<th>Doctor’s visit</th>
<th>Inpatients</th>
<th>Laboratory</th>
<th>Dental</th>
<th>Eye clinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kumba</td>
<td>Hot and humid</td>
<td>Semi-urban</td>
<td>Once a month</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Ashong</td>
<td>Hot and humid</td>
<td>Rural</td>
<td>Once a month</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Ndu</td>
<td>Cool and dry, high altitude</td>
<td>Semi-urban</td>
<td>Once a month</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Ngounso</td>
<td>Cool and dry, high altitude</td>
<td>Rural</td>
<td>Once a month</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Bangolan</td>
<td>Hot and humid</td>
<td>Semi-urban</td>
<td>Once every 3-6 months</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Kouhouat</td>
<td>Hot and humid</td>
<td>Rural</td>
<td>Once every 3-6 months</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Table 3. Less busy facilities (patients per day < 30)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Climate</th>
<th>Location</th>
<th>Doctor’s visit</th>
<th>Inpatients</th>
<th>Laboratory</th>
<th>Dental</th>
<th>Eye clinic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jikijem</td>
<td>Cool and dry, high altitude</td>
<td>Rural</td>
<td>Once a month</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Akeh</td>
<td>Cool and dry, high altitude</td>
<td>Rural</td>
<td>None</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Nyamboya</td>
<td>Cool and dry, high altitude</td>
<td>Rural</td>
<td>Once every 3-6 months</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Appendix 2. List of antibiotics

1. Amoxicillin
2. Ampicillin
3. Chloramphenicol
4. Cloramphenicol ointment
5. Clotrimazole
6. Clotrimazole cream
7. Cloxacillin
8. Co-trimoxazole
9. Doxycycline
10. Erythromycin
11. Extencilline
12. Gentamicin
13. Metronidazole
14. Neomycin eye drops
15. Penicillin benzathine
16. Penicillin G
17. Penicillin procaine
18. Penicillin procaine/ G
19. Penicillin V
20. Spectinomycin
21. Tetracycline
22. Tetracycline ointment

Appendix 3. Key essential drugs for Cameroon Baptist Convention

1. Amoxicillin
2. Aspirin
3. Chlorpheniramine
4. Chloroquine
5. Cloxacillin
6. Co-trimoxazole
7. Diazepam (pyrimethamine dapsone)
8. Fansidar
9. Ferrous sulphate
10. Ibuprofen
11. Magnesium trisilicate
12. Mebendazole
13. Metronidazole
14. Mixed expectorant set
15. Multivitamins
16. Paracetamol
17. Phenobarbitone
18. Piperazine
19. Promethazine
20. Quinine
Appendix 4. Case scenarios

Case scenario 1

A mother comes in with a crying, irritable child approximately 12kg. The child has had loose stools for 5 days. She has sunken and dry eyes and is breathing rapidly. What is the diagnosis? What is the treatment (dosage regimen)?

Case scenario 2

A young man of about 25 years, 60kg, visits the clinic complaining of problems when urinating and white discharge. He also has a blunt lower abdominal pain. He has had the discharge for the last three days. There are no sores on the genitals. What is the diagnosis? What is the treatment (dosage regimen)?

Case scenario 3

A mother brings her child of about 25kg to the clinic saying that she had visited the clinic with her child and had received medicine for malaria last week. She says her child still has a fever and cries often. Her patient card shows that chloroquine was prescribed. An examination reveals a white conjunctivas. What is the diagnosis? What is the treatment (dosage regimen)?

Case scenario 4

A man of about 30 years comes in complaining of shortness of breath and tiredness after a short walk. His blood pressure is 160/100. What is the diagnosis? What is the treatment (dosage regimen)?

Appendix 5. Acceptable answers for case scenarios

Case scenario 1

Problems in the description for levels of dehydration:
- Number of stools/ day not indicated
- Sunken eyes: moderate dehydration or severe dehydration
- Dry eyes: severe dehydration
- Breathing rapidly: (faster) moderate dehydration (fast/ deep) severe dehydration
- Irritable: moderate dehydration

Three signs suggest moderate and three signs suggest severe dehydration.

Intended diagnosis: moderate dehydration (5%)
Dosage regimen:
- Oral rehydration fluids (ORF) 180ml every hour (12 x 15) by mouth until fluid deficit corrected, then 100ml after every stool.
• ORF 4 or 5 packets
• 1st 1-2 hours give 1/4 of 425ml, or 850ml over 6-8 hours, then last 1/4 or 425ml over 14 hours or remainder over 24 hours, then reassess.

Intended diagnosis: severe dehydration (10%)
Dosage regimen:
• intravenous fluids or ORF by nasogastric tube
• ORF 4 packets or 1200ml
• 1st 1-2 hours 575ml, 1150ml over 6-8 hours, the 575ml over remainder of 24 hours and reassess condition of child before further prescription.

Case scenario 2

Intended diagnosis: gonorrhoea (no indications of complications or previous treatment)
Dosage regimen:
• probenecid 250mg, ii stat #2, wait 30 minutes and give procaine penicillin 4.8 million units IM divided between two sites or
• probenecid 250mg, ii stat #2, wait 30 minutes and give amoxicillin 250mg PO, 12 tablets stat, #12 (some people give #15 stat) or
• tetracycline 250mg PO, ii qd x 7 dys, #56 or
• doxycycline 100mg PO, i bid x 10 days, #20

Case scenario 3

Intended diagnosis: possible chloroquine-resistant malaria, anaemia
Dosage regimen:
• sulfadoxine/ pyrimethamine (Fansidar), i stat, #1

Case scenario 4

Problems with the case description for hypertension: BP 160/100 is mild hypertension but shortness of breath and tiredness after exertion are signs of heart failure.
Intended diagnosis: mild hypertension
Dosage regimen:
• for hypertension, first a diuretic, then re-evaluation after 2-4 weeks or intended diagnosis: mild heart failure
• hydrochlorothiazide 50mg PO, qd #30. Review in 2-4 weeks and add a second drug if necessary.
Appendix 6. Structured provider interview

Interviewer ____________

Name _______________________ Date: _______ Facility: _________________

Sex: F ( ) M ( ) Age _____ years Country of Origin __________________

Good morning/afternoon, Dr./Mr./Ms. __________. In trying to learn more about your work in the health centres, we are interviewing health care personnel in all of the Baptist Health Centres. Your input will be extremely valuable as the information will be used to identify the needs of each health centre and to develop training programmes. No identifying names or characteristics will go into our report, so you may share your thoughts openly. Would you be willing to assist us by having a 30-45 minute interview with me?

1. Interview accepted: ___Yes ___No

First, I would like to ask you some background information.

2. What formal education have you received? (Check all that apply)
   _____ Primary school _____ Secondary _____ High School
   _____ University _____ Professional/Technical

3. What is your profession?
   _____ Doctor _____ State Registered Nurse _____ Assistant Nurse

4. Are you patient screening? ___ Yes ___ No

5. How long have you been screening patients? _____ years _____ months

6. How long have you been working in CBC facilities? _____ years _____ months

7. Have you received any education/training outside of Cameroon? ___Yes ____ No
   Where? __________________________________________________________

Thank you. Now I would like to ask you some questions about the health centre.

8. To your knowledge, are there any standard treatment guidelines in this health centre? (If no, skip to question 12) ___Yes ___No

9. May I look at them? (Where are they and what shape are they in?)
   ________________________________________________________________

10. Did you receive any training or information about when to use the standard treatment guidelines? ___Yes _____ No

11. If yes, what kind of training/information?
<table>
<thead>
<tr>
<th>Appendix Type</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meeting</td>
<td></td>
</tr>
<tr>
<td>Written materials</td>
<td></td>
</tr>
<tr>
<td>Lectures</td>
<td></td>
</tr>
<tr>
<td>Memo</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
</tbody>
</table>
12. When you are working, do you receive any kind of supervision? (if no, skip to question 18)  _____Yes _____ No

13. Who is your supervisor? _____________________________________________

14. How many times have you received supervision in the last year? ________ times

15. How are you supervised?

   _____ Observation  _____ Record Review  _____ Telephone
   _____ Other ( specify)______________________

16. On average, how many minutes does each supervision episode last? For each method used, please list the average number of minutes:

<table>
<thead>
<tr>
<th>Method</th>
<th>Number of minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

17. How do you feel about the supervision you receive?

   1  2  3  4  5  6  7
   Not at all    So So    Extremely
   Helpful

18. Do you have suggestions or changes you feel would be useful? ________________________________________________________________

19. Have you received any training on prescribing drugs?   ____Yes ____No
   (if no, skip to question 28 )

20. When did you receive the training? ___/___/__ (dd/ mm/ yy)

21. Who was the trainer? ___________________________________

22. Where was the training held? _____________________________

23. How long was the training?  ___________(Hours, days or months - specify)

24. What was the format?

   _____ Lecture                      _____ Circulation of written information
   _____ Group discussion     _____ Other (please specify) __________________

25. How much did you learn from the training?

   1  2  3  4  5  6  7
   nothing    some    a lot

26. How useful or relevant was the knowledge gained with regards to daily practice?

   1  2  3  4  5  6  7
   not useful    somewhat    very

27. Overall, how did you feel about the training?

   1  2  3  4  5  6  7
   Would have    somewhat    very satisfied
   preferred not    satisfied
to do it.

28. What do you think patients regard as good treatment?
   _____ Drugs  _____ Thorough examination/ physical contact  _____ Lab. tests
   ____ Other (specify) __________________________________________________

29. Do patients ever request a specific treatment for, as an example, malaria?
   ___Y ___N
   (If yes, specify treatment) ____________________________________________

30. What do you do? ______________________________________________________
    ___________________________________________________________________

31. Is there anything else you’d like to add? ________________________________
    ___________________________________________________________________

Thank you very much for your time. The information you have provided is very valuable. We will be happy to discuss our findings with you and are open to any suggestions you may have. Thanks again for your assistance.
Appendix 7. Structured dispenser interview

Interviewer ____________  

Name _____________________ Date: _______ Facility: ________________

Sex: F ( ) M ( )  Age _____ years  Country of Origin _________________

Good morning/afternoon Mr./Ms. __________. In trying to learn more about your work in the health centres, we are interviewing health care personnel in all of the Baptist Health Centres. Your input will be extremely valuable as the information will be used to identify the needs of each health centre and to develop training programmes. No identifying names or characteristics will go into our report, so you may share your thoughts openly. Would you be willing to assist us by having a 30-45 minute interview with me?

1. Interview accepted: ___Yes ___No

First, I would like to ask you some background information.

2. What formal education have you received? (Check all that apply)
   _____ Primary school  _____ Secondary  _____ High School
   _____ University  _____ Professional/Technical

3. What is your profession?
   _____ Pharmacist  _____ Pharmacist Assistant  _____ Pharmacy Tech
   _____ Pharmacy Aide  _____ Pharmacy Auxiliary  _____ Other ____________

4. Do you dispense drugs? ___Yes ___No

5. How long have you been dispensing? _____ years ______ months

6. How long have you been working in CBC facilities? _____ years ____ months

7. Have you received any education/training outside of Cameroon? ___Yes ___No
   Where? ________________________________

Thank you. Now I would like to ask you some questions about the health centre.

8. When you are working, do you receive any kind of supervision? (if no, skip to question 14) ___Yes _____ No

9. Who is your supervisor? __________________________________________

10. How many times have you received supervision in the last year? ______ times

11. How are you supervised?
    _____ Observation  _____ Record Review  _____ Telephone
    _____ Other (specify)  __________________________

12. On average, how many minutes does each supervision episode last? For each method used, please list the average number of minutes:
<table>
<thead>
<tr>
<th>Method</th>
<th>Number of minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
13. How do you feel about the supervision you receive?
   1 2 3 4 5 6 7
   Not at all helpful   So So     Extremely helpful

14. Do you have suggestions or changes you feel would be useful? ________________

15. Have you received any training on dispensing drugs?   ___ Yes   ___ No (if no, skip to question 28)

16. When did you receive the training?   ___/___/___ (dd/ mm/ yy)

17. Who was the trainer? _____________________________________________________

18. Where was the training held? _____________________________________________

19. How long was the training? ________ (Hours, days, or months - specify)

20. What was the format?
   ____ Lecture                      ____ Circulation of written information
   ____ Group discussion         _____ Other (please specify) ____________________

21. How much did you learn from the training?
   1 2 3 4 5 6 7
   nothing       some      a lot

22. How useful or relevant was the knowledge gained with regards to daily practice?
   1 2 3 4 5 6 7
   not useful    somewhat      very

23. Overall, how did you feel about the training?
   1 2 3 4 5 6 7
   Would have preferred not somewhat satisfied very satisfied

Thank you very much for your time. We will be happy to discuss our findings with you and are open to any suggestions you may have.
Appendix 8. Structured patient interview

Name of Interviewer ___________________ Name of Clinic ____________
Date ____________________
Interview # ___________

CASUAL INTRODUCTION....
Hello. How are you? I am working with the hospital/clinic on a survey. May I ask you a few questions about the drugs that you have just received from the dispensary?

Yes _____ No _____

1. How many different drugs are there in your hand? Number ______

2. Can you tell me what each drug is for? (e.g. pain, itching, infection, etc.) Did person correctly identify what ALL drugs are for?
Yes _____ No _____

3. For each drug, can you tell me how and when to take them?
Did person correctly describe quantity and frequency of ALL drugs to take?
Yes _____ No _____

4. For each drug, are there any possible precautions you should take? Did person correctly describe precautions of ALL drugs?
Yes _____ No _____

5. Can I see the drugs? Check to see that ALL drugs are labelled with name, quantity and frequency of dosage. All drugs are adequately labelled.
Yes _____ No _____

Thank you for your time.

Notes

__________________________________________________________________________
Appendix 9. Operational definitions

Adherence to selected standard treatment guidelines diagnosis: Selected diagnoses from CBC standard treatment guidelines, e.g. temperature >37 is malaria.

Adherence to selected standard treatment guidelines treatment: Selected treatments from CBC standard treatment guidelines, e.g. treatment for malaria is oral chloroquine.

Adequately labelled: Patient name, drug name and when the drug should be taken.

Antibiotics: The drugs to be defined as antibiotics will include - penicillins, other anti-bacterial, anti-infective dermatological drugs, anti-infective ophthalmologic agents, anti-diarrhoeal drugs with streptomycin, neomycin, nifuroxazide or combinations (WHO, 1995).

Antimalarials: Antimalarials include - chloroquine, mefloquine, proguanil, primaquine + sulfadoxine (Fansidar), amodiaquine, quinine, halofantrine, and tetracycline. Antimalarial injections will include intravenous administration.

Consultation time: Time in seconds from when patient arrives in consulting room to when patient leaves consulting room.

Dispensing time: Time in seconds from when patient arrives at dispensing window to when patient leaves dispensing window.

Drugs prescribed per encounter: Combination drugs will be counted as one. The CBC will provide guidelines on how to count certain ambiguous prescribing practices (e.g. some standardized sequential therapies).

Essential drugs list: The CBC has provided a copy of their essential drugs list to which data on prescribed drugs will be compared.

Generic drugs: The drugs classified as generic are those found in WHO’s The use of essential drugs (WHO 1995).

Injections: Immunizations will not be considered injections in order to estimate more accurately the tendency to unnecessarily inject.

Key essential drugs: Determined by consultation with Head Pharmacist of CBC.

Patient knowledge: Patient should know name of drug, when and in what quantity the drug should be taken.

Prescription indicators: While implementation of appropriate drug use policies attempt to encourage prescription of generic drugs and only essential brand name drugs, other prescription indicators such as number of drugs per encounter, encounters with an antibiotic prescribed, and encounters with an injection prescribed will indicate any subsequent substitution by prescribers. Encounters with an antimalarial prescribed is an indicator included to surmise baseline antimalarial prescription practices for future comparison.


Ten most prescribed drugs: Determined from record review of hospital and health clinic patient records over last six months.

Unit cost of drug: Cost of purchase by CBC.
# Appendix 10. Results of indicator study for individual facilities

## DRUG INDICATORS

### Table 1. Busy facilities (patients per day > 100)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Number of Prescriptions</th>
<th>Average Number of Drugs</th>
<th>% Antibiotics</th>
<th>Quinine: Chloroquine Ratio</th>
<th>% of Laboratory Referrals</th>
<th>Average Cost '96</th>
</tr>
</thead>
<tbody>
<tr>
<td>BBH</td>
<td>n = 360 prescriptions</td>
<td>2.0 SD 0.9</td>
<td>32.9</td>
<td>1:0.8</td>
<td>34.6%</td>
<td>CFAF 1663</td>
</tr>
<tr>
<td>MBH</td>
<td>n = 360 prescriptions</td>
<td>2.4 SD 1.0</td>
<td>28.9</td>
<td>1:2.4</td>
<td>39.5%</td>
<td>CFAF 1567</td>
</tr>
<tr>
<td>Nkwen</td>
<td>n = 360 prescriptions</td>
<td>2.5 SD 1.2</td>
<td>34.2</td>
<td>1:1.1</td>
<td>40.5%</td>
<td>CFAF 2002</td>
</tr>
<tr>
<td>Mutengene</td>
<td>n = 360 prescriptions</td>
<td>3.0 SD 1.2</td>
<td>26.1</td>
<td>1:0.3</td>
<td>46.5%</td>
<td>CFAF 2492</td>
</tr>
<tr>
<td>Etoug-Ebe</td>
<td>n = 360 prescriptions</td>
<td>2.5 SD 1.2</td>
<td>33.9</td>
<td>1:0.1</td>
<td>47.3%</td>
<td>CFAF 2412</td>
</tr>
</tbody>
</table>

### Table 2. Moderately busy facilities (100 < patients per day > 30)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Number of Prescriptions</th>
<th>Average Number of Drugs</th>
<th>% Antibiotics</th>
<th>Quinine: Chloroquine Ratio</th>
<th>% of Laboratory Referrals</th>
<th>Average Cost '96</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kumba</td>
<td>n = 360 prescriptions</td>
<td>2.9 SD 1.2</td>
<td>27.8</td>
<td>1:0.2</td>
<td>37.9</td>
<td>CFAF 2668</td>
</tr>
<tr>
<td>Ashong</td>
<td>n = 360 prescriptions</td>
<td>2.6 SD 1.1</td>
<td>33.1</td>
<td>1:1.4</td>
<td>22.2</td>
<td>CFAF 1727</td>
</tr>
<tr>
<td>Ndu</td>
<td>n = 360 prescriptions</td>
<td>3.0 SD 1.3</td>
<td>29.4</td>
<td>1:2</td>
<td>42.6</td>
<td>CFAF 1904</td>
</tr>
<tr>
<td>Ngounso</td>
<td>n = 360 prescriptions</td>
<td>3.7 SD 1.4</td>
<td>50.6</td>
<td>1:1.4</td>
<td>41.2</td>
<td>CFAF 2621</td>
</tr>
<tr>
<td>Bangolan</td>
<td>n = 360 prescriptions</td>
<td>2.7 SD 1.1</td>
<td>29.6</td>
<td>1:0.4</td>
<td>44.9</td>
<td>CFAF 1801</td>
</tr>
<tr>
<td>Kouhouat</td>
<td>n = 360 prescriptions</td>
<td>3.1 SD 1.3</td>
<td>32.8</td>
<td>1:1.8</td>
<td>37.5</td>
<td>CFAF 2178</td>
</tr>
</tbody>
</table>

### Table 3. Less busy facilities (patients per day < 30)

<table>
<thead>
<tr>
<th>Facility</th>
<th>Number of Prescriptions</th>
<th>Average Number of Drugs</th>
<th>% Antibiotics</th>
<th>Quinine: Chloroquine Ratio</th>
<th>% of Laboratory Referrals</th>
<th>Average Cost '96</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jikijem</td>
<td>n = 360 prescriptions</td>
<td>2.3 SD 1.1</td>
<td>29.2</td>
<td>1:11.3</td>
<td>16.7</td>
<td>CFAF 1414</td>
</tr>
<tr>
<td>Akeh</td>
<td>n = 360 prescriptions</td>
<td>3.0 SD 1.3</td>
<td>39.0</td>
<td>1:4.4</td>
<td>2.9*</td>
<td>CFAF 1570</td>
</tr>
<tr>
<td>Nyamboya</td>
<td>n = 360 prescriptions</td>
<td>3.3 SD 1.4</td>
<td>45.0</td>
<td>1:4.4</td>
<td>19.5</td>
<td>CFAF 1538</td>
</tr>
</tbody>
</table>

*Akeh has no laboratory facilities.*
PATIENT CARE INDICATORS

Table 4. Busy facilities (patients seen per day > 100)

<table>
<thead>
<tr>
<th></th>
<th>BBH</th>
<th>MBH</th>
<th>Nkwen</th>
<th>Mutengene</th>
<th>Etoug-Ebe</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>34</td>
<td>35</td>
<td>29</td>
<td>35</td>
<td>40</td>
</tr>
<tr>
<td>Average nurse consultation (min)</td>
<td>6.60</td>
<td>3.92</td>
<td>5.85</td>
<td>4.41</td>
<td>5.23</td>
</tr>
<tr>
<td>SD</td>
<td>4.22</td>
<td>1.85</td>
<td>3.52</td>
<td>1.77</td>
<td>2.69</td>
</tr>
<tr>
<td>Average doctor consultation (min)</td>
<td>2.20</td>
<td>4.95</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>SD</td>
<td>.91</td>
<td>3.04</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Average waiting time (min)</td>
<td>21.30</td>
<td>29.36</td>
<td>10.67</td>
<td>29.91</td>
<td>10.29</td>
</tr>
<tr>
<td>SD</td>
<td>11.24</td>
<td>15.53</td>
<td>5.87</td>
<td>16.45</td>
<td>4.85</td>
</tr>
<tr>
<td>Average dispensing time (min)</td>
<td>.66</td>
<td>1.72</td>
<td>1.15</td>
<td>1.86</td>
<td>.64</td>
</tr>
<tr>
<td>% Knew how/ when to take</td>
<td>81.3</td>
<td>96.4</td>
<td>90.6</td>
<td>84.2</td>
<td>93.8</td>
</tr>
<tr>
<td>% Adequately labelled</td>
<td>81.3</td>
<td>78.6</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 5. Moderately busy facilities (30 < patients per day > 100)

<table>
<thead>
<tr>
<th></th>
<th>Kumba</th>
<th>Ashong</th>
<th>Ndu</th>
<th>Ngounso</th>
<th>Bangolan</th>
<th>Kouhouat</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>26</td>
<td>30</td>
<td>31</td>
<td>22/14/18</td>
<td>17/9/13</td>
<td>19/19/23</td>
</tr>
<tr>
<td>Average nurse consultation (min)</td>
<td>7.82</td>
<td>4.41</td>
<td>5.28</td>
<td>5.37</td>
<td>4.77</td>
<td>5.95</td>
</tr>
<tr>
<td>SD</td>
<td>4.95</td>
<td>1.77</td>
<td>4.30</td>
<td>3.94</td>
<td>2.02</td>
<td>3.94</td>
</tr>
<tr>
<td>Average doctor consultation (min)</td>
<td>N/A</td>
<td>4.25</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Average waiting time (min)</td>
<td>12.07</td>
<td>10.54</td>
<td>5.35</td>
<td>14.15</td>
<td>10.69</td>
<td>17.57</td>
</tr>
<tr>
<td>SD</td>
<td>7.31</td>
<td>8.32</td>
<td>2.89</td>
<td>10.83</td>
<td>5.98</td>
<td>11.29</td>
</tr>
<tr>
<td>Average dispensing time (min)</td>
<td>.96</td>
<td>1.22</td>
<td>1.36</td>
<td>.78</td>
<td>.72</td>
<td>1.37</td>
</tr>
<tr>
<td>% Knew how/ when to take</td>
<td>100</td>
<td>48.3</td>
<td>87.1</td>
<td>83.3</td>
<td>89.5</td>
<td>63.6</td>
</tr>
<tr>
<td>% Adequately labelled</td>
<td>100</td>
<td>100</td>
<td>77.4</td>
<td>83.3</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

* Data collected during monthly doctor’s visit

Table 6. Less busy facilities (patients per day < 30)

<table>
<thead>
<tr>
<th></th>
<th>Jikijem</th>
<th>Akeh</th>
<th>Nyamboya</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>31/15/18</td>
<td>0*</td>
<td>0*</td>
</tr>
<tr>
<td>Average nurse consultation (min)</td>
<td>8.01</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>SD</td>
<td>5.52</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Average doctor consultation (min)</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Average waiting time (min)</td>
<td>22.64</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>SD</td>
<td>12.86</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Average dispensing time (min)</td>
<td>1.01</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>% Knew how/ when to take</td>
<td>95.2</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>% Adequately labelled</td>
<td>81.0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

* Too few patients seen during facility visit to collect data
## Prescribing Personnel Characteristics

### Table 7. Busy facilities (patients per day > 100)

<table>
<thead>
<tr>
<th></th>
<th>BBH n = 8</th>
<th>MBH n = 8</th>
<th>Nkwen n = 5</th>
<th>Mutengene n = 3</th>
<th>Etoug-Ebe n = 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age</td>
<td>38.5</td>
<td>41.2</td>
<td>47.4</td>
<td>35.0</td>
<td>44.0</td>
</tr>
<tr>
<td>% personnel with at least secondary school</td>
<td>87.5</td>
<td>50.0</td>
<td>20.0</td>
<td>66.6</td>
<td>50.0</td>
</tr>
<tr>
<td>Average years screening</td>
<td>9.3</td>
<td>13.4</td>
<td>9.6</td>
<td>6.1</td>
<td>9.7</td>
</tr>
<tr>
<td>% personnel with screening course</td>
<td>25.0*</td>
<td>62.5*</td>
<td>100</td>
<td>100</td>
<td>75.0</td>
</tr>
<tr>
<td>% personnel with standard treatment guidelines training</td>
<td>25.0</td>
<td>50.0</td>
<td>60.0</td>
<td>100</td>
<td>50.0</td>
</tr>
<tr>
<td>Average weeks of training</td>
<td>10.0**</td>
<td>7.8**</td>
<td>8.0</td>
<td>6.5</td>
<td>4.3</td>
</tr>
<tr>
<td>Average months since training</td>
<td>116.7*</td>
<td>131.0*</td>
<td>36.4</td>
<td>42.0</td>
<td>32.0</td>
</tr>
</tbody>
</table>

*Includes doctors. **Does not include doctors.

### Table 8. Moderately busy facilities (30 < patients per day > 100)

<table>
<thead>
<tr>
<th></th>
<th>Kumba n = 2</th>
<th>Ashong n = 1</th>
<th>Ndu n = 2</th>
<th>Ngounso n = 2</th>
<th>Bangolan n = 2</th>
<th>Kouhouat n = 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age</td>
<td>29.5</td>
<td>42.0</td>
<td>37.5</td>
<td>34.0</td>
<td>36.0</td>
<td>33.5</td>
</tr>
<tr>
<td>% of personnel &gt; secondary school</td>
<td>100</td>
<td>0</td>
<td>50</td>
<td>50</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Average years screening</td>
<td>4.0</td>
<td>11.0</td>
<td>12.4</td>
<td>6.7</td>
<td>7.2</td>
<td>6.5</td>
</tr>
<tr>
<td>% of personnel with screening course</td>
<td>50.0</td>
<td>100</td>
<td>0</td>
<td>50</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>% of personnel with standard treatment guidelines training</td>
<td>100</td>
<td>100</td>
<td>0</td>
<td>50</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Average weeks of training</td>
<td>6.5</td>
<td>13.0</td>
<td>0.5</td>
<td>1.0</td>
<td>6.0</td>
<td>0</td>
</tr>
<tr>
<td>Average months since training</td>
<td>55.5</td>
<td>60.0</td>
<td>24.0</td>
<td>24.0</td>
<td>18.0</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table 9. Less busy facilities (patients per day < 30)

<table>
<thead>
<tr>
<th></th>
<th>Jikijem n = 3</th>
<th>Akeh n = 1</th>
<th>Nyamboya n = 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age</td>
<td>36.3</td>
<td>30.0</td>
<td>27.0</td>
</tr>
<tr>
<td>% of personnel with at least secondary school</td>
<td>0</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Average years screening</td>
<td>7.7</td>
<td>0.4</td>
<td>2.0</td>
</tr>
<tr>
<td>% of personnel with screening course</td>
<td>66.7</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>% of personnel with standard treatment guidelines training</td>
<td>66.7</td>
<td>0</td>
<td>100</td>
</tr>
<tr>
<td>Average weeks of training</td>
<td>2.1</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Average months since training</td>
<td>36.0</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
## Dispensing Personnel Characteristics

### Table 10. Busy facilities (patients per day > 100)

<table>
<thead>
<tr>
<th></th>
<th>BBH</th>
<th>MBH</th>
<th>Nkwen</th>
<th>Mutengene</th>
<th>Etoug-Ebe</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Average age</td>
<td>39.2</td>
<td>30.0</td>
<td>38.0</td>
<td>29.3</td>
<td>33.0</td>
</tr>
<tr>
<td>% of personnel with only primary school</td>
<td>20.0</td>
<td>33.3</td>
<td>0</td>
<td>100</td>
<td>66.7</td>
</tr>
<tr>
<td>Average years' dispensing experience</td>
<td>6.3</td>
<td>1.5</td>
<td>3.5</td>
<td>2.3</td>
<td>1.7</td>
</tr>
<tr>
<td>% of personnel with dispensing course</td>
<td>100</td>
<td>66.7</td>
<td>50.0</td>
<td>33.3</td>
<td>66.7</td>
</tr>
<tr>
<td>Average weeks of training</td>
<td>10.2</td>
<td>4.7</td>
<td>0.5</td>
<td>5.3</td>
<td>2.0</td>
</tr>
<tr>
<td>Average months since training</td>
<td>24.0</td>
<td>4.0</td>
<td>5.0</td>
<td>1.0</td>
<td>78.0</td>
</tr>
</tbody>
</table>

### Table 11. Moderately busy facilities (30 < patients per day > 100)

<table>
<thead>
<tr>
<th></th>
<th>Kumba</th>
<th>Ashong</th>
<th>Ndu</th>
<th>Ngounso</th>
<th>Bangolan</th>
<th>Kouhouat</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Average age</td>
<td>31.6</td>
<td>32.0</td>
<td>23.6</td>
<td>31.0</td>
<td>29.0</td>
<td>22.3</td>
</tr>
<tr>
<td>% of personnel with only primary school</td>
<td>33.3</td>
<td>50.0</td>
<td>0</td>
<td>100</td>
<td>50.0</td>
<td>33.3</td>
</tr>
<tr>
<td>Average years dispensing experience</td>
<td>2.1</td>
<td>5.0</td>
<td>2.9</td>
<td>2.4</td>
<td>6.0</td>
<td>2.3</td>
</tr>
<tr>
<td>% of personnel with dispensing course</td>
<td>0</td>
<td>0</td>
<td>33.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average weeks of training</td>
<td>N/A</td>
<td>N/A</td>
<td>2.6</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Average months since training</td>
<td>N/A</td>
<td>N/A</td>
<td>108.0</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

### Table 12. Less busy facilities (patients per day < 30)

<table>
<thead>
<tr>
<th></th>
<th>Jikijem</th>
<th>Akeh</th>
<th>Nyamboya</th>
</tr>
</thead>
<tbody>
<tr>
<td>n</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Average age</td>
<td>28.5</td>
<td>31.3</td>
<td>23.3</td>
</tr>
<tr>
<td>% of personnel with only primary school</td>
<td>50.0</td>
<td>66.7</td>
<td>50.0</td>
</tr>
<tr>
<td>Average years dispensing experience</td>
<td>7.5</td>
<td>2.7</td>
<td>3.5</td>
</tr>
<tr>
<td>% of personnel with dispensing course</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Average weeks of training</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Average months since training</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
References


CDC/ WHO (1996) EpiInfo, 6.03.


Promoting appropriate drug use in missionary health facilities in Cameroon


