STANDARDISED SUPPLY OF ESSENTIAL DRUGS IN GHANA

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Cover:
The Ghanaian symbol of "Gye Nyame", used to indicate God's omnipresence. The motto could be translated as "Everything by God" and is traditionally printed on "adinkrah" funeral cloth, using a round stamp made of calabash shell and black ink.

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Bayerɛ ammɔ a, yennuno no; aba ne sibere so.

If the yam does not grow well we should not blame it; it is due to the soil.

(Ghanaian proverb)

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List of abbreviations

ANC	Ante Natal Controls
BUFMAR	Bureau des Formations Médicales Agréées du Rwanda
CBM	Christoffel Blinden Mission
CHAG	Church Hospital Association of Ghana. After 1982: Christian Health Association of Ghana
CWC	Child Welfare Clinic
DAP	Drug Action Programme
DCD	Defined Curative Dose
DDD	Defined Daily Dose
DFl	Dutch Florin (1 DFl = $ 0.33)
ED	Expatriate Doctor
GD	Ghanaian Doctor
GNP	Gross National Product
HAI	Health Action International
IDA	International Dispensary Association
IFPMA	International Federation of Pharmaceutical Manufacturers Associations
INN	International Non-proprietary Names
IOCU	International Order of Consumers Unions
OPD	Out-Patient Department. Usually in the sense of out-patient consultations. The total number of out-patient consultations (total OPD) is the sum of the number of sick out-patient consultations (sick OPD), the number of under-five or child welfare clinic consultations (CWC) and the number of ante natal controls (ANC)
R&D	Research and Development
RHP	Rural Health Programme
UNIDO	United Nations Industrial Development Organization
WHO	World Health Organization

INTRODUCTION

During the past decade the economic situation in many of the sub-Saharan African countries has been deteriorating. Most of their governments have not been able to meet the basic health needs of the growing population. There is unequal distribution of the limited health resources between the urban and the rural areas and, within urban agglomerations, between the priviliged and the poor. The funds available for the purchase of drugs and medical materials are both inadequate and badly spent. As a result most essential drugs are unavailable to the majority of the rural population.

If the basic needs of the African sub-Saharan countries are ever to be met a meticulous use of limited resources is essential. In Africa, about half of the health budget is spent on drugs, compared to less than 7% in Europe[1] and, in Africa, up to three quarters of the drug budget is spent on drugs which are expensive, useless or even harmful[2-4].

An important step in the rationalization of expenditure on drugs is the formulation of a list of essential drugs. Many of these lists have been published but very little has been written on the quantities in which the essential drugs are necessary. Yet this information is important when essential drugs programmes are to be started.

In 1980 the supply of drugs in Ghana had stagnated to such an extent that foreign aid was offered. The church-related health institutions, associated in the Christian Health Association of Ghana (CHAG), constituted a Drug Committee that in the following years advised on the selection, the quantities necessary and the distribution of essential drugs, and also supervised the carrying out of several drug relief programmes to all 66 CHAG hospitals and clinics by means of the distribution of prepacked standard packages of essential drugs.

During the implementation of these drug relief programmes the need was felt to evaluate the methods and the results of the selection of essential drugs, the quantification of drug needs and the system of distribution. This book describes the studies, reports on the advice of the CHAG Drug Committee and gives an evaluation of its activities.

In Chapter I a review of the literature on essential drugs is given.

Chapter II describes the country and population of Ghana and its health facilities.

Chapter III describes the studies and activities of the CHAG Drug Committee and the resultant advice.

In Chapter IV the methodology and results of a drug utilization study involving seventeen CHAG institutions over the years 1981-82 are presented and discussed.

In Chapter V the activities of the Drug Committee are evaluated. The *method of drug selection* is evaluated by comparing the CHAG list of essential drugs with a quantified consensus of 38 lists of essential drugs made in or for African countries. Each decision made to select the drugs for the CHAG list is analyzed.

The *quantified drug needs* as expressed in the CHAG estimates are compared with results of the few available studies, and with the results of the drug utilization study presented in Chapter IV. The present CHAG methodology of quantifying drug needs

is compared with two other methods known from literature.

The *system of distribution* using standard packages is evaluated by comparing for several individual health institutions the actual volume of drugs allocated with the actual consumption data derived from the drug utilization study. Further the use of statistical parameters in quantifying the drug needs of health institutions is discussed.

In Chapter VI is discussed the extent to which the conclusions of this present study could be used by health planners in other sub-Saharan countries.

I have been a member of the Drug Committee from its inception in 1980 and have been involved in all studies and activities. Chapters II, III and IV have been written from this point of view. After returning from Ghana in September 1983 I have tried to take distance and to evaluate the work done there by carrying out a study of the literature on essential drugs and the analysis, partly by computer, of all available data. This critical evaluation is contained in Chapter V.

In view of my involvement in the activities of the CHAG Drug Committee and the fact that I am the author of this study, it should be realized that my personal role is dualistic as I am both actor and critic.

Chapter One

LITERATURE ON ESSENTIAL DRUGS

I.1 Introduction

In this chapter a review of the literature on essential drugs is given. The following subjects are discussed: the general concept of essential drugs (I.2), the selection of essential drugs (I.3), the quantification of drug needs (I.4), policies on the supply of essential drugs (I.5) and the distribution of essential drugs (I.6).

I.2 Essential Drugs

I.2.1 Definition of essential drugs

The World Health Organization (WHO) defines "drugs", "medicines", "pharmaceutical products" and "medicinal products" as "the substances and/or the products used in man for prophylactic, diagnostic and therapeutic purposes, including substances of synthetic or natural origin, biologicals such as vaccines and sera and in some cases, blood and its derivatives"[5]. Although not specifically stated we can assume that dressings, X-ray material and various plastic disposables as syringes, gloves and catheters are not included.

In the 1983 WHO list of essential drugs a definition of essential drugs is given[6]: "Essential drugs are those that satisfy the health care needs of the majority of the population". Parallel to the definition of drugs *per se*, this will include vaccines, sera and products for diagnostic procedures.

Not all authors and certainly not all essential drugs programmes use this definition. Most publications describing programmes supplying a number of health institutions with a set of essential drugs are faced with the problem that some basic items that are not "essential drugs" according to the definition are in fact nearly as essential. In actual programmes these items are then usually supplied together with the essential drugs and for practical purposes they are sometimes added to the list. Examples are dressing material[7] and soap, envelopes and exercise books[8]. On many larger lists pharmaceutical raw materials (used to formulate e.g. mixtures or ointments), laboratory materials and diagnostic chemicals for X-ray examinations are included. Although these substances are considered as drugs in the WHO definition and although for larger health institutions they can be considered essential, the fact that they are sometimes included and sometimes not makes comparison between lists difficult. Within the scope of this study therefore these items will not be considered.

The same applies to vaccines. According to the two WHO definitions vaccines can

certainly be called essential drugs. Many authors have even stressed that they might be more essential than most drugs[9,10]. Yet vaccines are not included in most of the short lists of essential drugs. The main reason is probably a practical one: vaccines require a cold chain and the supply therefore will nearly always be separate from that of essential drugs. Within the WHO there is a separate programme for vaccination, the Extended Programme on Immunization. In this study vaccines will not be considered. We will limit ourselves to essential drugs, excluding products for diagnostic procedures, pharmaceutical raw materials and vaccines except when otherwise stated.

I.2.2 History of the essential drugs concept

The concept of essential drugs has emerged simultaneously from many countries. In 1963 Cuba was probably the first country to publish a National Formulary by generic names[11]. Maurice Kings revolutionary book "Medical Care in Developing Countries" (1966) published the first check-list of basic drugs[12]. Tanzania followed in 1970 with the first national list divided for different levels of health care[13]. In 1972 Peru published a comprehensive list "Medicamentos Básicos"[14] based on a clear national policy accompanied by adapted legislation.

The early nineteenseventies brought the insight that economic growth could not be unlimited[15] and that it would not automatically supply the needs of all the people on earth. New concepts in meeting global needs on a scheduled basis were developed[16]. In line with this trend of economizing on resources and meeting basic needs on a global scale, the first WHO list of essential drugs was published in 1977, listing 212 active ingredients[17]. It was reviewed in 1979[18] and 1983[6]. At first, reactions were mixed. An editorial in The Lancet in 1978 reacted positively to the concept and even considered applying a similar approach to developed countries, yet called the selection "desert island drugs"[19]. In general however, many positive critiques were published[20,21] and extra suggestions were made[22]. The pharmaceutical industry criticised the idea[20,21], claiming that drugs not on the list would be considered inessential and that a list restricting a free choice of drugs would lead to a deterioration in health care[19]. Lasagna made various comments on what he called "ex cathedra judgements"[23] and concluded that "clearly suboptimal care for patients would result from restriction to these WHO drugs"[24]. Together with others he called for differentiating the list according to level of existing health care and available resources[23]. In Ghana the 1979 version of the list was received with the comment: "As a starting point it is good, as an end a disaster"[25].

In later years acceptance of the WHO concept of essential drugs became more or less universal and now "underlies any approach to a rational and cost-effective pharmaceutical policy"[26]. It has become obvious that the first WHO list made an enormous impact.

In 1978 the Executive Board of the WHO approved the Action Programme on Essential Drugs[27,28] which was ratified by the World Health Assembly in 1978 and 1979[29,30]. In this Drug Action Programme (DAP) the WHO played an even more active role. The objective was formulated as "to ensure the regular supply to all people of safe and effective drugs of acceptable quality at lowest possible cost, in order to reach the overall objective of health for all by the year 2000 through health systems based on primary health care"[31]. In 1978 the African Regional Expert Committee on Drugs

underlined the concept of essential drugs[32], advised countries to work on a rational drug policy[33] and in 1981 published a regional list of essential drugs[34]. However, in 1982 WHO Director-General Mahler warned the committee that "action at the international level can be useful for generating important concepts; action at the national level is all important for putting them into effect"[35]. By that time some African countries had already gone a long way to ensure a regular supply of essential drugs at affordable cost, e.g. Mozambique[26,36-40] and Lesotho[41-43], or were struggling to do so as in the case of Kenya[7,44-46] and Tanzania[8,47-49]. In other countries Voluntary Agencies were trying to organise a coordinated supply for their health institutions, e.g. in Ruanda[43,50-52], Southern Sudan[53-56] and Ghana[57-62]. Outside Africa, Cuba[11], Peru[14], Bangladesh[43,63-67] and Sri Lanka[68,69] have set examples in rational drug supply and adapted legislation.

I.2.3 Criteria for essential drugs

The criteria to determine which drugs are essential were formulated by the WHO at the presentation of the first list in 1977[17] and were later slightly adapted[6].

a) essential drugs should offer the widest possible coverage of the population; the selection is dependant on pattern of diseases, experience and training of health personnel, financial resources and genetic, demographic and environmental factors;
b) only drugs for which sound scientific data on efficacy and safety are available should be selected;
c) adequate standards of quality, bioavailability and stability under expected local conditions should be assured;
d) whenever available, the international non-proprietary (generic) name should be used;
e) when two or more drugs seem similar, the choice should be made on a basis of careful evaluation of their relative efficacy, safety, quality, price and availability; in some cases pharmacokinetic properties or the possibility of local manufacture may influence the choice;
f) fixed combinations are only acceptable when the combination provides a proven advantage over the single compounds in therapeutic effect, safety or compliance.

I.2.4 Advantages and disadvantages of the concept of essential drugs

Many authors have mentioned the advantages of an essential drugs list. They can be summarised as follows:[40,70]

a) reducing the number of drugs to be purchased, stored, analyzed and distributed, resulting in easier and more effective management and facilitating quality control;
b) stimulating national production of essential drugs;
c) facilitating bulk purchasing with consequent reduction of costs;
d) making cost-effective use of limited resources;
e) facilitating medical and therapeutical training of health care workers at all levels;
f) facilitating objective drug information;
g) facilitating the monitoring of drug use.

Further it can be stated that without essential drugs, Primary Health Care is impossible[71,72]. Korn[73] advocates the use of a list of essential drugs on a more microenvironmental basis: the supposed improved availability will increase the faith of patients in the health station and will also increase the status and job-satisfaction of the health-worker; moreover, a more precise diagnosis will be necessary as compared with the situation where drugs are not available anyway. Moore[44] adds to this that when people have gained the confidence to come more regularly they will also have more access to family-planning and preventive activities; that the unnecessary self-referral to higher levels of health care will diminish and that, as a consequence, health care will become cheaper. In Kenya this seems to be the case[74]. Bygberg[75] mentions that costs will be reduced as no more expensive drugs will be given out unnecessarily when cheaper alternatives are available.

The disadvantages as brought up by the pharmaceutical industry and some authors when the first WHO list was published can be summarised as follows:

a) to restrict the choice of drugs limits the doctor in prescribing the best drug for each patient;
b) drugs not on the list will be considered inessential;
c) some drugs are widely used although their efficacy has not been scientifically proved; it would be unjust to ban them as many patients and doctors prefer to use them;
d) the quality of generic products is less guaranteed than that of brandnamed drugs;
e) when buying generic products, no funds will be generated for research and the development of new drugs[24].

Few of these arguments have stood the test of time. By 1984 the concept of essential drugs had been taken over by more than 80 countries[74]. The deteriorating economic situation in most of the poorer countries has made a costeffective use of their limited resources more and more of a necessity.

I.2.5 Ethical aspects of medical choices

Whenever resources are insufficient to meet the needs of all, making a choice is inevitable. This necessity to choose underlies the concept of essential drugs.

Doctors, however, are not very well equiped for such an economical choice. This aspect is hardly ever incorporated in the curriculum of their medical studies; moreover, the Hippocratic oath[76,77] is based on the concept of the doctor doing his utmost for each individual patient and therefore does not include the possibility of making a choice. The oath fails to guide him in respect to the wider context of his responsibility to the health needs of a whole community[78,79]. This means, in fact, that any amount of money or effort spent on individual patients can be defended by citing the oath or the concept behind it. This confuses the issue of injustices in the allocation of health care resources and is often misused to justify expensive urban health care in countries that cannot afford it.

McDermott[80] has written a fine chapter on what Waddington[81] called "statistical morality". This is the idea that some action we may take, influencing the frequency of a phenomenon, can be morally good even without our knowing just who may be affected, which makes it possible to shift the criterium of the "moral good" from the known

individual, as in the thought behind the Hippocratic oath, to a less identifiable *group* of individuals. He cites the example that when efforts to improve the statistical indices of child nutrition or infant mortality are taken as morally good, for the population as a whole the individual relationships cease to be the essence of the matter and that this "moral good" can then hardly be expressed except in statistical parameters[80]. This example shows that the "moral good" is not restricted to individuals or to decisions morally good for individuals, and brings to light the possibility that **an ethical choice which has to be made between an individual and the (statistical) masses does not necessarily have to be in favor of the individual.**

This choice is a basic problem in most African countries in which 80-90% of the already limited health budget is spent on curative care for a minority of the people living in urban areas. Among others, Yudkin is a passionate advocate of reallocation of these health resources by means of their transfer from the overspending urban elite to deprived rural areas[82-84] and by reducing expenses on luxurious drugs[37,48]. As WHO Director-General Mahler put it: "Wisdom demands that health measures be applied where they are most needed, most effective and least costly"[85]. Speaking about expensive Western medical technologies he said: "These technologies are appropriate only if they are effective and can be applied for the benefit of the whole of a society in a manner it can accept and at a cost it can afford"[85].

When resources are limited, and in Africa they are, priorities have to be set. This means, in fact, that resources for meeting basic health needs will, at least partly, have to be generating by cutting down on expensive health actions. As these actions might in principle be defended by the Hippocratic oath this oath is then seen to be in conflict with the "statistical good" as mentioned above.

Apart from this, Christian-ethical implications should be included as the Bible also has stressed the depth and responsibilities of interpersonal relations. The church-related health institutions in Africa, usually ahead of other organisations in implementing a policy of fair allocation of limited health resources, face a similar ethical dilemma when one doctor's salary could pay for ten health workers, or when an elective operation takes as much time as a health talk to twenty women about their sixty children. In their Primary Health Care programmes these institutions try to provide basic, acceptable health care which is effective in respect to 90-95% of the diseases of poverty and within the existing limits of resources this is often the best they can do. Yet this statistical choice leaves a certain number of fellow-men unserved, fellow-men that the Bible tells one not to disregard. In a note from the Board of Missions of the Netherlands Reformed Church, this problem is very well formulated as "whom do we choose to ignore?"[86]

The answer could be to change the compassion of coping with the problem of one patient at a time into a different one, an indirect, statistical compassion to those "we never get to see"[80]. The WHO has clearly made this choice. In a paper from 1977 Mahler stated: "Social justice demands that all citizens of the world should reach an acceptable level of health that permits them to lead socially and economically productive lives, before sophisticated measures for individual health care are provided beyond what can be afforded for the population as a whole"[87].

The WHO list of essential drugs was meant as a first step in setting priorities for health care. It can certainly be used as an instrument to ban the most obvious examples of expensive, useless or even harmful drugs and if used as such, the advocates or users

of such drugs have something to fear. However, the main goal is to offer a tool to those who, with limited resources, face ethical choices for the benefit of the majority of the people.

I.3 The selection of essential drugs

I.3.1 Introduction

In this section a number of essential drugs lists is reviewed. After having selected the lists within given parameters, the question is considered as to whether it is possible to reach a certain consensus as to which drugs are considered essential. The occurence of drugs on 38 lists is quantified.

I.3.2 Selection of essential drugs lists

There are far too many essential drugs lists to be able to enumerate them all and by no means all of them have been published. It is therefore impossible to present a comprehensive study of all these lists up to the end of 1983 and an attempt only can be made. Apart from general lists intended for no specific area, attention is focused on lists made in or for sub-Saharan countries. Lists of individual health institutions are not taken into account and only one list from the district level is included[88]. In the case where later or reviewed editions of a list are available the latest available version has been taken. However, when an extensive time lapse between editions has occurred, or when the lists grossly differentiate they have been included separately. In such cases the intellectual effort behind each of the lists is considered to be different, meriting separate inclusion)*.

I.3.3 Description of selected essential drugs lists

1) Source

In this study 30 different essential drugs lists are reviewed. Of these, 17 are intended for twelve individual countries in Africa: Tanzania[8,13,70], Lesotho[42,89], Ruanda[90,91], Ghana[88,92], Cap Verde[93], Zaire[94], Sierra Leone[95], Chad[96], Sudan[54], Uganda[97], Kenya[7] and Cameroon[98]. Six of these have been produced by Voluntary Agencies, eleven by local governments. Of thirteen lists not limited to one particular country, seven have originated from international organisations WHO[6,17,99], Red Cross[100], FAO[101], PAHO[102] and UNIDO[103], three have come from Voluntary Agencies[102,104,105] and three are scientific publications[12,106,107].

)* For this reason the first list of the WHO from 1977[17] as well as the 1983 revision[6] are included and the 1979 review[18] is not. For Tanzania the list of 1970[13], the official Government list of 1981[70] and the basic list for the drug supply plan of 1983[8] are considered separately.

2) Dating

The lists can be divided into three groups: seven early lists from before 1978, the WHO list of 1977 with later editions, and 21 later lists, published after 1980.

3) Description

Of the seven early lists, the list of King[12] and the 1970 Tanzania lists[13] are by far the most useful. Other ones include proprietary names[98,100], many obsolete preparations[94] or both[106]. One is too short to be effective[93]. As to the lists published after the WHO list of 1977[17] it is not easy to compare the quality. Criteria used are: whether the WHO list has been of influence; whether the order of presentation is the same as that of the WHO list; whether solely generic names have been used; whether drugs of very limited use are included or drugs of very common use have been left out; and whether many obsolete drugs are on the list. When compared according to these criteria, eight lists are of outstanding quality. Three of these have been published using the WHO system of classification: the official list of Tanzania[70], the list of Simmonds and Walker published in The Lancet in 1982[107] and the proposed list for a large drug project in Sudan[54]. Five other lists that did not use the WHO classification are: a 1981 list from the Church Hospital Association of Sierra Leone[95], one from the Christian Medical Commission of the World Council of Churches[102], one from a 1983 drugs logistics educational paper from the WHO[99] and the lists for the drug relief plans for Kenya[7] and Tanzania[8].

Four other lists carry no visible relation to the WHO list. They are the proposed list for a project in Chad[96], the list for the Ashanti Akim district in Ghana[88] and the lists of the Lesotho Dispensary Association[89] and of BUFMAR in Ruanda[90]. The remaining lists are of limited value: six of them because of inconsistent choices or omissions and three that are long, comprehensive lists of the Health Ministries of Lesotho[42], Ghana[92] and Ruanda[91] which are intended to exclude drugs rather than to indicate priorities.

The WHO lists[6,17] are a group in themselves. Their impact has been enormous and, as mentioned before, they now form the basis of many essential drugs programmes. Their value lies in the world-wide discussion and change in thought they have brought about.

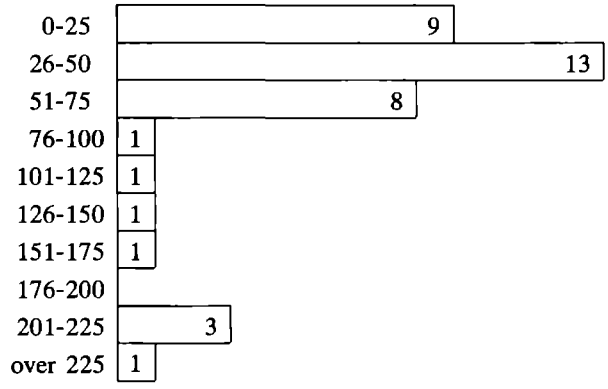

Figure 1. Frequency distribution of number of items on 38 essential drugs lists. Number of items is given as number of chemical preparations and not as number of drugs, which would be higher.

4) Number of items on the lists

Of 30 lists, five are differentiated for use at different levels of health care[13,54,70,105,106]. When each of these differentiations are considered as separate lists, the total number of lists rises to 38)*. The frequency distribution according to number of items on each list is visualized in Figure 1. It can be seen that the majority of essential drugs lists contains less than 75 items.

Three different groups will be analyzed separately: short lists (0-50 items), medium lists (51-100 items) and long lists (over 100 items). In Table 1 these groups are differentiated for early, WHO, and later lists. The short lists are usually meant for dispensaries and health centres, the longer lists for hospital care.

Table 1. 38 lists of essential drugs differentiated for early, WHO and later lists with indication of the number of items.

*Number of items**	*0-50*	*51-100*	*101-*	*Total*
Early lists (- 1978)	5	3	2	10
WHO lists** (1977, 1983)	—	—	2	2
Later lists (1981 -)	17	6	3	26
Total	22	9	7	38

* In accordance with general practice the number of items is given as the number of chemical preparations and not as number of dosage forms, which would be higher

** The 1979 WHO list is not reviewed separately

I.3.4 Quantitative analysis of consensus on the selection of essential drugs for Africa

1) Methods

Drugs from all 38 lists were tabulated and for each drug the total number of lists on which it appeared was marked. Excluding pharmaceutical preparations and diagnostic agents, 368 different drugs were included in the lists. A selection of the results is presented in Appendix 1 in which 107 drugs that were included seven times or more (7/38 = 18%) are listed. Data are presented according to the groups as used in Table 1.

Frequency of appearance on the lists in the different groups was quantified by counting the number of lists in which the drug was included. The result was expressed as a percentage of the maximum possible. The maximum score for a drug was therefore 38/38 (100%). For certain drugs closely related alternatives were in use. In these cases the total score for the therapeutic category was counted, e.g. ferrous sulphate and ferrous fumarate were taken together as "iron tablets".

)* A leveled list with 20 basic drugs and 40 supplementary drugs is scheduled as one list of 20 and another of 60 drugs.

2) Results

The 29 drugs that were included in 50% or more of all lists are presented in Table 2. This first selection of "most essential drugs" includes all 26 highest scoring drugs within the group of the 22 short lists, being drugs that were included in this group of lists eight times or more (36%). From the group of 9 medium lists it includes the upper 16 drugs, being all drugs mentioned seven times or more (78%).

Table 2. 29 "most essential drugs", included in 20 or more of 38 different lists of essential drugs. Frequency expressed as percentage.

	Drug	*Frequency in 38 lists (%)*	*Remarks*
76-100%	aspirin tab.	100	
	chloroquine tab.	95	
	iron tab.	89	sulphate: 84% fumarate: 13%
	sulfa tab.	84	dimidine: 71% other: 16%
	tetracycline cap.	79	
	antibiotic eye oint.	76	tetracycline: 45% other AB: 39%
61-75%	broad anthelmintic	74	meb.: 37% tiab.: 34% beph.: 24% leva.: 21%
	oral rehydration salt	74	especially after 1977
	antacid	71	alum.hy.: 45% magn.tr/hy.: 47%
	antiasthmatic	68	am.ph.: 45% salb.: 21% ephedr.: 42%
	benzyl benzoate	66	
	piperazine	66	tabs/syrup
	procain pencillin inj.	66	
	ergometrine	63	inj.: 53% tab.: 37%
	phenobarbital	63	
	disinfectans	61	chlorhex.: 39% iodine: 50%
	chloroquine inj.	61	
	vitamin (multi/BCo)	61	multiv.: 47% BCo.: 39%
50-60%	phenox.meth.penicill.t.	58	especially after 1977
	folic acid tab.	58	
	lidocain 1-2% inj.	53	
	metronidazole tab.	53	
	benzath.benz.penic.inj.	53	
	chloroquine syrup	53	
	laxans	53	senna: 34% other: 26%
	paracetamol tab.	50	only after 1977
	chloramphenicol cap.	50	
	epinephrine inj.	50	
	gentian violet paint	50	

No more information can be gained from the dugs mentioned in less than 36% of the short lists. However, only drugs mentioned seven times or more (78%) in the group of 9 medium lists have been included in the list of most essential drugs. For that reason all drugs that appeared on at least five of the medium lists (over 50%) have been taken to indicate a second level priority, insofar as the drugs had not yet been included in the first list of most essential drugs. These 15 drugs are presented in Table 3.

Table 3: 21 essential drugs not mentioned in Table 2 which appear in 5 or more of 9 medium size (51-100 item) lists of essential drugs. Frequency expressed as percentage.

Drug	*Frequency in 38 lists (%)*	*Remarks*
promethazine tab/syr.	47	
niclosamide	45	
antitussivum	45	codeine: 26% other: 24%
diuretic tab.	42	furosemide: 26% hydr.chl.th: 26%
aminophylline inj.	39	
papaverine/atropine tab.	29	
antischistosomiasis tab.	45	niridazole: 34% metrif: 16%
water for inj.	45	
retinol cap.	47	
benzoic ac.comp.oint.	42	
chlorpromazine tab.	45	
diazepam inj.	37	
atropine inj.	39	
morfia/pethidine inj.	37	
quinine inj.	29	
Appearing mainly on lists after 1977:		
co-trimoxazole tab.	29	
vaccines: tetanus*	29	
DTP	26	
polio	24	
BCG	24	
measles	21	
chlorphenamine tab.	29	
diethylcarbamazine tab.	34	
diazepam tab.	32	
antihypertensivum	29	res: 24% hydr.c.th: 16% meth.d: 13%

* Vaccines have a low score because they do not appear on some lists at all; of 31 lists of less than 100 items vaccines are included in 9 lists only, mainly from after 1977

A third level of priority was indicated by listing all drugs that appeared six or seven times in the group of seven long lists, insofar as they had not been included in the previ-

ous selections. This group of long lists is not very selective and this is the reason why only a score of 6/7 or more is taken into consideration. This selection of 18 drugs is presented in Table 4.

Table 4. 18 essential drugs not mentioned in tables 2 and 3 which appear on at least 6 long (over 100 item) lists of essential drugs. Frequency expressed as percentage.

Drug	*Frequency in 38 lists (%)*
benzyl penicil.inj.	47
streptomycin inj.	45
INH/Thiacetazone tab.	37
hydrocortisone inj.	29
chlorpromazine inj.	39
digoxin tab.	29
digoxin inj.	29
sodium chloride inf.	29
glucose 5% inf.	26
emetine inj.	26
iron dextran inj.	26
prednisolone tab.	26
oxytocin inj.	26
insulin inj.	21
ether	18
snake antivenom	18
thiopentone inj.	24
tetanus antitoxin	24

One more selective criterium had to be used as, for some drugs, the situation since the early seventies has changed, negatively influencing their opportunity to be included in the early lists. The reason for this could be either the introduction of the drug after that time, changes in indications for use, or reduction in price e.g. after the patent expired. To correct for these possible changes the same criteria for selection had to be applied in respect to the later lists only. This application had no effect on the first list of "most essential drugs" as all high scoring drugs had already been included; six more drugs qualified on the second list and these have been added to the list in Table 3. The subgroup of late long lists was too small to be of use.

I.3.5 Discussion

Including a drug in a short list of essential drugs is a much stronger indication of its being considered essential than including it in a long list. For this reason the short lists are more discriminating and supply, in fact, much more valuable information.

There are two reasons as to why the list of "most essential drugs" is interesting and might be of value. The first is that its contents more particularly express the consensus within the group of short lists, being the more discriminating group. This is illustrated by the fact that the list of 29 "most essential drugs" contains all 26 highest scoring drugs of this group. The second reason is that this list will be especially useful in choosing essential drugs for dispensaries and health centres which is the level of health care on which most essential drug programmes are concentrating.

Although this "core" list, a term used by a WHO working group on essential drugs, can never be considered as complete or ready-made for a given situation, it can serve very well as a check-list for sub-Saharan countries to ensure that no essential drugs have been forgotten. In some situations a few more drugs for specific conditions prevalent in the area will have to be added. In section V.2 of this study this core list of "most essential drugs", based on consensus in literature on essential drugs, will be used as a yardstick to evaluate other lists of essential drugs.

The second and third selection indicate the extra priorities as prevalent in the medium and long lists of essential drugs, which can be rougly attributed to health care at hospital level. What should be realized is that the method of recording implies that in the second selection are included only drugs that have a score of less than 36% in the short lists; these were drugs that rarely appeared on short lists. This implies also to the third selection in which are included only drugs that had a low score in both short as well as medium lists, and that therefore appeared mainly in the lists of over 100 items. Again the results can not be considered as fully comprehensive. The number of medium and long lists the data are based on is rather small and the lists, being long, are rather undiscriminating. In general there is much less agreement on the drugs to be used at hospital level. Yet the quantified consensus can indicate drugs that are generally considered essential. The lists might be used as check-list and have to be adapted to local situations.

When scores in early and late lists are compared, some drugs can be seen to be entering the scene: e.g. oral rehydration salts (early lists 30%, later lists 88%), paracetamol (early 0%, later 65%) and mebendazole (0%, later 46%). Other drugs are disappearing, e.g. tetrachlorethylene (60%, later 8%) and emetine (50%, later 12%). These changes could perhaps be attributed partly to the publishing of the WHO list of 1977.

Some drugs have unexpectedly low scores, e.g. ampicillin (39%) and antihypertensiva (29%). Apparently these are rarely selected as essential drugs.

I.4 Quantification of drug needs

I.4.1 Drug utilization studies

Drug utilization has been defined by a WHO expert committee as "the marketing, distribution, prescription and use of drugs in a society with a special emphasis on the resulting medical, social and economic consequences" [108]. The objectives of drug utilization studies are to quantify the state, the developmental trends and the time course

profiles of drug usage. The data are of value in the planning of drug supply and distribution and for estimating drug needs in a society,preferably after considering the overall morbidity pattern within the actual country or region[109].

Not many drug utilization studies have been carried out[110]. Moreover, the results of these are difficult to compare[111]. Rabin and Busch[112] mention three reasons for this. The first is that there is no single unit that is satisfactory as a basis for international comparison either at one point in time or over a period of time. The monetary unit is neither constant in time nor comparable between countries[113]. However, since 1979 the use of the Defined Daily Dose (DDD) has been advocated as a technical unit of measurement of comparison[109,114]. Whenever possible, this daily dosage should be given in weight of active substance[109].

The second reason for the scarcity of drug utilization studies is that data on drug use are often not available or that their source is uncertain. The third is that if attempts are made to compare countries with respect to changes in their consumption over time, additional problems arise e.g. in inflation, population growth, exchange rates and social changes.

I.4.2 Drug need quantification in Africa

In developing countries hardly any drug utilization studies have been carried out although there is a great need for reliable information on marketing, distribution and use of drugs in those countries "where progress in health care depends largely on improvements in the provision and use of drugs"[114]. This observation was made by Friebel who measured drug consumption in two African countries. His data were derived from 1977 purchasing orders from Central Medical Stores in the one and 1974 national estimates for drug supply for Primary Health Care in the other. He compared these data, expressed in DDD, with figures from Norway and concluded that the availability of drug utilization figures is a precondition of any improvement in drug supply[114].

As mentioned above, one of the problems is the difficulty of obtaining reliable data. Even official estimates as used in Friebels study can be grossly inaccurate. Hamel[115] sums up the possible reasons for these inaccuracies: hospitals requesting more than necessary, knowing that amounts will be cut anyhow; hospitals requesting unsuitable (cost/therapeutic) or unnecessary drugs through personal preferences or the influence of the drug companies; and less than optimal prescribing practices (polypharmacy, over-prescribing and unnecessary prescribing).

A 1979 WHO publication differentiates between three stages at which real drug utilization can be measured: drugs prescribed by the doctor, drugs acquired by the patient and drugs actually consumed by the patient. Information on this last stage can only be obtained with great difficulty by very exhaustive interviews of the patients[113] which can be very inaccurate[116]. Yet measurements of drug consumption by means of analysis of expenditure, prescriptions issued or hospital pharmacy files are also liable to many biases, especially in developing countries. Van der Geest has published several papers on the unofficial and illegal ways of distributing drugs[117-119] and for Cameroon cautiously estimates that in rural health institutions about one third of drugs are withdrawn from the system[117]. Whenever utilization is measured at an early stage in the drug flow, e.g. in hospital pharmacy files or central hospital stores, this loss cannot be differentiated from the actual drug consumption by the patient.

I.4.3 Methods of drug need quantification

Three different methods of drug need quantification can be distinguished: the population-based method, the service-based method (or demand-morbidity method) and the consumption-based method[120]. In this section a short description of each will be given. In section V.3.3 and in chapter VI the merits of each method will be discussed.

1) The population-based method

The method is based on the surveyed or estimated prevalence of various illnesses in the population. To estimate drug needs these data are combined with coverage of the population by existing health services and with generally accepted or devised treatment norms. In the book "Managing Drug Supply"[120] an example is given for Haiti. I know of no example from Africa.

The advantage of the method is its clear scientific approach. One of the disadvantages is that the result can never be more accurate than the underlying epidemiological data which are usually lacking or fragmentary in developing countries. A second disadvantage is that the coverage by existing health institutions is often difficult to assess. A third disadvantage is that it does not take into account the differences between calculated minimal requirements and the practical rate of consumption which includes all kinds of losses, spoiling, and less than optimal prescribing patterns.

2) The service-based or demand-morbidity method

This method uses the morbidity pattern among patients visiting health institutions as derived from patient statistics. These "demand-morbidity" data are combined with a chosen standard therapy regime and total drug needs are calculated. The best recorded example is given by Simmonds and Walker[107] who calculated the drug requirements for a hypothetical population of 10.000 in a refugee camp. The results were later used by the WHO/UN High Commission for Refugees. Moore[7] used the method to calculate the contents of standardised kits of essential drugs for dispensaries and rural health centres in Kenya. Of late the WHO has used the same method in a training paper on drug supplies and logistics[99,121]. Moore and Walker used it in Ethiopia[122].

The advantage of this method is that it is much more practical than the population-based method, as the problem of collecting epidemiological data and data on coverage are avoided. Moreover, it estimates drug needs for a system with a standardised optimal prescription pattern. This is at the same time a disadvantage as no such optimal prescription pattern is practised and as estimates tend to be too low. A second disadvantage is that reliable data on morbidity pattern from hospital- or health centre statistics might be difficult to obtain, for two reasons. The first is that in a fair proportion of patients no strict diagnosis is made and only the symptoms are treated. The method of translating symptoms into recordable diagnoses should be uniform for the statistics to be reliable but this is often not the case. The second reason is that many patients present with more than one diagnosis. Here again the method of recording should be uniform but often is not.

3) The consumption-based method

A third method of estimating drug requirements is to study the pattern of drug consumption in a number of health institutions in a given area over a given period. These

consumption figures can be related to the number of patients treated. The average drug consumption per number of patients treated can be used as a model for other institutions or for the region as a whole. The essential drugs programme of the Christian Health Association of Ghana[60] is an example of this method and will be discussed and evaluated in this study.

The advantage of the method is that only one parameter is used, bypassing epidemiology, coverage, and standard therapy, measuring actual drug consumption only. Losses and actual (mostly less than optimal) prescribing practices are incorporated in the result. The advantage here is at the same time the disadvantage: these losses cannot be differentiated from the actual drug requirements of the patient.

I.5 Policies on the supply of essential drugs

I.5.1 Introduction

Improving the availability and quality of essential drugs in developing countries at affordable cost involves many factors. Experience has shown that adequate results have been achieved only when a coherent and strong national drug policy exists, backed by adequate legislation. The literature on this subject is vast. In this section a review will be presented of some different elements in national drug policies insofar as they have been of historical interest or can be of practical consequence.

I.5.2 National drug policies

In the introduction to the first WHO list of essential drugs[17] clear advise is given on formulating a national drug policy. More publications followed[5,32,123-125]. The most comprehensive description of necessary steps in establishing a national drug policy is given by Lionel and Herxheimer[126,127]. To summarise: a national drug policy usually starts with the formation of a national committee of experts to advise the government on reduction of costs, increase in effectivity, and on necessary legislation. The policy itself usually includes the following elements: the formulation of a national list of essential drugs using generic names; bulk purchase by international tender; local production of some basic items; quality control; drug information and health education, both for health workers and the general public; and the regulation of advertising and sales promotion.

In 1978 the African Regional WHO Expert Committee on Drugs confirmed the WHO recommendations[33]. Outside Africa, sound examples of national drug policies are to be found in Cuba[11], Peru[14], Sri Lanka[68] and Bangladesh[128-130]. In Africa, Mozambique has been the most succesful[26,38,40,131] in that the number of drugs on the national list is now less than 300, all prescribing is by generic names and sales promotion has virtually disappeared[40,48]. The cornerstone of Mozambique's policy has been the establishment of strict drug registration, an effective national formulary and an exclusive state system of drug procurement through international tenders[40], all within the

context of a national struggle to create a socialist and democratic society[48].

Each of the elements mentioned above will be discussed briefly.

1) Reduction of costs

The reduction of costs is a most urgent problem for most developing countries. In Africa, in 1981, 46.4% of total health expenditure was spent on pharmaceuticals as compared to 6.1% in North America and 6.8% in Europe[1]. Drug expenditure in Africa has been increasing much faster than the BNP: in the period 1971-75 drug expenditure in 32 African countries rose by 21.1% per year while the BNP rose by 4.7% only per year[132]. Yudkin estimated the increase for one African country at one third per year throughout a period of five consecutive years[79,83].

Patel[1] gives the best available summary of five different ways to reduce drug expenditure and tries to quantify the estimated effects of each. The two most effective measures are a national selection of drugs, and bulk purchase, which together could account for a 40% reduction in costs; other measures which can be taken are a public system of distribution, the use of generic names, and domestic production; the three together to account for another 20% reduction.

Many other authors also indicate measures which can be taken to reduce the costs. Silverman[133] emphatically states that the formulation of national drug formularies will have the strongest effect. Not only the reduction of the use of unnecessary brand-named drugs but also reduction in the use of expensive dosage forms such as syrups and injections can represent a considerable saving[38,78]. Studies in Ghana[2] and Zaire[3] show that cost reductions of 70-75% can be achieved by a rational, generic prescribing of essential drugs in the simplest dosage form.

It should be realized that no real savings in an absolute sense can be expected from national drug policies as a whole. As the impact of the policy increases, more people will have access to essential drugs and the cost of the total system will be likely to rise[44]. In any case the savings made by a more efficient drug supply will be necessary in order to pay for the supply to that part of the population that previously had no access to essential drugs.

2) Legislation

Effective legislation is the backbone of any drug policy. Detailed descriptions of the necessary elements have been given by the WHO[134] which has expressed willingness to advise member states[124], and by Lionel and Herxheimer[126,127]: the laws and regulations must "specify the standards required and the categories of persons to be permitted to manufacture, sell, prescribe and dispense drugs; they must also set out the means to be used to ensure that provisions are met and the penalties for contravention or non-compliance"[126]. The authors mention that voluntary regulation is far more reliable, effective and cheaper than external regulation but observe that many efforts at self-policing are exceedingly disappointing.

Most West-African countries have obsolete and inadequate drug laws[135].

3) Use of generic names

The WHO has from the beginning[17] advocated the use of generic names as laid down in the International Nonproprietary Names for Pharmaceutical Substances (INN)[136]. This advise is also given by nearly all authors writing on the reduction of

costs[1,78]. The advantages are well summed up in the Tanzanian list of essential drugs[70]: The use of generic names is less confusing than when there are many dissimilar brand-names for one drug; the generic name drugs are usually cheaper and give the pharmacists flexibility in the dispensing of drugs, and facilitate the teaching of healthworkers as they will have to learn one name only. The cost reduction achieved by using generic products is estimated at between 10%[1,137] and 30%[48,83]. The pharmaceutical industry is not happy with the idea and claims that it will be harmful to innovation[137,138]. This issue will be discussed in section I.5.4.

4) Essential drugs lists: restrictive and selective

Essential drugs lists have at least two different functions. The first is to ban unnecessary, mostly brand-named, drugs which usually consume a fair proportion of the national drug budget. This function could be called *restrictive.* Restrictive essential drugs lists, intended to exclude drugs, usually contain several hundred items. Examples of restrictive essential drugs lists are the lists of the Ministries of Health of Lesotho[42], Ghana[92] and Ruanda[91]. Mozambique has probably been the most successful in actually banning any drug not on the national list[26,38]. This is the most essential step necessary to reduce expenses on many unnecessary brand-named drugs that are generally propagated with vehemence by pharmaceutical companies.

The second function of essential drugs lists is to select a limited number of drugs for the different levels of health care and to serve as a basis for the supply of drugs by local production or bulk import by the government. A notable example is the five-tier list of Tanzania[70]. These *selective* essential drugs lists are much shorter.

5) Import

Although many developing countries already economize on the purchase of drugs as compared with richer countries[114] considerable saving can still be achieved by a more rational import policy on essential drugs. The system of governmental bulk purchase by international tender has been advocated by many authors[17, 139-141]. As it does not require a big governmental body but only a small motivated expert committee, this system does not involve a big investment[5]. Although officially practised in many African countries, in reality the bulk purchasing by tender system is often disrupted by the agressive marketing policies of pharmaceutical companies which many officials cannot resist.

WHO and UNICEF have offered assistance and advice to individual countries[32,124,142]. The possible savings have been estimated at 20%[1] or even more in individual cases[79]. Up till now Mozambique[26] and Tanzania[143] seem to be the most successful in implementing a rational import policy.

6) Local production

The advantages of local production of essential drugs have been summarized by Lionel and Herxheimer[126]: increased self-reliance, a reliable flow of supply, the saving of foreign exchange and the provision of local employment. To this can be added a better utilization of local resources[144], transfer of technology, manpower training and industrialization[141]. The view has been expressed that the whole process of increasing local production could be financed from savings made on the rational supply of essential drugs as a whole[1].

The counter arguments are many, the most important of these being that drugs domestically produced are generally more expensive than generic products bought by international tender. The price difference has been estimated at 60-80% but could be much higher[145]. The reasons for this are usually linked to small scale production *per se*[123]: depreciation of investment, maintenance, spareparts[146] and quality control[123] are more expensive for small industries than for the big drug companies. Even production by a subsidiary of a multinational company can be expensive because of patent restrictions and because of systems of tied purchases and transfer-pricing (when raw materials are sold from the multinational firm to the local subsidiary for fixed, exorbitant prices)[79]. Greater self-reliance and savings in foreign exchange might prove illusory when dependence on expensive spare parts and servicing still exist[5]. Specific African problems exist in the absence of a chemical industry, the unreliability of public services such as water and electricity and because of the lack of qualified personnel[33].

Problems involved in marketing fall outside the scope of this study.

The UNIDO has differentiated between five levels of pharmaceutical industrialization[63,103,147] which can be summarized as follows:

Phase 0: no pharmaceutical industry in any form;
Phase 1: repacking and packaging; production of packaging material;
Phase 2: formulation of tablets, capsules, syrups and ointments from bulk drugs; production of plant extracts and some organic and anorganic intermediates;
Phase 3: formulation of parenterals, biologicals, immunologicals, single-step synthetic drugs and fine organic intermediates;
Phase 4: multi-step synthetic drugs, fermentation products (e.g. antibiotics)[147].

In 1976 Ghana was in Phase 2 and this is still the case.

The conditions necessary to start local production are: a finished feasibility-study[32] for which WHO help has been offered[124], and a strict adherence to a national list of essential drugs[5,41]. One very interesting point to be considered is that before local production is started, a quality control laboratory should be operating, as quality control is a prerequisite for both local production and generic bulk purchase[138,148-150].

7) The choice between bulk purchase and local production

Most authors agree that local production is usually more expensive than bulk purchase. However, it should be realized that the price of the products of a new industry can never be low[114]. For example Tanzania accepts that locally produced drugs are 25% more expensive than imported ones[49]. Another point which requires mentioning is that it is claimed that starting national production is inevitable. As an UNIDO official put it: "the course of local production of pharmaceuticals in order to cut down imports in a situation where collaboration from transnational cooperations and developing countries and decentralized economies is not forthcoming, becomes the only possible way out of a dire situation"[103].

It is questionable as to whether a pharmaceutical industry is the best sector in which to start industrialization[114]. The goals of industrialization and those of providing inexpensive drugs to the poor are not always compatable as local manufacture does not necessarily produce cheap drugs[146]. It could be a more desirable option for poor countries to build up systems for the purchasing of drugs as efficiently as possible as "in this way investment risks are minimized and production is centred in the most competitive plants"[63]. This is what Taylor wrote in a publication for the Office of Health Econom-

ics, which was founded in 1962 by the Association of the British Pharmaceutical Industry.

It is difficult to see why a first stage of repacking and formulating simple mixtures and ointments should not be profitable in view of the price and transportation costs of imported finished products. In the case of more sophisticated processes a careful study should be made of the foreign currency involved and the capital investment necessary should be compared with that involved in starting other industries, before any steps are taken. Feasibility and acceptability in view of the available manpower should be assessed as well.

An interesting view is expressed by the Christian Medical Commission of the World Council of Churches[149]: one could consider starting local production in a decentralised way, e.g. expanding facilities for the production of eye-drops in a hospital pharmacy that is already making them for domestic use. In this manner the existing expertise can be carefully expanded. Small-scale projects are typical of Voluntary Agencies, which have started several[43,97,151].

8) Quality control

As has been mentioned above, both in the case of local production[149,150] and in that of generic bulk purchase[138] quality control is a prerequisite; in regard to the latter because examples are known of substandard products[138,140]. Furthermore, quality control is essential in order to check on the disintegration of drugs under tropical conditions[152] and control the quality of raw materials[124,150]. A final reason is that effective quality control could be necessary to convince the medical profession of the acceptability of imported or locally produced generic products.

In 1975 the WHO in resolution WHA 28.65 adopted the "Certification Scheme on the Quality of Drugs moving in International Commerce"[153]. This scheme requires certification of three essential aspects: that the product is authorised for sale and for distribution in the exporting country; that the batch conforms to specifications; and that the manufacturing plant is regularly inspected for proper manufacturing standards and quality control measures[154]. Another WHO publication defines the different responsibilities of government and producer: the government to be responsible for the inspection of the manufacturing plant, for sampling and for quality analysis, for verifying analytical specifications and for the use of the Certification Scheme; the manufacturers' responsibility includes self-inspection at all stages of production, maintaining adequate analytical facilities and the keeping of records on all analytical tests performed. Moreover, the WHO states clearly that in the case of the importing country not being able to guarantee sufficient quality control the exporting country should then supply documents according to the Certification Scheme[17]. This Scheme was, however, up to the present (1984) not been endorsed by all member states, including some important drug exporting countries such as Germany and Switzerland[153].

Setting up regional quality control laboratories has been considered[33,155]. Recently the WHO published data indicating that even a small national one-analist laboratory could undertake 200-300 analyses per year, could detect substandard and mislabeled drugs and could perform the full analysis of more than 75% of the drugs on WHO's model list of essential drugs[152,156]. It is obvious that when the means available are limited, quality control is only possible in the case of a restricted number of drugs[139]. This justification for the use of a list of essential drugs has been mentioned before.

9) Education and information

In order to be able to form a policy that will be successful in improving the supply of essential drugs it is essential to educate both health workers on all levels and the general public[5,7,17,49,148].

Malcolm Segall[139] distinguished three levels at which the necessary education can take place: during the basic training of health workers, during their post-basic training by a governmental information service on drugs emphasising sound prescribing practices, and health education of the general public.

Many authors mention the enormous consequence of some basic shortcomings on the training of health workers. Concentrating on university medical studies, Yudkin[79] observes that their general set-up is Western and that training is mostly carried out by teachers who received their own training in developed countries. He describes the desire to establish an "international reputation" for the medical school, which is necessary for the international mobility of graduates and concludes that "health care comes to be synonymous with curative medicine, and this in turn is reduced to hospital technology and the latest drugs"[48]. The Christian Medical Commission speaks of "professional elitism"[157] and Gunaratne states: "medical education seems to be patterned to give professional satisfaction to the teachers rather than education and training to their students"[158]. There is an urgent need for the establishment of a different curriculum for doctors and other health workers; they should be taught to place clinical decisions about the individual patient within the context of the health needs of the population and to make a more discriminating use of the scarce resources available in their diagnosis and treatment[9]. Another necessity is the careful re-training of health workers in the field, e.g. with diagnostic flow-charts and standard therapy regimes[2,7].

It is usually seen as a governmental responsibility to supply objective information on drugs[1,26]. Examples are the 1972 "Vademécum Oficial de Medicamentos Básicos" of Peru[14] and the 1981 Lesotho formulary[42]. However, the main problem in developing countries with regard to post-basic training is the fact that the multinational pharmaceutical firms have a virtual monopoly on information on drugs, as medical journals and objective publications on drug efficacy and costs are usually lacking[83]. The well-known MIMS Africa[159] is more often than not the only desk reference available. Moreover, the pharmaceutical firms put enormous pressure on doctors with, for example, one sales representative per four doctors in Tanzania, compared to one in twenty in Britain[83].

A recent example of a welcome initiative is the wall-chart with indications and dosage of some forty essential drugs in the Kenyan drug distribution plan[160], which is useful both to health workers in the field and to the public. A similar chart is in use in Tanzania. This is of course only possible in the case of a limited range of drugs. It is extremely useful for making all parties involved acquainted with the national policy on essential drugs.

10) Advertising

Examples of incomplete or wrong information in advertisements[161-163] or, more specifically, the presentation of more indications for use and the omission of certain contra-indications[164] are well documented. Mellrose[165,166] and Silverman[133,167] have effectivily focused public attention on many examples of what they call "drug dumping" in the Third World.

Effective control on advertising is usually lacking[48,83] although the WHO called for it from 1977 onwards[17]. An interesting phenomenon, however, may be observed in Mozambique where rigid governmental bulk purchasing linked to a national list of essential drugs brought about, as a spontaneous side-effect: the virtual disapparance of drug advertising and company salesmen, without the need for direct administrative and legislative measures on promotional activities[40]. This could perhaps serve as a model for other countries.

I.5.3 International action

In the 1975 WHO Certification Scheme on the quality of drugs[153], regulations for labelling and drug information have been laid down. The International Federation of Pharmaceutical Manufacturers Associations (IFPMA) admits that drug information should in principle be uniform all over the world[168] and in 1981 published a Code of Pharmaceutical Marketing Practices[169]. This code, however, was received by Health Action International (HAI) as being grossly insufficient. HAI is an informal cooperating network of some 50 consumers, development action and other public interest groups, established in 1981[170]. Anwar Fazal, president of the International Order of Consumer Unions (IOCU) even suggested that the industry proposed the code "not to put its house to order, but simply to forestall external regulation of the industry, notably by the WHO"[64]. A serious flaw in the IFPMA code is the absence of any form of sanction. As a reaction the HAI published its own Draft International Code of Pharmaceutical Marketing Practices[171].

The offer of several IFPMA member firms to supply essential drugs at reduced prices is a recent issue[31,63,172]. HAI reacted strongly, calling this a threat to the objectivity of the WHO because it would be very difficult to both cooperate with the pharmaceutical industry and at the same time regulate its behavior. "Industry priorities and world health priorities inherently conflict"[173]. In the same paper the Chairman of the WHO Ad-hoc Committee on Drug Policies was cited as saying "the question at issue was whether industry would give priority to health or profit if it is considered that to be its option. The question was one which the WHO Executive Board should consider very carefully before deciding what ground rules should be laid down for the industry participation in and contribution to the Organizations Action Programme on Essential Drugs"[173])*.

I.5.4 Research and development

The WHO has listed the present goals of research into health problems of the third world as: clinical and epidemiological studies on the efficacy and the safety of essential drugs used in local conditions; the development of appropriate technology for packaging and formulating the most essential drugs in these countries; and studies on the

)* Figures show that this is not illusory. Six countries (USA, Japan, W-Germany, Switzerland, Britain and France) control 70-75% of all world drug production[1,64]; these countries also contribute about 50% of the total budget of the WHO[64].

stability of the products under tropical conditions[33]. In the introduction to the 1983 revised list of essential drugs[6] is also mentioned: the investigation of the benefits and safety of some traditionally used herbal remedies; the value of non-medicinal forms of treatment; the effects of genetic, nutritional and environmental factors on the therapeutic response; and operational research to improve procurement procedures and to evaluate and improve distribution systems.

Paul Janssen[174] of the Belgian pharmaceutical firm of the same name made a complete inventory of the state of affairs in 90 infectious diseases of the developing world and concluded that excellent mass immunisation is possible against 10, that excellent chemotherapy exist against 24 and satisfactory chemotherapy against another 23. This leves 33 diseases against which either no, or unsatisfactory chemotherapy is available. Simon[175] is very optimistic about the prospects for new vaccines and rationally developed effective drugs. We can conclude that there is a need for research on the treatment or prevention of tropical diseases and that good prospects for research in his field exist. This research should be aimed at both generating new knowledge and at applying existing knowledge[87].

This subject is linked to the concept of essential drugs by the fact that, in reaction to the policy of using generic drugs instead of brand-named preparations, the pharmaceutical industry has warned that this would hamper innovation[137,138]. The fundamental problem is that whilst 5-20% of the price of drugs is spent on research and development (R&D)[5] and whilst 15-20% of world drug consumption takes place in the developing world[31,63,168] only about 1% of the total budget of R&D is spent on research in drugs against tropical diseases.)*

Apart from this budget from the pharmaceutical industry, there is the much smaller budget for the WHO Special Programme on Research and Training in Tropical Diseases[176]. As the estimated cost of developing one single drug is estimated at between US $ 40-55 million[123] the possibilities of developing new drugs are limited. For Diana Mellrose this settles the argument: as such a small proportion is spent on research on drugs for developing countries there is no need for them to contribute to this budget by buying brand-named drugs[177]. Or, as Herxheimer put it, if the consumer contributes to the cost of drug development he should have some say in the direction such development should take[138]. The pharmaceutical industry's response was to state that in many cases the health problems of the North and South overlap, that the Third World, after having completed the demografic transition, will have the same pattern of diseases as the developed world and will then need the same drugs, and that in general the outcome of research can never be predicted[63]. Yudkin, however, states that the pharmaceutical companies feel that it is more profitable to create in an underdeveloped country a market for drugs produced mainly for developed countries, than to create a drug especially for underdeveloped countries where resources are limited and profits may therefore be low[48]. As the WHO has explicitly stated that it is very urgent to ensure thorough application of existing knowledge within the health system as well

)* These are the figures: total expenditure on R&D is estimated at US $ 8.000 million annually[146] of which only US $ 60 million is spent on drugs intended for use in developing countries[10]; this is about the same as one fighter bomber or a few kilometers of motorway[123], or about 2% of all R&D on cancer[48].

as to immediately apply new knowledge as soon as it has proved its worth[87], the fear of the pharmaceutical industry might not be completely unjustified that, immediately after launching a successful drug, the patent will be ignored by some countries. On the other hand, the high prices for new drugs such as praziquantel[178], a new and promising anti-schistosomiasis drug, prohibit their use in the areas where they are most needed.

These factors would constitute an argument in favour of international financial support of R&D in drugs against tropical diseases, as in fact has been propagated as probably the most effective form of help the North could offer the South[10,63]. In any case the grossly inadequate budget for R&D on tropical diseases should be increased.

I.6 Distribution

I.6.1 General aspects

Fair and regular distribution is "a vital link"[179] in the supply of essential drugs. "A just distribution of health resources is as important as their quality and quantity" said Mahler[85]. The need for a functioning distribution system will even become greater as more areas are reached by Primary Health Care systems[179].

The present distribution of health resources shows differences as big within developing countries as those that exist between the rich and the poor world. In 1977 even in Tanzania 79% of drug funds went into hospitals, 7% to health centres and 14% to dispensaries[48].

The problems are many and nearly insurmountable; they mostly are related to a combination of bad transport facilities lacking maintenance and fuel, bad communications[179] and long distances[139], resulting in inadequate supply, the inadequate flow of information, a lack of supervision and feelings of neglect and isolation on the part of the health workers[179]. Of all the factors mentioned, transport is usually the most capital intensive. The problem is a vicious circle: as there is no proper distribution system no drugs are supplied, and as there are no drugs there is no need to improve the system[148]. The combined introduction of a system of bulk import, repackaging and distribution of a limited set of essential drugs would be ideal. This would involve providing facilities for storage and inventory control, transportation and maintenance, repackaging and labelling, quality control and education and motivation at all levels of staff. This last element is often considered to be the most essential[5,44].

There has been much discussion on the desirability of the system existing in many countries whereby drugs are distributed free of charge as part of an over-ambitious National Health Service. The system has many disadvantages[33], of which the resulting passive attitude of the patient and the inability of the state to pay for it have to be especially mentioned. Another disadvantage is that under such a system drugs do not appear to have any financial value and this might lead to a situation where the necessary administrative structure is inadequate or even non-existent. A workshop in Ruanda advised against it and propagated a governmental subsidy on essential drugs instead[141]. A system of this sort exists in Mozambique[36].

No clear advise emerges on distribution plans. We have to limit ourselves to looking

to some recorded examples. In the Tanzanian drug relief plan[49] existing transport to regional centres and into the district is considered sufficient. In the Kenyan programme to supply dispensaries with essential drugs, sealed boxes are distributed throughout regional and district centres[7]. In a drug supply plan for Southern Sudan the transport of the drugs is up to the "consumers", i.c. the local community or health committee[55]. As will be discussed later, the same applies to the drug distribution system of the Christian Health Association of Ghana, where health institutions from all over Ghana have to collect their allocation from two distribution centres[60]. In the case of these last two examples "collection" has replaced "distribution".

I.6.2 Distribution by means of standard packages

The first publication on the distribution of essential drugs by means of prepacked standard packages was Simmonds and Walker's paper[107] that was published in The Lancet of Februari 1982 at a moment when the first five hundred prepacked boxes for all church related health institutions in Ghana had already been shipped. It was a short paper on the estimated drug needs of an imaginary population of 10.000 in a refugee camp. At that time in certain areas of Kenya a pilot project was in progress to test the system of a monthly supply of essential drugs to dispensaries and rural health centres by standard kits of essential drugs. Moore reported on this project later in 1982[7,180]. In the years 1982 and 1983 similar plans were prepared for Tanzania and Southern-Sudan. No official publications appeared untill the present (1984), therefore working papers only are available[8,49,54-56,143].

Table 5. Summary of publications on standard packages of essential drugs.

		Meant for:		
	Number of items on the list	*Number of patients* *	*Time period*	*Type of health institution*
1982 Simmonds & Walker[107]	28 □	10.000	3 m	(refugee camp)
1982 Moore, Kenya[7, 46]	30 □ 38 □	2.000 3.000	1 m 1 m	dispensary health centre
1982-83 Tanzania[8]	17 31 □ 35 □	1.000 1.000 2.000	1 m 1 m 1 m	dispensary B dispensary A health centre
1982-83 S.Sudan[54]	15 21	? ?	3 m 6 m	PHC unit dispensary

□ These lists have been used for a comparative study (section V.2)
* New patients, consultations, or treatment episodes

In all programmes the general idea is the same: calculated amounts of several different essential drugs are packed together in a standard kit, intended for a certain type of health institution for a given period of time, or for a given number of treatment episodes.)* In Table 5 a summary of these publications is given.

The assumption is, in the concept of standard packages, that needs within the various health institutions are more or less the same. Objectives are to provide drug quantities that are sufficient but not excessive, and to encourage a more careful diagnosis and treatment[49]. The advantages are: safe and intact delivery; easy handling, storage and inventory control; increased confidence in the Health Service; new interest and motivation among health workers; less self-referral to higher echelons; and working within clear budgetary limits[49].

In Chapter V the choice of essential drugs and quantification of drug needs as reported in these publications will be discussed in detail.

)* See section V.4.3.*3*

Chapter Two

GHANA

II.1 Land and people

In 1957 Ghana, formerly the British Colony of the Gold Coast, was the first African country to gain independence from colonial rule. In 1966 the president of this rich and promising country, dr. Kwame Nkrumah, was ousted by the first of, by 1984, five successful military coups. Since 1981 the country has been governed by a Provisional National Defence Council under the leadership of Fl. Luitenant Jerry Rawlings.

Ghana is situated on the Gulf of Guinea in West Africa, and is roughly rectangular in shape with a north-south distance of 750 km and a coast line of 540 km along which more than forty forts and castles were once situated to protect the gold and slave trades (see figure 2). Three climatological areas can be distinguished: a narrow coastal strip

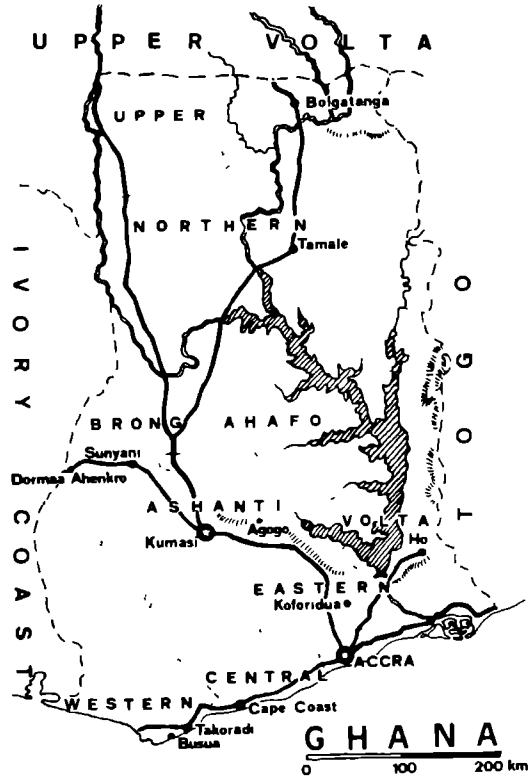

Figure 2. Map of Ghana with administrative regions and main roads.
● CHAG distribution centre

of dry savanna land, a broad tropical forest belt covering about one third of the total surface, and the northern savanna area. The Volta Lake, which was formed after construction of the Akosombo dam, is one of the largest man-made lakes in the world and virtually cuts the country in two. Rainfall varies from 2000 mm per year in the humid South to 1000 mm per year in the North.

In 1980 the total population was 11.679.000 according to a World Bank estimate[181]. Compared with data from the last census of 1970 this would imply an annual growth of 3.1% over 1970-79. With 47 inhabitants per km^2 in 1980 Ghana is, after Nigeria, the second most densily populated country of sub-Saharan Africa. Population is concentrated in the mid-southern part of the country, where in the four most densely populated regions, 52% of the population lives on 24% of the total surface (115 inh/km^2) (see figure 3). Of the total population, more than one third live in com-

Figure 3. Four administrative regions in Ghana constituting 24% of the total surface, in which more than half of the total population lives.

munities of over 5000, which makes Ghana one of the most urbanized countries in Africa. Annual growth of the cities was 5.1% over the period 1970-79, which is more than the population growth in general[181]. However, 48% of the urban population lives either in the agglomerations Greater Accra (one million inhabitants in 1982) or Kumasi (400.000 in 1982)[182], and it should be realized that many Ghanaian towns are still purely agrarian and are in fact large rural settlements rather than organized cities[183]. In 1978 71% of children were enrolled in primary school, and 32% in secondary school. Like all public services, schools suffer greatly from lack of resources caused by the continuing political and economical crises.

More than 60% of the population has maintained adherence to the traditional religions, with 20% Christians (mainly in the South) and 12% islamic influences (in the North). Tribal distinctions have a rather limited effect on national policy. English is the official language. The country has been divided in nine administrative regions.

The Gross National Product (GNP) was estimated at US $ 420 per capita per year in 1980 (Netherlands: US $ 10.230) which being over US $ 370, places Ghana nar-

rowly within the World Bank group of Middle Income Countries[63]. However, in this group the average GNP is US $ 1420, while in the Lower Income group it is only US $ 240. In view of the fact that the average annual growth over the period 1960-79 in Ghana has been minus 0.8%, it would be more realistic to include Ghana in this Lower Income group, as is also suggested by health indicators which are discussed below. In 1979 agriculture and fishing accounted for 54% of employment; mines, industry and public works for another 20% and services and government for 26%[181]. Because of the continuing economic crisis a large proportion of the professional population has left the country for Nigeria, European countries or the USA.

II.2 Health indicators in Ghana

Some vital health statistics of Ghana are represented in Table 6 with corresponding data of low, middle and high income (industrialized) countries as reference. Most indicators show that Ghana is in a situation comparable with lower income countries, or worse. Some of the goals to be achieved by these countries have been formulated as: an infant mortality of less than 50 per 1000, a life expectancy of 65 years or more, and

Table 6. Health indicators in Ghana, compared with those for low, middle and high income countries[9,181-183].

	Ghana[a]	*34 Low Income Countries*	*60 Middle Income Countries*	*18 High Income Countries*
Gross National Product per capita, in US $ (1980)	400	240	1420	9440
Crude birth rate in births per 1000 population	48-50	42	34	15
Crude death rate in deaths per 1000 population	17-19	16	10	10
Life expectancy at birth in in years	49-50	51	61	74
Infant mortality rate in deaths per 1000 live births	130 (63-235)[b]	49-237[c]	12-157[c]	13
Child mortality rate in deaths per 1000 children 1-4 yr	22	18	10	1

a Figures for 1980 and 1982
b Figures for the urbanized South and the rural North
c Variation between countries

a literacy rate of at least 75%[16]. As can be seen from the table, Ghana still has a long way to go.

No reliable statistics on incidence and prevalence of the most common diseases are available. However, the Ghana Health Assessment Team has described a method for assessing quantitatively the relative importance of different disease problems on the health of the population by measuring the impact of a disease by the number of healthy days of life lost through illness, disability and death. According to this method, the first ranking ten for Ghana are: malaria, measles, child pneumonia, sickle cell disease, malnutrition, prematurity, birth injury, accidents, gastroenteritis and tuberculosis; together they cause 57.4% of all lost days of healthy life[184]. This list however does not completely correspond with the most frequent complaints or most frequent diagnoses in health institutions, as many common conditions (e.g. worm infections) are not considered to cause a great loss of healthy life. On the other hand these extensive studies have contributed to the development of the idea of selective primary health care[9], which is the process of choosing the most cost-effective approaches to meeting health needs.

II.3 Health facilities in Ghana

In the seventies Ghana allocated 7-9% of the annual budget to health care[185], of this amount more than one third was spent in Accra where only ten percent of the population lives[186,187]. In 1975 15% was spent on primary health care, 45% on secundary (district) hospital care, and 40% on tertiary (specialized) services, mainly concentrated in Korle-Bu teaching hospital[188]. This disparity of distribution of resources is further illustrated by the fact that 70% of the population lives in rural areas where only 24% of the national health personnel and only 14% of doctors are stationed[189]. In 1976 75.9% of the budget was reserved for curative care, and 9.7% for prevention[189,190]. Reliable data for the period after 1976 are not available because of the deteriorating economic situation and political instability.

Existing health facilities, according to 1983 Ministry of Health data[182] are presented in Table 7. The total number of hospitals is 106, of which 35 are church-related (33%). It can be seen that (para)governmental hospitals, pharmaceutical manufacturing plants and retail shops are concentrated in the four most densily populated regions, while church-related hospitals are not. The total number of beds was 12.973 in 1975[191]. It is unlikely that this number has increased in subsequent years. The total number of out-patient attendances in 1981 was 5.267.996 according to a Ministry of Health estimate[182]. The accuracy of this figure cannot be established. Government health care is free. The services however suffer from nearly unsurmountable difficulties caused by the exodus of trained personnel and lack of resources and materials. Voluntary Agency facilities are partially financed by the Government and charge moderate fees.

The total number of doctors in Ghana was 1.031 in 1975 (1 per 9.625 inh.) but this was reduced to a mere 600 in 1983, with less than half of these working in rural areas. This resulted for 1983 in an estimated de facto ratio of 1 per 7000 inh. in urban agglomerations, and 1 per 35.000 in rural areas. Since 1979 the government has com-

Table 7. Health facilities in Ghana.

	Total	*In four most densely populated regions**
Government hospitals	51	28 (55%)
Para-government & mines hospitals	20	13 (65%)
Church-related hospitals	35	11 (31%)
Health centres	69	30 (43%)
Health posts	119	50 (42%)
Dressing stations	67	41 (61%)
Pharmaceutical factories	21	21 (100%)
Pharmaceutical shops	197	175 (89%)**

* Greater Accra, Central, Eastern and Ashanti Region, where 52% of the population lives (see figure 3)

** 118 in Greater Accra alone

mitted itself to the primary Health Care Strategy[192]. Pilot district projects have been started in each region, which were in some cases closely related to existing church-related hospitals. The projects suffer from the same problems as the governmental health services as a whole and, in fact, only those projects with some external resources (mostly from Voluntary Agencies) have survived.

II.4 CHAG and CHAG Drug Committee

In september 1967 about forty church-related "mission-"hospitals and clinics in Ghana founded a voluntary association with the name "Church Hospital Association of Ghana" (CHAG) that was later changed into "Christian Health Association of Ghana" with the initials remaining the same. Its objectives were defined as: to encourage and promote the highest standards of Christian Medical Care; to facilitate and coordinate the relationship of its members with the Ministry of Health; and to assist its members in employment of staff, in procurement of supplies, in planning and the coordination of training programmes and also any other medical work or services requested[193]. It is not a legislative or policy-making body, and does not infringe on the authority of any church, diocese, or governing board.

In 1968 the combined CHAG institutions had about 2800 hospital beds, which was by then about 25% of the national total[194]. In 1982 the number of member institutions had increased to 66, with 4386 beds, which was 34% of the total (see figure 4). In 1979 the total number of out-patient consultations was 2.998.211, while in 1982 it was 3.995.198[59] (see Appendix 2). This increase of 33.2% over 3 years was partly caused by an increase in the number of participating institutions (10.9%) but mainly by an increase in patient attendances in existing CHAG institutions (22.3%). Apart from an

Figure 4. CHAG health institutions in Ghana.
- ⌞ Clinic
- ☆ Hospital
- ⊙ Institution in drug utilization study

increasing coverage of the rural population, this last figure is more likely to illustrate a shift in attendance from government- to church-related institutions, which could have been caused by the deterioration of the former and survival of the latter. The availability of medical supplies and other materials through their own overseas relations has been an essential element in this survival of the CHAG institutions. Yet it should be realized that many church-related health institutions can only continue their services by the continuous government subvention which is usually enough to cover salary costs.

As all governmental services suffer greatly from an absolute lack of nearly everything, especially drugs and medical materials, and as many patients are therefore forced to supply their own from the free market outside, at present a much more intense use is made of CHAG institutions than of governmental facilities. For this reason one can safely assume that the 34% CHAG beds stand for a 40-50% CHAG proportion in actual effective public health services, excluding of course traditional practitioners and private clinics for which no figures are available.

In 1980 the economic situation had deteriorated so much that the Ghana government could no longer guarantee a regular supply of essential drugs and medical materials, of which the CHAG institutions also regularly received a share. As national funds to import drugs and raw materials were strained as well local production stagnated and a serious shortage of essential drugs and materials followed. In june 1980

the CHAG Executive Board appointed a CHAG Drug Committee to assess the need of essential drugs, to coordinate overseas drug donations and to set out a long term policy on the supply of essential drugs and materials. The committee consisted of two pharmacists (Dutch and Philippine), two doctors (Ghanaian and Dutch) and the CHAG Executive Secretary (Ghanaian). The author was appointed secretary, and, as from 1982, chairman.

In the years 1980-83 the committee was engaged in many activities in the field of data-collecting and of planning, coordinating and supervising the distribution of many overseas drug donations and assisting in several relief operations[57-59]. In total over Dfl 3.5 million (US $ 1.2 million) worth of drugs and medical supplies were distributed through CHAG, of which Dfl 1.5 million was donated by overseas churches and over Dfl 2 million by the government of the Netherlands. These activities will be discussed and evaluated in the following chapters.

Chapter Three

CHAG DRUG COMMITTEE ACTIVITIES

III.1 Introduction

To identify the problems and to pave the way to future solutions, the Drug Committee (hereafter the committee) started its activities by formulating a number of basic questions. These questions were:

a) How many CHAG institutions have to be served? How many patients do they treat?
b) Which drugs are to be considered essential?
c) In what quantities are these drugs needed?
d) How could the drugs be allocated and distributed with the means currently available?
e) What would the cost of a reliefoperation amount to?

It was decided to find the answers to the first two questions by conducting an inquiry among all member institutions. The remaining questions were to be answered by administrative research carried out by the committee itself.

In this chapter are discussed: the methods and results of the 1980 Inquiry (III.2); the quantification of drug needs (III.3); allocation and distribution of drugs (III.4); the 1981-83 CHAG drugs programmes (III.5); and the 1983 revision of the CHAG list of essential drugs (III.6). An evaluation of the above activities is described in Chapter V. The material from section III.2-4 has been published elsewhere[60].

III.2 The 1980 Inquiry

III.2.1 Materials and Methods

An inquiry form was distributed to the, by then, 52 CHAG institutions)* at the annual conference in August 1980. Within one month 39 forms had been returned (75%).

The inquiry consisted of three parts. In the first, statistical data over 1979 had to be given (number of beds, admissions, out-patient attendances, ante-natal controls, deliveries, and major surgery). In the second part 80, by that time common, drugs in

)* By then 30 hospitals, 21 clinics and rural health programmes (RHP) and 1 maternity home. It is difficult to differentiate exactly between a clinic and a hospital, although consensus existed within CHAG as to which was what. In general a clinic or RHP had no doctor and no emphasis was put on in-patient care although usually a few beds were available for maternity and emergency cases.

93 dosage forms were listed and respondents were asked to mark only 25 needed for their immediate relief. It was thought that this would indicate the most acute needs at that moment, and was also intended as a practice exercise for the respondent. In the third part the same list was presented, and the respondents were again requested to mark 25 only, but this time to indicate the drugs that were considered to be indispensable in general, regardless of shortages at that particular time, and to indicate the estimated annual consumption of each. In the choice offered in both lists topical preparations, mixtures and vaccines were deliberately omitted. The reasons for the omissions were that mixtures and topical preparations are bulky and expensive to import ready-made, and should preferably be produced locally from raw materials; and secondly, as both budget and available logistics could afford only a bar minimum of essential drugs, these preparations were considered to be of less vital importance[60]. Vaccines were left out because a separate governmental organisation, the "Medical Field Unit" was taking care of that.

Statistical data from the inquiry were condensed into a "Complete List of Member Institutions of the Church Hospital Association of Ghana"[58]. The missing figures from the non-responding institutions were compiled from annual reports that were available from the CHAG Secretariat, derived from careful estimates based on the number of beds which was usually known from previous lists and was not likely to have changed, and from any other information available to the committee.

The choices indicated in the two drug lists were worked out separately. The number of times a particular drug had been marked was counted and this result was in a later stage differentiated for hospitals and clinics. The number of times each drug had been marked was expressed as a percentage of the number of respondents and called "priority-score".

III.2.2 Results

The response of 75% to the inquiry is satisfactory, as in general most biases seem to disappear when a response rate of 70% or more is achieved[195].

1) Statistical data

It does not fit within the scope of this paper to present the full 1979 data of all CHAG institutions. Instead, the 1979 totals are given in Table 8. The data have been used for defining categories of size of the institutions, and for allocating supplies (see section III.4).

Table 8. 1979 Annual figures for 52 CHAG institutions.

Beds	3.858
Admissions	127.773
Out-patient consultations	2.555.500
Ante natal controls	442.700
Deliveries	39.000
Major surgery	12.000

Table 9. Results of the 1980 inquiry.
Number of times drugs were marked as "indispensable" by 39 CHAG institutions, differentiated for hospitals and clinics. Priority score expressed as percentage of the number of respondents. Drugs not on the WHO list of essential drugs [6] in brackets.

1983 WHO class.	*Drug*	*Absolute score* (39) *Total*	(23) *Hosp.*	(16) *Clin.*	*Priority score* (%) *Total*	*Hosp.*	*Clin.*
1.1	ether	14	13	1	36	56	6
	thiopentone inj.	11	11	—	28	48	—
1.2	lidocain inj. 2%	8	8	—	21	35	—
	(5% heavy)	11	11	—	28	48	—
	(ketamine inj.)	11	11	—	28	48	—
2.1	aspirin	23	10	13	59	43	81
	paracetamol tab.	18	7	11	46	30	69
	(syr.)	12	2	10	31	9	62
	(APC)	4	2	2	10	9	12
	(phenylbutazone)	4	1	3	10	4	19
	(pentazocine)	—	—	—	—	—	—
	(novamin sulphone inj.)	18	10	8	46	43	50
2.2	morfia/pethidine inj.	25	22	3	64	96	19
4.2	atropine inj.	9	9	—	23	39	—
5	diazepam inj.	18	12	6	46	52	37
	phenobarbital tab.	24	14	10	62	61	62
	inj.	3	—	3	8	—	19
6.1	mebendazole	17	12	5	44	51	32
	piperazine tab./syr.	14	6	8	36	26	50
	tiabendazole	15	7	8	38	30	50
	any broad anthelmintic	27	18	9	69	78	56
6.2	metronidazole	17	10	7	44	43	44
	(clioquinol)	6	2	4	15	9	25
6.3.1	ampicillin cap.	28	18	10	72	78	62
	syr.	14	5	9	36	22	56
	inj.	7	6	1	18	26	6
	benz.pen.cr. inj.	21	16	5	54	70	31
	phenoxymeth.pen. tab.	15	8	7	38	35	44
	syr.	11	4	7	28	17	44
	proc.pen. inj.	29	14	15	74	61	94
6.3.2	chloramphenicol cap.	20	12	8	51	52	50
	(syr.)	18	9	9	46	39	56
	inj.	7	7	—	18	30	—
	sulfadimidine	11	3	8	28	13	50
	(triple sulfa)	16	9	7	41	39	44
	any sulfa	21	11	10	54	48	62
	co-trimoxazole	8	5	3	21	22	19
	tetracycline cap.	27	14	13	69	61	81
	syr.	11	2	9	28	9	56
	inj.	—	—	—	—	—	—

1983 WHO class.	Drug	Absolute score (39) Total	(23) Hosp.	(16) Clin.	Priority score (%) Total	Hosp.	Clin.
	nitrofurantoin	6	4	2	15	17	12
6.3.4	streptomycin inj.	14	14	—	36	61	—
	INH/thiacetazone	8	8	—	21	35	—
6.4	diethylcarbamazine	10	7	3	26	30	19
6.5	griseofulvine	3	2	1	8	9	6
6.7	chloroquine tab.	35	20	15	90	87	94
	syr.	22	9	13	56	39	81
	(inj.)	20	9	11	51	39	69
	(pyrimethamine)	10	2	8	26	9	50
6.8	(niridazole)	22	13	9	56	56	56
	(stibophen inj.)	3	—	3	8	—	19
10.1	ferrous sulphate	24	10	14	62	43	87
	folic acid	24	11	13	62	48	81
	iron dextran inj.	4	2	2	10	9	12
10.2	phytomenadion inj.	8	4	4	21	17	25
	methyldopa	4	3	1	10	13	6
	reserpine	5	3	2	13	13	12
	any antihypertensivum	8	6	2	21	26	12
12.4	digoxin tab.	3	3	—	8	13	—
	inj.	7	7	—	18	30	—
12.5	epinephrine inj.	8	7	1	21	30	6
16	furosemide tab.	8	6	2	21	26	12
	inj.	12	11	1	31	48	6
17.1	alum.hydrox. tab.	8	5	3	21	22	19
17.2	promethazine tab.	20	11	9	51	48	56
	inj.	15	12	3	38	52	19
	spasmolytic tab.	9	3	6	23	13	37
17.3	antihaemorrhoid supp.	5	1	4	13	4	25
17.5	(laxans supp)	2	—	2	5	—	12
18.1	hydrocortisone inj.	11	10	1	28	43	6
	prednisolone	6	6	—	15	26	—
22	ergometrine tab.	12	7	5	31	30	31
	inj.	27	17	10	69	74	62
	either	31	19	12	79	83	75
	oxytocin inj.	5	2	3	13	9	19
24	amitryptiline	—	—	—	—	—	—
	chlorpromazine tab.	8	3	5	21	13	31
	inj.	12	5	7	31	22	44
	diazepam tab.	11	5	6	28	22	37
25.1	aminophylline tab.	6	2	4	15	9	25
	inj.	6	5	1	15	22	6
25.2	codeine	8	5	3	21	22	19
26.1	pot.chloride	3	3	—	8	13	—
26.2	dextrose 5% inf.	7	5	2	18	22	12
	saline 0.9% inf.	7	5	2	18	22	12
	five other inf.	—	—	—	—	—	—

1983 WHO class.	Drug	Absolute score (39) Total	(23) Hosp.	(16) Clin.	Priority score (%) Total	Hosp.	Clin.
27	ascorbic acid tab.	11	2	9	28	9	56
	(inj.)	4	2	2	10	9	12
	retinol	4	1	3	10	4	19
	(multivitamin)	21	9	12	54	39	75
	(vit. B-complex)	15	6	9	38	26	56
	either multiv./BCo	23	11	12	59	48	75
	multivitamin syr.	14	2	12	36	9	75
	vit. B-complex inj.	13	7	6	33	30	37

2) Drugs for immediate relief

The list of drugs with priority-scores for "immediate relief" was used as a basis for an emergency eight-drug relief plan carried out in 1981-82 with financial support from the Netherlands Reformed Church and other donor agencies. As this relief plan was strongly influenced by drug needs at that particular time, it will not be included in further discussions.

3) Indispensable drugs in general

Results of the inquiry on "indispensable drugs" and the calculated priority scores for hospitals and clinics are presented in Table 9.

These results could not be indiscriminately used to establish a CHAG list of essential drugs because they were in fact only a reflection of what were felt to be needs that were in themselves strongly related to prescription habits. As an essential drugs list should be a harmonious entity offering a reasonable compromise between therapeutic range, safety, quality and cost, the committee had to "edit" the results of the questionaire into a useful range of essential drugs. A fine example of a dubious result from the inquiry is the fact that Multivitamin syrup had a priority score of 75% in clinics; despite this, it was not included in the final list because of its limited therapeutic value and because of cheaper alternatives being available.

Differentiating the priority scores for hospitals and clinics raised the theoretical possibility of three lists of essential drugs: one for hospitals only, one for clinics only, and one for both. In practice, hardly any drug emerged exclusively required by clinics only so that a two-step essential drugs list could be compiled: 24 drugs for hospitals and clinics alike, and an extra 10 for hospitals only. Both lists are presented in Table 10, in order of total priority score; scores differentiated for hospitals and clinics are included.

III.2.3 Remarks on the choice of drugs

In this section a rough indication is given of the reasons why certain drugs have been choosen by the committee, especially in cases in which choices have been different from preferences as expressed by priority scores.

Table 10. CHAG essential drugs list, 1981, in order of total priority score. Scores differentiated for hospitals and clinics. Drugs that are not on the WHO list of essential drugs[6] in brackets.

WHO class.	*Drug*	*Priority score (%)* *Total*	*Hosp.*	*Clin.*
	Standard list (hospitals and clinics)			
6.7	chloroquine phosphate tab. 150 mg base	90	87	94
6.3.1	procain penicillin inj. 4 MU	74	61	94
6.3.1	ampicillin cap. 250 mg	72	78	62
22	ergometrine inj. 0.5 mg/ml	69	74	62
6.3.2	tetracycline cap. 250 mg	69	61	81
6.3.2	nitrofurantoin tab. 100 mg*	65	61	69
5	phenobarbital tab. 100 mg	62	61	62
10.1	folic acid tab. 5 mg	62	48	81
10.1	ferrous sulphate tab. 200 mg	62	43	87
27	(multivitamin/vitamin B-Co tab.)	59	48	75
2.1	aspirin tab. 300 mg	59	43	81
6.8	metrifonate tab. 100 mg**	56	56	56
17.2	promethazine tab. 25 mg	51	48	56
6.7	chloroquine phosphate inj. 200 mg/5 ml	51	39	69
2.1	(novamin sulphone inj.)	46	43	50
6.3.2	(chloramphenicol syr. 125 mg/5 ml)	46	39	56
6.1	mebendazole tab. 100 mg	44	51	31
6.2	metronidazole tab. 250 mg	44	43	44
6.3.1	phenoxymeth. penicillin tab. 250 mg	38	35	44
6.1	piperazine tab./syr.	36	26	50
24	diazepam tab. 5 mg	28	22	37
6.3.1	phenoxymeth. penicillin syr. 125 mg/5 ml	28	17	44
6.4	diethylcarbamazine tab. 100 mg	26	30	19
6.7	(pyrimethamine tab. 25 mg)	26	9	50
	Extra hospital list			
2.2	pethidine inj. 100 mg/2 ml	64	96	19
6.3.1	benzyl penicillin cr. inj. 1 MU	54	70	31
6.3.2	chloramphenicol cap. 250 mg	51	52	50
5	diazepam inj. 10 mg/2 ml	46	52	37
6.3.4	streptomycin inj. 1000 mg	36	61	—
1.1	anaesthetic ether 500 ml	36	56	6
16	furosemide inj. 20 mg/2 ml	31	48	6
1.1	thiopentone sodium inj. 1000 mg	28	48	—
6.3.4	INH/thiacetazone tab. 300/150 mg	21	35	—
1.2	lidocain inj. 2% 50 ml	21	35	—

* Score for sulfa plus nitrofurantoin
** Score for niridazole

Anaesthetics

The choice fell on ether and thiopentone sodium, as ketamine was considered to be too expensive while quantities needed were very divergent.

Analgesics

Aspirin, by far the cheapest, was preferred to paracetamol (four times the price) and brand-named preparations (ten times). As injectable analgesic besides pethidine, novamin sulphone had to be included in spite of its side effects[196] as no reasonable alternative was available.

Anthelmintics

Piperazine for ascariasis and mebendazole for all other worms were chosen. Although not included in the inquiry and by that time hardly known, the committee preferred metrifonate above niridazole, it being easier to administer and cheaper.

Antibiotics

Benzyl penicillin was considered not practical for clinics, requiring six-hourly injections. Procain penicillin was chosen instead, together with phenoxymethylpenicillin tablets, tetracyclin capsules and a limited quantity of the more expensive ampicillin for selected cases. For children penicillin and chloramphenicol syrups were included. For hospitals chloramphenicol capsules, streptomycin and benzyl penicillin injections were added.

Chemotherapeuticals

It was assumed that sulfa was mainly used for urinary tract infections, therefore nitrofurantoin was preferred, being cheaper. Basic anti-tuberculosis drugs were included despite a rather low priority score; the reason was that the committee was afraid to let many on-going therapy schedules be interrupted by a shortage of these drugs.

Antimalarials

Nearly all cases of malaria in Ghana could still be treated by chloroquine tablets[197]. For cerebral malaria a limited quantity of chloroquine injections was included; the quantity recommended was purposely not big enough to give each patient a "strong injection". Cloroquine syrup, bitter, bulky and expensive, was left out. Pyrimethamine was included because it was widely used as a prophylactic agent.

Placebo

The need for a placebo is universal. Each patient claims a right to medicine and can not easily be sent away without it. To prevent the more expensive drugs being given out without sufficient indication, multivitamin or vitamin B-Complex tablets were considered indispensable as well and included in generous quantities.

Other drugs

In a meeting with all pharmacists of CHAG hospitals to discuss the results of the inquiry, certain extra suggestions were made; based on these, diazepam tablets and diethylcarbamazine tablets were included although their priority score was not very high.

Drugs left out

Some of the drugs with high priority scores were left out because they were of limited therapeutic value or because cheaper and/or safer alternatives were available. All drugs left out while priority scores were above 40% for either hospitals or clinics are listed in Table 11, together with reason for exclusion.

Table 11. Drugs with priority scores of over 40% in either hospitals or clinics in the 1980 inquiry, which were not included in the CHAG essential drugs list of 1981, in order of total priority score. Drugs that are not on the WHO list of essential drugs[6] between brackets.

WHO class.	*Drug*	*Priority score (%)*			*Reasons why excluded*
		Total	*Hosp.*	*Clin.*	
6.7	chloroquine phosphate syr.	56	39	81	1)
6.3.2	sulfa tab.	54	48	62	1)
2.1	paracetamol tab.	46	30	69	1)
17.2	promethazine inj.	38	52	19	2)
6.1	tiabendazole tab.	38	30	50	1) 2)
6.3.1	ampicillin syr.	36	22	56	1)
27	(multivitamin syr.)	36	9	75	1)
24	chlorpromazine inj.	31	22	44	2)
2.1	(paracetamol syr.)	31	9	62	1)
1.2	(lidocain 5% inj. heavy)	28	48	—	2)
1.1	(ketamine inj.)	28	48	—	1) 2)
18.1	hydrocortisone inj.	28	43	6	2)
6.3.2	(tetracycline syr.)	28	9	56	1) 2)
27	ascorbic acid tab.	28	9	56	1) 2)

1) Cheaper or safer alternative provided
2) Limited use

III.3 Quantification of drug needs

As funds were promised for a six-month stock of essential drugs for all CHAG institutions, it became necessary to quantify drug needs in order to be able to estimate costs and to place orders.

One problem was that the estimated needs of drugs as expressed by respondents to the inquiry proved to be very divergent and the accuracy of the information could by no means be assessed. In fact the figures were useless. However, in two CHAG hospitals, Agogo and Dormaa-Ahenkro, detailed records were available on patient attendance and drug use. As time was pressing, data from these two hospitals were used to estimate drug needs for all CHAG institutions. As this later proved to be an important policy decision, a short description of these two institutions should be given.

Agogo hospital is a 200-bed hospital in the Ashanti hills. It was founded in 1928, is

well-equiped and has around eight, in the majority expatriate, doctors of which four are specialists. It serves as a referral and training hospital. The author was a member of the staff and had in the previous year rationalized procurement and registration of essential drugs so that both a permanent supply and sound book-keeping were guaranteed. Dormaa-Ahenkro was, in 1980, a middle-size, 89-bed hospital with three expatriate doctors; the hospital was well administered and had a permanent stock of drugs.

Drug utilization data over the first half of 1980 in Agogo were linked with patient attendance over the same period and average drug use per number of out-patient consultations was calculated. These data were later combined with 1980 data from Dormaa hospital.

For several reasons it was decided to link drug use to the number of sick out-patient consultations only)*. The first reason was, that the sick out-patient department (sick OPD) was considered to be the department where most of the drugs are used, while the range of drugs in specialized departments such as CWC and ANC)* is limited, rendering their number useless for purposes of calculating general drug use. A second reason was, that it was assumed by the committee that the number of in-patient admissions, ante natal controls and child welfare clinic attendances would be a more or less constant fraction of the total OPD. The third reason was that the definition of "admission" was different in various CHAG hospitals, resulting in such a variation of figures in inquiry and annual reports, that data on number on admissions became useless for planning purposes)**. The last reason came into being because of a practical problem. Drug use in both hospitals was, at central drug store level where it was recorded, not differentiated for in and out-patient use as drugs were issued to the pharmacy only, from where they were given out to wards or individual patients. Registration of drug use at pharmacy or ward level was too incomplete to expect reliable results.

Results of the 1980 estimates of necessary quantities are presented in Table 14 which will be discussed in section III.4.

III.4 Allocation and distribution

The committee decided to distribute the six-month stock of essential drugs to all CHAG institutions by using prepacked standard kits. The idea was that a certain amount of each of the 24 essential drugs be packed together as one "standard unit", intended for both hospitals and clinics; and that another calculated amount of the ten extra hospital drugs be packed as an "extra hospital unit" for hospitals only. This would differentiate between the drug needs of hospitals and clinics, leaving only the size of the institutions to be taken into account. For this purpose all institutions were

)* The total number of Out-Patient Department consultations (total OPD) consists of sick OPD plus Child Welfare Clinic (CWC) and Ante Natal Controls (ANC). Visits for dressings or injections alone are not counted as consultations.

)** It was hardly ever recorded in hospital statistics whether patients admitted for a few hours in the emergency room were counted as admissions or not; the same applied for short-time maternity admissions and hospital-born babies.

divided into four categories of size. These categories were based upon three parameters: number of beds, annual number of deliveries, and annual number of sick out-patient consultations (sick OPD). The number of beds was chosen because this was a constant and therefore a reasonably reliable figure, usually well-documented. This figure, however, was not very revealing as to the amount of activity within the institution: some six-bed clinics treated more patients than some very large hospitals. For that reason, two parameters indicating activity had to be included: the number of deliveries, because that was usually well-documented, and the number of sick OPD because of the reasons stated in the previous section which can be summarized by the statement that the committee was of the opinion that the number of sick OPD consultations was the most accurate single figure related to drug use.)*

The parameters *not* used were: number of admissions (see previous section), number of ante natal controls (of little influence on drug use) and number of major operations (because of the uncertain definition of "major" and of the unclear relation to drug needs, while strongly related to skill and motivation of available manpower and therefore liable to fluctuation with time). Definition of the four categories of size based on the three parameters is presented in Table 12.

Table 12. Categories of size for CHAG institutions.

Cat.	*Beds*	*OPD per year*	*Deliveries per year*
A	over 150	over 100.000	over 1250
B	100-150	50-100.000	750-1250
C	50-100	20-50.000	250-750
D	0-50	0-20.000	0-250

The limits between the four categories for each of the three parameters were chosen by first taking the median value and then the median of the two resulting sub-groups. By this method four more or less equal groups were formed. These limits have not been changed since, although in the course of time some individual institutions changed category, based on new statistical data. In case of conflicting data (e.g. a clinic with few beds but many out-patients) the number of out-patients was the most influential parameter in defining the final category.

The ratio of estimated general drug use between the four categories was calculated as A : B : C : D = 10 : 6 : 3 : 1. This ratio was a working compromise between the ratios of the three different parameters)**.

The 1981 categorisation of the, by then, 54 CHAG institutions is given in Table 13,

)* It should be noted that in the 1980 inquiry sick OPD attendance had not been separated from CWC figures; this was specifically corrected later.

)** In some cases this ratio was, for practical purposes, changed into 9 : 6 : 3 : 1. As there were no category D hospitals this simplified the ratio between hospitals to 3 : 2 : 1 which is very useful for distribution purposes.

Table 13. Categorisation of 54 CHAG institutions (1981).
Total number of distribution units between brackets.

	Cat. A. (10 units)	*Cat. B. (6 units)*	*Cat. C. (3 units)*	*Cat. D. (1 unit)*	*Total units*
Hospitals	8 (80)	15 (90)	7 (21)	—	(191)
Clinics	—	1 (6)	8 (24)	15 (15)	(45)
Total	8 (80)	16 (96)	15 (45)	15 (15)	(236)

Table 14. CHAG distribution unit, per six months (1981).

WHO class.	*Drug*	*Distribution unit for six months*
	Standard kit	
2.1	aspirin tab. 300 mg	40.000
	novamin sulphone inj.	500
5	phenobarbital tab. 100 mg	3.000
6.1	piperazine syr. 750 mg/5 ml, litre	10
6.1	mebendazole tab. 100 mg	1.000
6.2	metronidazole tab. 250 mg	1.000
6.3.1	ampicillin cap. 250 mg	2.000
	phenoxymeth. penicillin tab. 250 mg	2.000
	phenoxymeth. penicillin syr. 60 ml bottle	100
	procain penicillin inj. 4 MU	400
6.3.2	chloramphenicol syr. 125 mg/5 ml, litre	10
	tetracycline cap. 250 mg	3.000
	nitrofurantoin tab. 100 mg	5.000
6.4	diethylcarbamazine tab. 100 mg	10.000
6.7	chloroquine phosphate tab. 150 mg base	15.000
	chloroquine phosphate inj. 200 mg/5 ml	300
	pyrimethamine tab. 25 mg	10.000
6.8	metrifonate tab. 100 mg	1.000
10.1	ferrous sulphate tab. 200 mg	20.000
	folic acid tab. 5 mg	10.000
17.2	promethazine tab. 25 mg	1.000
22	ergometrine inj. 0.5 mg/ml	200
24	diazepam tab. 5 mg	4.000
27	multivitamin or vit.B-Co tab.	50.000
	Extra hospital kit	
1.1	anaesthetic ether, 500 ml	20
	thiopentone sodium inj. 1000 mg	100
1.2	lidocain inj. 2%, 50 ml	25
2.2	pethidine inj. 100 mg/2 ml	200
5	diazepam inj. 10 mg/2 ml	200
6.3.1	benzyl penicillin inj. 1 MU	500
6.3.2	chloramphenicol cap. 250 mg	4.000
6.3.4	streptomycin inj. 1000 mg	800
	INH/thiacetazone tab. 300/150 mg	6.000
16	furosemide inj. 20 mg/2 ml	100

with the final allocation of distribution units. The schedule was as follows: a standard kit of 24 essential drugs was prepared in such a way that it could serve as a distribution unit. A category A institution would receive ten units, a category B six, C would receive three and D one.

In total 236 standard units and 191 extra hospital units were necessary. The quantities of drugs used for these standard kits to cover six-month's use in each of the institutions are presented in Table 14. A certain reserve had been incorporated. These are the final quantities that were used for planning all subsequent drug donations up till 1983.

III.5 CHAG essential drugs programmes 1981-1983

Because of various misunderstandings and political problems it was not until the end of 1982 that the West German donating agency MISEREOR gave the final approval for the six-month's supply of essential drugs. Drugs were ordered according to existing plans and supplied and prepacked by the International Dispensary Association (IDA) in Amsterdam, The Netherlands. Including a certain reserve, 250 standard units and 200 extra units were sent, for a total value of DFl 770.000 (US $ 260.000) including packing, transport and insurance. The standard unit was packed in four cartons (116 kg), the extra unit in two (52 kg) (see figure 5). The total of 39.400 kg was shipped in four containers which arrived two by two in April and June 1983. The cartons were stored in the CHAG warehouse in Accra, from where member institutions had been requested to collect their share. Within three weeks nearly three quarters of the total had been collected.

Figure 5. The first part of one standard distribution unit in the MISEREOR drug relief plan (April 1983).

Other donor agencies had, in the meantime, also shown interest in the plans and, by november 1982, Christoffel Blind Mission from West-Germany (CBM) had approved DFl 550.000 (US $ 185.000) for a similar operation. The committee then made a clear policy decision: that a six-months stock of drugs was the minimum that was worth the effort of prepacking and distribution, and preferred to spend the available funds on a six-month's supply of less than 34 drugs rather than on an estimated four-month's supply of the full 34. For that reason 19 basic drugs were selected from the CHAG list to which CBM, being especially committed to ophthalmological care, requested that atropine- and tetracycline eye-ointment be added. The committee of course agreed to this request to its own advantage as would become evident later. One type of kit with these basic drugs was ordered for hospitals and clinics the like. In May 1983 the 250 units, packed again by IDA and each consisting of three cartons, arrived and were distributed through the CHAG warehouse in Accra and through the Diocesan Hospital Pharmacy in Kumasi, serving as distribution depot for Ashanti, Brong-Ahafo, Northern and Upper Regions. By that time the committee and IDA had gained considerable experience in packing and handling procedures. Instead of containers being opened in the CHAG warehouse in Accra and part of the contents sent separately to the second distribution depot in Kumasi, separate containers for Kumasi alone were prepared by IDA and sent to Kumasi straight from the harbor.

Special attention should be given here to an elegant and generous operation by the Government of the Netherlands in March 1983, when a half a million to a million Ghanaians were expelled from Nigeria and flooded all health institutions in Ghana. Based on available drug need estimates it was possible, within a matter of hours, to draw up a DFl 260.000 (US $ 87.000) plan which would supply all CHAG institutions with a six-months stock of aspirin, chloroquine, tetracycline and procain penicillin injections. The plan was immediately approved by the Directorate-General for Development Cooperation of the Ministry of Foreign Affairs in The Hague and the drugs supplied by IDA were quickly flown in. Only a few weeks after the big migration most of the institutions had collected their share.

In the summer of 1983 a big consignment of drugs and other medical materials, worth DFl 1.045.000 (US $ 345.000), was again distributed in the same way. Apart from drugs, pharmaceutical materials were distributed to all CHAG institutions with a formulating pharmacy, to enable these to prepare a number of essential pharmaceutical preparations themselves. As well as this, a six-month's supply of dressing materials, X-ray films and -chemicals and plaster of paris was allocated and distributed.

Of course not all materials could be prepacked. However, the allocation system could also be used by dividing a bulk quantity into 250 identical portions, and then calling such a portion a "unit". This way a large number of items could be allocated at a same time, as the unit size for each item could be calculated. When these unit quantities were put on a list, institutions could receive or collect a ten, six, three or one-fold issue of these quantities, whether prepacked or not.

A summary of CHAG Drug Committee activities is given in Table 15.

Some remarks should be made on the system of "distribution by collection". Ghana is administratively very much centralized. In practice this means that nearly all CHAG institutions have, at regular intervals, to send staff-members to Accra for reasons of administrative procedures, purchases or meetings. It was therefore not a big strain to request members to collect their share from Accra where CHAG warehouse, head-

Table 15. CHAG Drug Committee activities 1980-83.

	CHAG Drug Committee Activities	*Essential drugs list in use*	*Drug donations planned*	*Arrived*
1980	Inquiry hospital statistics; Inquiry essential drugs.		8 drugs ($ 85.000) Netherlands Churches	Apr 82
1981	Quantification of drug needs, based on data from Agogo and Dormaa; Categorization of institutions.	24 standard drugs 10 extra drugs for hospitals	34 drugs ($ 260.000) Misereor	Apr 83
1982	Inquiry pharmaceutical preparations; Inquiry laboratory-techniques/data; Second inquiry essential drugs.		21 drugs ($ 185.000) CBM; 34 drugs & med.mat. ($ 345.000) Netherl.govt.	May 83 Jul 83
1983	Drug Utilization Study	34 standard drugs 17 extra drugs for hospitals	4 drugs ($ 87.000) Netherl.govt.	Mar 83

quarters and resthouse are situated in one compound. From the moment the distribution depot in Kumasi could be used it was logical to have institutions from the Ashanti, Brongh-Ahafo, Northern and Upper Regions collect their share from there, as these regions are only to be reached from Accra by means of a road around the Volta lake, through Kumasi (see Figure 2). The remaining Western, Central, Eastern and Volta Regions are administratively and transport-wise completely orientated towards Accra. It was only when serious fuel shortages occurred that collection was temporarily hampered. In several cases institutions pooled transport.

III.6 Revision of the CHAG list of essential drugs

Following further discussions on the essential drugs programme the need arose to revise the CHAG list of essential drugs. Some items were considered to be superfluous and others missing. In 1982 the committee decided to conduct a second inquiry. This time the open method was chosen: all members received a form on which the CHAG 1981 list of 34 drugs was presented and were requested to comment on the chosen items and to suggest drugs they felt were missing. Of the by then 60 member institutions, 38 (63%) returned the form.

In total 252 suggestions had been made, for 82 new drug dosage forms. All suggestions were marked and counted and drugs mentioned three times or more were considered for inclusion on the new list. Suggestions were compared with other data: the results of the 1980 inquiry ("priority-score", see Table 9); the results of a preliminary survey of twelve essential drugs lists from other countries, by then in Ghana available

to the committee, and the 1979 WHO list of essential drugs. As a result, 20 drug dosage forms were added to the CHAG list, two that had been limited to the extra list for hospitals only were moved to the standard list, and three were removed.

The 22 new drugs are listed in Table 16. In most cases all parameters indicated that inclusion was justified. Only two drugs were included that were *not* on the WHO list of essential drugs: ketamine and lidocaine 5% for spinal anaesthesia, having been suggested by many respondents. Two drugs were strongly suggested by respondents, but were not included in many other lists: chloramphenicol injection and ampicillin syrup. Some drugs were included because they were frequently found on other lists (ergome-

Table 16. Drugs included in the 1983 revision of the CHAG list with reasons for inclusion. Drugs not on WHO list[6] between brachets.

WHO class.	*Drug*	*Suggested in 1982 inquiry*	*1980 hosp/clin. prior. score*	*High in lit.*[a]	*On 1979 WHO list*	*For hosp/ clin.*[b]
1.1	(ketamine inj.)	7 x	48 / 0			H
1.2	(lidocaïne 5% heavy inj.)	4 x	48 / 0		■	H
2.1	paracetamol tab.	6 x	46 / 30	■	■	HC
4	atropine inj.	3 x	39 / 0	■	■	H
6.3.1	ampicillin syr.	7 x	22 / 56		■	HC
	benzath.benz.penic.inj.	3 x		■	■	HC
6.3.2	chloramphenicol inj.	8 x	30 / 0		■	H
	sulfadimidine tab.	8 x	48 / 62[c]	■	■	HC
12.4	digoxine tab.	6 x	13 / 0	■	■	H
16	hydrochl.thiazide tab.	5 x			■	HC
17.1	aluminium hydroxyde tab.	7 x	22 / 19	■	■	HC
18.1	prednisolone tab.	8 x	26 / 0	■	■	H
22	ergometrine tab.		30 / 31	■	■	HC
	oxytocine inj.	7 x	9 / 19	■	■	H
24	chlorpromazine inj.	6 x	22 / 44	■	■	H
25.1	aminophylline tab.	6 x	9 / 25	■	■	HC
	inj.	3 x	22 / 6	■	■	H
26.1	oral rehydr. salts			■	■	HC
27	retinol (vit.A)	3 x	4 / 19	■	■	HC
To be included in standard list:[d]						
1.2	lidocain 2% inj.	5 x	35 / 0	■	■	HC
5	diazepam inj.	7 x	52 / 37	■	■	HC

a By that time around twelve essential drugs lists were known to the committee
b H: for hospitals only; HC: for hospitals and clinics
c Score for "sulfa tablets"
d These drugs were already on the list, but for hospitals only

trine tablets and retinol). In some cases the 1982 result expressed the need of a drug while the 1980 priority score was low (reserpine, digoxin, prednisolone, aminophylline). The committee thought the inclusion of these drugs justified to complete the therapeutic range for hospitals.

The three drugs removed from the list were phenobarbital tablets and chloramphenicol- and penicillin syrup. The first was considered superfluous as diazepam was on the list; and the two syrups were replaced by ampicillin syrup. Drugs that were not included in the new list despite the fact that they were suggested three times or more, are listed in Table 17, with reasons stated.

The new CHAG list of essential drugs was published in August 1983[59] and is presented in Appendix 3. It consists of 34 drugs for hospitals and clinics (standard) and 17 extra for hospitals only (extra). The list has been limited to tablets and injections, apart from oral rehydration sachets, excluding vaccines, mixtures, topical preparations and infusions. The reasons have been stated before (section III.2.1). For these items a separate list was used. In 1981 a list of 15 essential pharmaceutical preparations was drafted by the committee. In the large scale relief programma of the Government of the Netherlands in 1982 funds were allocated to import 31 pharmaceutical raw materials necessary for these preparations, which were to be distributed to all

Table 17. Drugs suggestes three times or more in the 1982 inquiry that were not taken for the 1983 CHAG essential drugs list, with reasons for exclusion. Drugs not on the 1983 WHO list[6] between brachets.

WHO class.	*Drug*	*Suggested on 1982 inquiry*	*Low in 1980 inquiry*	*Low in lit.**	*Not on 1979 WHO list*	*Other*
2.1	(phenylbutazone tabs.)	3 x	■	■	■	1)
6.1	tiabendazole tabs.	3 x				1)
6.3.1	ampicillin inj.	6 x	■	■		1)
6.3.2	cloxaxillin cap.	3 x		■		1)
	co-trimoxazole tab.	3 x	■	■		1)
	(sulfathalazole tab.)	3 x		■	■	
6.5	griseofulvin cap.	3 x	■	■		
	nystatin tab.	3 x	■	■		
10.2	phytomenadion inj.	3 x	■			2)
12.3	methyldopa tab.	5 x	■	■		1)
	propranolol tab.	5 x		■		
16	furosemide tab.	4 x	■	■		3)
18.1	hydrocortisone inj.	6 x				2)
18.4	oral antidiabetic tab.	3 x		■		
19.1	antivenom serum	3 x		■		

1) (Cheaper) alternative provided.
2) Limited therapeutic calue.
3) Hydrochlorthiazide tablets were preferred because of their antihypertensive effect, being cheaper as well.
* By then around twelve lists were known to the committee.

CHAG formulating pharmacies. In 1983 the committee extended this list to 21 items, based on data of a separate inquiry. Some items that are usually found on essential drugs lists are included in this list instead of in the CHAG essential drugs list. Examples are iodine tincture, gentian violet, and benzyl benzoate. The list of essential formulations is included in Appendix 4, although discussion of the distribution of pharmaceutical raw materials to CHAG institutions falls outside the scope of this study. Oral rehydration salts and aluminium hydroxyde tablets have in a later stage been moved to the 1983 CHAG list of essential drugs, because these are not bulky and do not need preparation. In fact the need for preparation is the distinguishing factor between the list of essential drugs and the list of essential pharmaceutical preparations. It should be realized that the CHAG lists have been made for practical purposes and that they are closely related to the means and possibilities of supply. Infusions have not been included because a large and well-organized infusions manufacturing plant is operating in Ghana (which has separately been supported by the 1982 Netherlands Government relief plan). Moreover, the possibilities to produce infusions in hospital pharmacies were too divergent to justify standardised distribution of raw materials.

Chapter Four

DRUG UTILIZATION STUDY

IV.1 Introduction

In 1980 the CHAG Drug Committee realized the narrow basis of the drug consumption figures on which all subsequent drug programmes were to be based but had to accept it as neither opportunity nor time were available to extend it. However, the need for evaluating the accuracy of these estimates was felt and it was later decided to perform a country-wide survey to measure actual drug use in as many CHAG institutions as possible. This survey was performed between January and April 1983, before the actual relief operations took effect. The combination of the original 1981 estimates based upon material from two hospitals and the 1983 country-wide survey on actual drug use can be considered as a prospective study in which a working hypothesis (the 1981 estimates) is applied (the 1981-82 relief plans) and results evaluated (the 1983 survey). It should be stressed that actual drug use was measured during a period *after* the original estimates had been used for ordering the drugs, but *before* the big drug donations arrived in the country. This had been done because drug use could be influenced by choice and quantity of the donated drugs.

IV.2 Materials and Methods

IV.2.1 Selection

In 1983 the CHAG had 66 member institutions, which are listed in Appendix 2. Of these, 29 were hospitals, 30 were clinics and 5 were Rural Health Programmes)*. Clinics and Rural Health Programmes are hereafter taken together as "Clinics". Given the limitations in time and availibility of petrol 34 institutions could be visited by the author and screened if it were possible to use them for administrative research. Screening criteria were: a reliable state of records on patient attendance over the previous years and a reasonably well kept system of stock-keeping in the central drug store. Of 34 institutions screened 17 could be admitted to the drug utilization study, of which 15 were hospitals and 2 clinics.

In table 18 this selected group is compared with the total of 64 CHAG institutions according to certain criteria. The difference between a hospital and a clinic has been

)* The two remaining institutions were a babies' home and an orthopaedic centre which are left out of consideration.

mentioned before)*. The limit between small and large institutions is set at 50.000 Sick OPD consultations per year)** over the period studied. Data on presence of expatriate (western) staff (for clinics: nurse in charge, for hospitals: doctor) were obtained from the CHAG personnel officer)***. Relation to church (catholic or other) was recorded from the CHAG secretariat.

Tabel 18. Selected group of 17 institutions compared with total group of 64 CHAG institutions with p values indicating the probability that the distribution could be attributed to chance.

	Total group	*Selected*	*(%)*	*p*
Clinics / RHP[a]	35	2	6%	0.0001
Hospitals	29	15	52%	
Small[b]	46	9	20%	0.09
Large[c]	18	8	44%	
Ghanaian	20	6	30%	0.91
Expatriate	44	11	25%	
Catholic	40	13	32%	0.27
Other	24	4	18%	

a Rural Health programme
b Less than 50.000 sick OPD consultations per year
c More than 50.000 sick OPD consultations per year

As can be seen in the table, for all criteria except one p is more than 0.05 which indicates that the sample may be treated as a random sample with respect to these criteria. For one criterium however p is very small. This indicates that in our sample clinics are under-represented; this is hardly surprising in view of the data.

Selection of clinics is shown in table 19. Apart from the 15 clinics visited extensive information was obtained on seven more, which information made the presence of a good administration too unlikely even to merit a screening visit. In total only two out of 22 clinics therefore had an administration reliable enough to be included in the drug utilization study. The conclusion is therefore that clinics are, by force, under-represented in this study.

)* See note page 43
)** See note page 51
)*** When a hospital had both Ghanaian and western staff the choice was made by determining whose influence was likely to be the strongest on pattern of prescription in the out-patient department.

Table 19. Selection of clinics.

	CHAG clinics	*Clinics visited*	*Clinics selected*
Ghanaian	13	5	0
Expatriate	22	10	2
Total	35	15	2

The selection of hospitals according to the two most important criteria has been summarized in table 20. The group of hospitals can be considered as a random sample of the total ($\chi^2 = 0.811, p > 0.3$). In the selection 12 in 15 hospitals are Catholic (80%) while in the total group this is 23 in 29 (79%).

Table 20. Selection of hospitals.

	29 CHAG hospitals			*19 hosp. visited*			*15 hosp. selected*		
	*small**	*large***	*total*	*small**	*large***	*total*	*small**	*large***	*total*
Ghanaian	5	5	10	4	4	8	3	3	6
Expatriate	11	8	19	5	6	11	4	5	9
Total	16	13	29	9	10	19	7	8	15

* Less than 50.000 sick OPD consultations per year
** More than 50.000 sick OPD consultations per year

The conclusion is that the group of 15 hospitals is representative for the total of 29 CHAG hospitals for the mentioned criteria; it is in particular not so that hospitals selected on the presence of a reliable administration are only found in the group of large and/or expatriate doctor hospitals.

IV.2.2 Institutions and periods studied

Characteristics of and some statistical data for the selected institutions, according to data supplied by the institutions themselves, are presented in table 21. The total number of sick OPD consultations in the period studied was 1.593.768; the total number of OPD consultations was 2.499.613. Some of the hospitals and clinics had outstations in which patients were treated by staff with supplies from the institutions; these numbers have been added to their respective statistics.

In principle, drug use in each institution was measured over the administrative years 1981 and 1982. In two cases the period was extended to early 1983 because administrative registration of drug use had only started in the course of 1982. In all cases the

Table 21. Relevant statistical data for and characteristics of 17 CHAG institutions selected for the Drug Utilization Study.

Name	*Study Period*	*Mths*	*Sick OPD**	*CWC**	*ANC**	*Characteristics* 1	2	3	4	5
Kpandu	81-82	24	93.400	30.000**	4.940	H	S	G	C	B
Adidome	81-82	24	52.125	18.103	10.092	H	S	G	P	C
Akwatia	8.82-4.83	9	94.810	8.487	15.862	H	L	G	C	A
Nkawkaw	9.81-82	16	208.067	40.463	36.638	H	L	E	C	A
Koforidua	81-82	24	157.893	50.484	—	H	L	G	C	B
Asikuma	82	12	51.580	20.575	19.377	H	L	E	C	B
Agogo	81-82	24	219.367	81.592	21.327	H	L	E	P	A
Maase-Ofinso	9.82-4.83	8	24.883	3.726	3.984	H	S	G	C	B
Agroyesum	81-82	24	49.493	86.634	20.669	H	S	E	C	C
Pramso	10.81-3.82	6	21.001	7.501	3.953	H	S	E	C	C
Berekum	81-82	24	199.127	53.513	34.214	H	L	E	C	A
Dormaa-Ahenkro	81-82	24	117.309	28.000	26.203	H	L	E	P	B
Duayaw-Nkwanta	81-82	24	63.032	28.683	14.474	H	S	E	C	B
Hwidiem	81-82	24	80.204	62.983	24.924	H	S	E	C	B
Techiman	81-82	24	107.812	47.973	29.483	H	L	G	C	B
Nsawam	81-82	24	43.938	9.831	11.363	C	S	E	C	C
Bolgatanga	81-82	24	9.728	43.093	6.701	C	S	E	P	D

1 H = hospital
C = clinic
2 S = small (less than 50.000 sick OPD consultations per year)
L = large (more than 50.000 sick OPD consultations per year)
3 G = Ghanaian doctor or nurse
E = expatriate doctor or nurse
4 C = Catholic
P = Presbyterian
5 CHAG Category of size (see table 12)
* see note page 51
** estimate

study period ended before drug donations arrived. In three cases stock administration had only started after the beginning of 1981; in one case a certain period of time only could be measured. In all, drug use was measured over 333 institution months with an average of 19.6 months per institution.

IV.2.3 Measurement of drug use

In fifteen institutions stock was administered by means of tally cards on which in and out going quantities and stock level were recorded. In nearly all cases drug move-

ments were limited to receiving supplies from outside by purchase or donation and issuing them to the pharmacy. This is the reason that no differentiation could be made for in and out-patient use as these flows usually separate in the pharmacy only. For our study the tally cards were a very useful method of administration as also stock level was recorded which clearly indicated periods during which the drug had been out of stock.

Outgoing quantities were measured. This is the total drug use being the sum of the amount of drugs received by the patient (called "drug consumption") and that of losses by wastage, pilfering and the like.

In case the drug having been out of stock for a certain time, usually a number of months, it was recorded. When in a later stage drug use was paired with patient attendance this could be corrected. For example: paracetamol had been out of stock in Agogo Hospital during two months in 1981 and 1982. The total drug use of 207.000 paracetamol in these 22 months can be paired with 22/24 of 322.286 total OPD consultations over 1981-82. This method was used whenever the period of the drug being out of stock was not longer than one third of the study period. In the case of longer interruptions and in certain therapeutic groups it had to be assumed that alternatives had been used. For that reason all possible alternatives were measured as well. In the previous example it could safely be assumed that whenever paracetamol had been out of stock, aspirin or another analgesic had been used in stead. It would not be easy to measure this extra consumption separately. For this purpose separate recordings were made of "aspirin plus paracetamol" and "all oral analgesics". In these measurements this alternative use has been included. These extra calculations have been performed for all therapeutic groups were alternative use could be assumed during periods of shortages. As drugs with sometimes different dosage per day have to be added to each other, drug use in these cases has been expressed in Defined Daily Dose (DDD)[109,114] when necessary. The use of anthelmintics has been expressed in Defined Curative Dose (DCD) which is a necessary modification of the former as the length of the treatment can be different. Whenever two dosages for the same drug had been used, e.g. 125 mg and 250 mg penicillin tablets, the total quantity was calculated expressed in the most common dosage.

In two cases, Koforidua hospital and Nsawam clinic, no tally cards were available to measure the flow of drugs. These institutions could be admitted to the study because a complete administrative record of all drugs purchased and received in 1981-82 was present. The two assumptions necessary to be made were that stock level at the beginning of 1981 was roughly the same as by the end of 1982 and that no serious shortages had occurred in the mean time. Both assumptions seemed valid.

In thirteen institutions data were collected from the stock administration by the author himself who by doing so could get an impression of the accuracy. In four cases in which accuracy of administration and staff had been assessed at previous visits data were accepted that had been compiled by the officer in charge.

All data were coded and entered into the NAS computer of the Catholic University of Nijmegen, Netherlands. Most of the analyses have been performed by especially designed computer programmes, some others by available standard programmes. Drug use data were related to number of total OPD consultations over the periods studied.

To express the average drug use per 10.000 total OPD consultations over all 17 institutions the "weighted mean" of the individual results per drug was taken. This

Table 22. Average drug use in 17 CHAG institutions over 1981-82, expressed per 10.000 total OPD consultations, and differentiated for Ghanaian doctor and expatriate doctor hospitals. Number of institutions the data are based upon in brackets. Drugs not on the WHO list of essential drugs[6] in brackets.

1983 WHO class.	*Drug*	*Drug use per 10.000 total OPD*	*Total OPD consultations (x 1000) and number of institutions the data are based upon*	*Ghanaian doctor hospitals*	*Expatriate doctor hospitals*
1.1	anaesthetic ether 500 ml	8	1454 (9)	10	8
	thiopentone sodium inj. 5 g	33	1114 (6)	15	41
	(ketamine inj. 200 mg/20 ml)	5	894 (4)	0	5
1.2	lidocain inj. 1-2%, 50 ml	19	1181 (10)	34	14
	lidocain inj. 5% heavy, 2 ml	28	785 (6)	36	25
2.1	acetylsalicylic acid, tab. 300 mg	27.000	2301 (16)	32.000	25.000
	paracetamol, tab. 500 mg	20.000	2040 (14)	29.000	16.000
	paracetamol, syr., liter	13	354 (5)	14	12
	(ac.sal. plus paracet.tab.)	44.000	2141 (14)	58.000	38.000
	(phenylbutazone, tab. 200 mg)	4.500	570 (5)	8.000	1.400
	indomethacin, tab. 25 mg	3.500	493 (8)	6.400	2.600
	(other analgesic tab.)	5.600	994 (8)	9.100	4.500
	(all analgesic tab.)	49.000	2141 (14)	66.000	41.000
	injectable analgesic. non-opioid	210	1419 (8)	150	210
2.2	injectable analgesic, opioid	95	935 (9)	140	79
4.2	atropine inj. 1 mg/ml	110	840 (4)	72	110
5	diazepam, inj. 10 mg/2 ml	110	1613 (10)	130	110
	phenobarbital, tab. 50-60 mg	2.800	1794 (13)	1.900[c]	3.300
6.1	mebendazole, tab. 100 mg	1.200	760 (7)	9.300	840
	piperazine, tab. 500 mg	1.500	1375 (11)	1.900	1.300
	piperazine, syr., liter	13	1379 (13)	21	10
	tiabendazole, tab. 500 mg	510	1238 (9)	1.100	440
	(levamisole, tab. 40 mg)	730	625 (5)	1.600	480
	(bephenium, tab. 500 mg	870	345 (2)	0	770
	(all anthelmintics, DCD[a]	610	2380 (16)	920	510
6.2	metronidazole, tab. 250 mg	2.500	1958 (14)	2.500	2.600
6.3.1	ampicillin, cap. 250 mg	6.300	2280 (17)	9.100	5.400
	ampicillin, inj. 500 mg	180	1504 (12)	380	110
	ampicillin, syr. 125 mg/5 ml, 60 ml	82	1470 (13)	120	81
	benzathinebenzylpenicillin inj.	44	568 (5)	22	40
	benzylpenicillin, inj. 1 MU	1.100	2379 (17)	660	1.400
	phenoxymethylpenicillin tab. 250 mg	4.000	1825 (16)	4.600	4.000
	phen.meth.penicillin syr., 60 ml	8	140 (2)	0	8
	procain penicillin, inj. 4 MU	390	2303 (16)	510	330
	(benz.pen plus proc.pen inj., DDD)[b]	440	2269 (14)	310	510

1983 WHO class.	*Drug*	*Drug use per 10 000 total OPD*	*Total OPD consultations (x 1000) and number of institutions the data are based upon*	*Ghanaian doctor hospitals*	*Expatriate doctor hospitals*
6.3 2	chloramphenicol, cap. 250 mg	3.800	2158 (16)	5.000	3 400
	chloramphenicol, inj. 1 g	210	1705 (12)	350	150
	chloramphenicol, syr. 100 ml	65	1228 (11)	54	72
	(sulfa, tab. 500 mg)	5.700	1799 (14)	6.700	5.400
	(sulfathalazole, tab. 500 mg)	2.500	1159 (10)	6.400	1 100
	(sulfameth.pyridazine, tab 500 mg)	430	185 (2)	0	430
	co-trimoxazole, tab. 400/80 mg	1 700	1379 (11)	1.900	1.700
	co-trimoxazole, syr. 100 ml	19	221 (3)	19	0
	tetracycline, cap. 250 mg	6.700	2239 (16)	12.000	4.900
	(tetracycline, inj. 250 mg)	24	601 (5)	110	18
	(tetracycline, syr. 60 ml)	49	624 (7)	88	9
	nitrofurantoin, tab. 100 mg	3.000	1701 (12)	2.400	3.100
	(tetra + ampi + cotrim, tab , DDD)	1.800	2289 (16)	2.500	1.500
	tetra + ampi + cotrim, syr., btl)	97	1563 (13)	140	88
	(ampi + chloramph , inj., DDD)	110	2269 (14)	170	81
6.3.4	ethambutol, tab. 400 mg	1.300	401 (2)	0	1 300
	isoniazid, tab. 100 mg	4.200	651 (4)	1.500	6 100
	rifampicin, cap. 150 mg	360	401 (2)	0	360
	streptomycin, inj 1000 mg	710	2170 (15)	770	700
	INH/Thiacetazone, tab. 300/150 mg	4.100	1636 (12)	6.300	3 400
6.4	diethylcarbamazine, tab. 50 mg	9.300	2036 (13)	8.700	9.500
6.5	griseofulvin, tab. 125 mg	920	1312 (11)	1.000	890
6.7	chloroquine, tab. 150 mg base	22.000	2253 (16)	34 000	18.000
	chloroquine, inj. 200 mg/5 ml	640	2097 (15)	1.100	460
	chloroquine, syr., liter	15	1595 (12)	27	8
	(pyrimethamin, tab. 25 mg)	6 100	1593 (11)	2.400	6.600
6.8	metrifonate, tab. 100 mg	920	669 (5)	0	920
	(nimidazole, tab 500 mg)	480	1381 (8)	220	510
10.1	ferrous salt, tab. 200 mg	25.000	2201 (16)	26.000	26.000
	folic acid, tab. 5 mg	12.000	1945 (15)	18.000	11 000
	iron dextran, inj. 100 mg/2 ml	130	1313 (10)	120	140
10.2	phytomenadione, inj. 10 mg/ml	54	814 (4)	0	54
12.3	methyldopa, tab. 250 mg	1.500	1502 (12)	2.400	1.000
	reserpine, tab. 0.25 mg	1.900	1097 (9)	1.200	2 200
	(other antihypertens. tab.)	920	251 (3)	930	900
	(all antihypertensiva, DDD)	800	1897 (12)	810	780
12.4	digoxin, tab. 0.25 mg	900	1617 (10)	2.000	640
	digoxin, inj. 0.25 mg/2 ml	39	861 (6)	20	42
12.5	epinephrine, inj. 1 mg/ml	52	1634 (8)	32	55
16	furosemide, tab. 40 mg	1.300	2034 (13)	2.300	960
	furosemide, inj. 20 mg/2 ml	72	1550 (10)	120	62

1983 WHO class.	*Drug*	*Drug use per 10.000 total OPD*	*Total OPD consultations (x 1000) and number of institutions the data are based upon*	*Ghanaian doctor hospitals*	*Expatriate doctor hospitals*
	hydrochlorothiazide, tab. 25 mg	2.200	414 (2)	0	2.200[c]
	(all diuretics, DDD)	1.600	2182 (13)	1.900	1.600
17.1	aluminium hydroxydc, tab. 500 mg	2.400	831 (8)	4.200	1.900
17.2	promethazine, tab. 25 mg	4.700	1745 (14)	11.000	2.600
	promethazine, inj. 50 mg/2 ml	67	261 (2)	64	75
	(all antihistaminics, tab.)	5.200	2055 (15)	11.000	3.500
17.4	atropine, tab. 1 mg	2.000	59 (2)	3.400[c]	920
	(butylscopalamine, inj. 20 mg/ml)	120	550 (2)	150	110
17.5	(laxative tab.)	1.500	979 (8)	1.300	1.600
18	hydrocortisone, inj. 100 mg	44	858 (6)	68	37
	prednisolone, tab. 5 mg	4.200	1407 (9)	2.800	4.700[c]
	(tolbutamide, tab. 500 mg)	1.500	1270 (8)	1.800	1.400
21.1	(antibiotic eye-ointment, 5 g)	69	526 (7)	100	49
21.6	acetazolamide, tab. 250 mg	1.600	451 (3)	1.100	1.700
22	ergometrine, tab. 0.5 mg	1.100	1574 (10)	540	1.200
	ergometrine, inj. 0.5 mg/ml	140	1805 (14)	160	140
	oxytocin, inj. 10 IU/ml	65	1020 (8)	100	49
24	chlorpromazine, tab. 25 mg	370	271 (2)	580	300
	chlorpromazine, inj. 50 mg/2 ml	49	779 (5)	59	46
	diazepam, tab. 5 mg	7.800	2182 (14)	15.000	5.000
	(all oral tranquillizers, tab.)	10.000	2182 (14)	16.000	8.100
25	aminophylline, tab. 200 mg	2.600	947 (8)	2.900	2.500
	aminophylline, inj. 250 mg/10 ml	32	1536 (9)	57	24
27	ascorbic acid, tab. 50 mg	8.800	1412 (12)	21.000	5.600
	retinol, cap. 50.000 U	690	667 (3)	0	670
	(multivitamin, tab.)	30.000	2352 (16)	35.000	29.000
	(multivitamin, syr., liter)	13	56 (2)	15	0
	(vit.B-Co, tab.)	22.000	1823 (15)	44.000	18.000
	(vit.B-Co, inj. 10 ml)	180	572 (2)	0	180
	(multivit + vit.B-Co tab.)	47.000	2274 (15)	55.000	45.000
	(all vitamin tab.)	52.000	2274 (15)	64.000	48.000

a DCD = Defined Curative Dose
b DDD = Defined Daily Dose
c Based upon one or two hospitals only

"weighted mean" was calculated by relating the total use in all 17 institutions to the total number of patients treated in the total number of periods in all institutions during which the drug had been available. As the result is calculated on the basis of total patient numbers, larger institutions contribute more to the result than smaller ones.

Drug use was separately calculated for hospitals and clinics and also for hospitals with Ghanaian (GD) and with expatriate (ED) doctors. In all, drug use was measured of 94 drug dosage forms and 14 therapeutic groups.

IV.3 Results

Mean use of 94 drugs and 14 therapeutic groups in 17 CHAG institutions over 1981-82 is presented in table 22, expressed per 10.000 total OPD consultations. In view of the standard error of the mean the results are printed in two significant digits only. Drugs are listed according to the classification of the 1983 WHO list of essential drugs[6]. The number of total OPD consultations and the number of institutions the results are based on, is given for each item. In the right half of the table mean drug use in Ghanaian doctor (GD) and expatriate doctor (ED) hospitals is given.

It is not easy to interpret this table at first sight, yet possible differences in drug use between GD and ED hospitals can be analyzed by simply counting the number of times the mean use of a certain drug is higher for the one than for the other. Of 81 comparable drugs the use is higher in GD hospitals in 57 cases (70%) and in 24 in ED hospitals (30%). Using the sign test this difference is significant ($p<0.01$). **The preliminary conclusion is that according to this method mean drug use in hospitals with Ghanaian doctors is higher than in those with expatriate doctors.**

It is possible to indicate the size of this difference by adding up all different mean drug use data. The results can be expressed in monetary units. For this purpose the cost of drugs has been introduced, according to the IDA price indicator of February 1984[178]. The mean drug use per 10.000 total OPD consultations can be expressed in Dutch guilders (1 DFl = US $ 0.33) and the total drug costs for all 94 drug dosage forms)* of table 22 can be calculated per 10.000 total OPD. Results are presented in table 23.

Table 23. Total cost per 10.000 total OPD consultations of 94 drugs listed in table 22, differentiated for hospitals and clinics and for Ghanaian doctor (GD) and expatriate doctor (ED) hospitals. Prices according to IDA price indicator, February 1984[178].

	Number	*Cost per 10.000 total OPD*
CHAG institutions	17	DFl. 6700.00
clinics	2	2400.00
hospitals	15	7000.00
GD hospitals	6	9600.00
ED hospitals	9	4900.00

Looking at the table it can be seen that clinics spent per consultation much less on drugs than hospitals. Furthermore it can be seen that in GD hospitals the amount spent is nearly twice that in ED hospitals. **This confirms our preliminary conclusion that in GD hospitals more drugs are used than in ED hospitals.**

To analyze which drugs in particular were used in larger quantities in GD hospitals some data from table 22 have been combined in table 24 which shows drug use in ther-

)* Totals of therapeutic groups have of course been excluded

apeutic groups of which mean use in 6 GD hospitals grossly exceeds that in 9 ED hospitals. **It shows that for these therapeutic groups mean drug use *per se* is higher in GD hospitals than in ED hospitals, irrespective of drug choice within the therapeutic groups and irrespective of cost.**

Table 24. Mean drug use per 10.000 total OPD consultations in therapeutic groups in which drug use in 6 Ghanaian doctor (GD) hospitals grossly exceeds use in 9 Expatriate doctor (ED) hospitals. Number of hospitals the data are based on in brackets.

WHO class.	*Therapeutic group*	*Unit*	*GD hosp.*	*ED hosp.*	*Factor*
2.1	all oral analgesics	tab.	66.000 (5)	41.000 (8)	1.6
6.1	all anthelmintics	DCD[a]	920 (5)	510 (9)	1.8
6.3	antibiotics[b] oral	DDD[c]	2.500 (6)	1.500 (8)	1.6
	antibiotics[b] syrups	btl[d]	140 (4)	88 (7)	1.7
6.7	chloroquine	tab.	34.000 (5)	18.000 (9)	1.9
17.2	all antihistaminics	tab.	11.000 (5)	3.500 (9)	3.2
24	all tranquillizers	tab.	16.000 (5)	8.100 (8)	2
27	all vitamins	tab.	64.000 (5)	48.000 (8)	1.3

a DCD = Defined Curative Dose
b Excluding chloramphenicol
c DDD = Defined Daily Dose
d btl = botle 60 ml

Table 25 lists the most striking examples of higher mean drug use with the number of hospitals the data are based on and the factor of difference. In the right half of the table drug use is expressed in DFl. It can be observed that higher use of ampicillin, tetracycline and chloroquine have enormous financial consequences. The total cost per 10.000 total OPD consentations for these 20 drugs is DFl 3700 which is 2.17 times the amount spent in ED hospitals. The absolute difference between the two, DFl 2000 per 10.000 total OPD, accounts for 43% of the total difference between GD and ED hospitals (table 23).

In some cases mean drug use is higher in ED hospitals than in GD hospitals. The most striking examples have been listed in table 26 with results expressed again in DFl. As can be seen the total cost difference is DFl 500 per 10.000 total OPD. As this is much less than the DFl 2000 the other way around we can conclude that GD hospital preferences are more expensive than those from ED hospitals.

Additional remarks have to be made on table 22. Some results that have to be interpreted with caution as they are based on recordings in one or two hospitals only have been marked in the table. Furthermore it can be seen that sometimes in ED hospitals other drugs are used as alternative for drugs used in GD hospitals. These alternatives are usually cheaper. Examples are: non-opioid analgesic injections compared with opioid, phenobarbitone versus diazepam and reserpine versus methyldopa. The latter especially is very expensive: per DDD forty times the price of reserpine[178].

For some drugs the mean drug use in GD and ED hospitals is very much the same.

Table 25. Drugs of which mean use in 6 Ghanaian doctor (GD) hospitals grossly exceeds mean use in 9 Expatriate doctor (ED) hospitals, with cost difference. Drug use expressed per 10.000 total OPD consultations. Number of hospitals the data are based on in brackets.

WHO class.	*Drug*	*Drug use*		*Factor*	*Cost (Dfl)*	
		GD hosp.	*ED hosp.*		*GD*	*ED*
2.1	paracetamol tab.	29.000 (5)	16.000 (8)	1.8	290.00	160.00
6.1	tiabendazole tab.	1.100 (3)	440 (5)	2.3	87.00	38.00
	levamisole tab.	1.600 (2)	480 (3)	3.4	26.00	8.00
6.3.1	ampicillin cap.	9.100 (6)	5.400 (9)	1.7	650.00	380.00
	inj.	380 (5)	110 (7)	3.5	240.00	66.00
6.3.2	sulfathalazole tab.	6.400 (4)	1.100 (5)	5.7	100.00	18.00
	tetracycline cap.	12.000 (5)	4.900 (9)	2.5	310.00	130.00
	inj.	110 (1)	18 (4)	6	70.00	12.00
	syr. (btl.)	88 (3)	9 (2)	9.8	80.00	8.00
6.7	chloroquine tab.	34.000 (5)	18.000 (9)	1.9	740.00	390.00
	inj.	1.100 (5)	460 (8)	2.4	120.00	51.00
	syr. (l)	27 (5)	8 (5)	3.4	110.00	33.00
12.3	methyldopa tab.	2.400 (5)	1.000 (6)	2.3	190.00	83.00
12.4	digoxin tab.	2.000 (3)	640 (7)	3.3	16.00	5.00
16	furosemide tab.	2.300 (5)	960 (7)	2.3	25.00	10.00
17.2	promethazine tab.	11.000 (5)	2.600 (8)	4.3	98.00	23.00
24	diazepam tab.	15.000 (5)	5.000 (9)	3	80.00	27.00
27	ascorbic acid tab.	21.000 (4)	5.600 (6)	4	210.00	56.00
	multivitamin tab.	35.000 (5)	29.000 (9)	1.2	120.00	97.00
	vitamin BCo tab.	44.000 (4)	18.000 (9)	2.4	150.00	61.00
Total				Dfl	3700.00	1700.00

Table 26. Drugs of which mean use in 9 Expatriate doctor (ED) hospitals grossly exceeds mean use in 6 Ghanaian doctor (GD) hospitals, with cost difference. Drug use expressed per 10.000 total OPD consultations. Number of hospitals the data are based on in brackets.

WHO class.	*Drug*	*Drug use*		*Factor*	*Cost (Dfl)*	
		GD hosp.	*ED hosp.*		*GD*	*ED*
6.3.1	benzylpenicil. inj.	660 (6)	1.400 (9)	2.1	190.00	400.00
6.3.4	ethambutol tab.	0	1.300 (2)	—	—	91.00
	rifampicin cap.	0	360 (2)	—	—	85.00
6.7	pyrimethamin tab.	2.400 (3)	6.600 (7)	2.8	11.00	30.00
6.8	metrifonate tab.	0	920 (5)	—	—	77.00
22	ergometrin tab.	540 (2)	1.200 (8)	2.2	13.00	27.00
Total				Dfl	210.00	710.00

Perhaps the indications for use are so clear that personal preference or prescribing habits have no gross influence on total use. Examples are: diazepam injection, metronidazole, streptomycin, diethylcarbamazine, ferrous salt, iron dextran injection, anti-hypertensiva, tolbutamide, ergometrine injections and aminophyllin. Tuberculostatics are also used more or less to the same extent; there seems however to be some emphasis in ED hospitals on ethambutol and rifampicin.

IV.4 Discussion and conclusion

The fact that in clinics much less is spent on drugs than in hospitals, expressed in cost per 10.000 total OPD consultations, could have been caused by at least three reasons. The most important is that the patient population for clinics is different from that for hospitals. In section V.4 it will be shown that for clinics the percentage of "preventive" services like CWC and ANC is larger than for hospitals. As these groups require both less and cheaper drugs it is logical that drug costs per 10.000 total OPD consultations are lower. The second reason is that even in the group of sick OPD consultations patients visiting a clinic will require or receive less sophisticated and therefore often less expensive drugs than patients visiting a hospital and being treated by a doctor. A third possible reason is that in a clinic, being smaller and therefore perhaps better manageable than a hospital, losses by overprescribing, wastage, pilfering and the like might be less. The extent to which each of these factors contribute to the total result falls outside the scope of this study.

The difference in drug use between Ghanaian doctor and expatriate doctor hospitals is striking. It can have been caused by several factors. The first is that general prescription patterns by Ghanaian doctors might be over-generous, drugs being prescribed both in larger quantities and in more expensive dosage forms or alternatives, on less stringent indications. Secondly, in GD hospitals training and supervision of junior prescribing staff might be less extensive. Thirdly, management, administration and control of stock might be less effective in GD hospitals than in ED hospitals in which the doctor often is, or at least feels, responsible for drug supplies. A fourth reason might be that the expatriate doctor is perhaps more influenced by thoughts of future shortages and is therefore more careful in prescribing. Again, the relative contributions of each of these factors cannot further be assessed.

The results of table 22 are the most reliable records currently available of drug utilization in Ghana. They record the actual drug use, that is the total drug use within existing patterns of prescription and losses, in seventeen institutions over 2.5 million patients contacts. These figures can be used to evaluate the 1981 CHAG drug need estimates (section V.3) and to estimate future drug needs. It cannot be proved that the figures could be a useful basis for drug need quantifications for other West African or sub-Saharan countries, as no comparable studies from other countries are available.

Chapter Five

EVALUATION OF CHAG DRUG COMMITTEE ACTIVITIES

V.1 Introduction

In this chapter some of the activities of the CHAG Drug Committee are evaluated. The following aspects are discussed: the selection of drugs (V.2); the quantification of drug needs (V.3); and the system of allocation (V.4). Evaluation of results in each section are followed by a discussion on the methodology. The chapter ends with a summary of the conclusions (V.5).

V.2 Evaluation of the CHAG selection of drugs

V.2.1 Introduction

In this section the CHAG method of selecting essential drugs is evaluated by comparing it with the literature available in December 1983 on the subject of selecting essential drugs (see the summary in section I.3). The 1981 and 1983 CHAG lists of essential drugs are compared with the list of drugs most frequently found on essential drugs lists (I.3.4) and with other lists of essential drugs that have been used as a basis for distribution in standard packages (I.6.2).

V.2.2 Evaluation of results

In table 27, the 29 "most essential" drugs from table 2 have been listed together with the number of times each has been included in 38 lists taken from the literature reviewal (I.3.4). Drugs from each of the lists mentioned in table 5 have been tabulated together with those from the 1981 and 1983 CHAG lists. As can be seen in the table, the 1981 CHAG standard list contains 14 (48%) of the 29 most essential drugs; these 14 form 58% of the 24 items on the list. The 1981 CHAG total list (standard list plus extra hospital list) contains 16/29 (55%) which comprises 47% of the total list.

These results are poor. Of the six items apparing on at least 75% of all essential drugs lists studied, two are missing on the CHAG list; of 18 drugs that appear on more than 60% of lists, seven are missing.

The other lists from table 27 are much more comprehensive. The total lists of Kenya[7] and Tanzania[8] contain 27 of the 29 most essential drugs, which comprise 71% and

Table 27. 29 most essential drugs as they appear on essential drugs lists used for distribution by means of standard packages.

29 most essential drugs	*Score on 38 lists of essential drugs* (nr)	(%)	Simonds and Walker[107]	Moore[7], Kenya: disp.	Moore[7], Kenya: h.c.	Tanzania[8]: disp. B	Tanzania[8]: disp. A	Tanzania[8]: h.c.	Sudan[54]: PHU	Sudan[54]: total	CHAG 1981[60]: stand.	CHAG 1981[60]: total	CHAG 1981[60]: including pharm. prep.	CHAG 1983[59]: stand.	CHAG 1983[59]: total	CHAG 1983[59]: including pharm. prep.
aspirin tab.	38	100%	■	■	■	■	■	■	■	■	■	■	■	■	■	■
chloroquine tab.	36	95	■	■	■	■	■	■	■	■	■	■	■	■	■	■
iron tab.	34	89	■	■	■	■	■	■	■	■	■	■	■	■	■	■
sulfa tab.	32	84	■	■	■	■	■	■	■	■				■	■	■
tetracycline tab.	30	79	■		■		■	■		■	■	■	■	■	■	■
antibiotic eye oint.	29	76	■	■	■	■	■	■	■	■						
broad anthelmintic	28	74	■	■	■	■	■	■	■	■	■	■	■	■	■	■
oral rehydration salt	28	74	■	■	■	■	■	■	■	■			■	■	■	■
antacid	27	71	■	■	■	■	■	■					■	■	■	■
cough tab.	26	68		■	■	■	■	■		■				■	■	■
benzyl benzoate	25	66	■	■	■	■	■	■	■	■			■			■
piperazine	25	66	■	■	■	■	■	■			■	■	■	■	■	■
procain penicillin inj.	25	66	■	■	■		■	■	■	■	■	■	■	■	■	■
ergometrine	24	63			■		■	■		■	■	■	■	■	■	■
phenobarbital tab.	24	63		■	■	■	■	■		■	■	■	■	■	■	■
disinfectans	23	61	■						■	■			■			■
chloroquine inj.	23	61			■		■	■	■	■	■	■	■	■	■	■
vitamin (multi/BCo)	23	61		■	■		■	■			■	■	■	■	■	■
phenoxymeth.penicil. tab.	22	58	■	■	■	■	■	■	■		■	■	■	■	■	■
folic acid tab.	22	58	■	■	■		■	■	■	■	■	■	■	■	■	■
lidocain 1-2% inj.	20	53			■		■	■		■		■	■	■	■	■
metronidazole tab.	20	53			■			■			■	■	■	■	■	■
benzath.benz.penicil. inj.	20	53		■	■			■						■	■	■
chloroquine syr.	20	53	■	■	■	■	■	■	■	■						
laxans	20	53	■	■	■	■	■	■								
paracetamol tab.	19	50	■	■	■		■	■						■	■	■
chloramphenicol tab.	19	50										■	■		■	■
epinephrine inj.	19	50		■	■		■	■		■						
gentian violet paint	19	50	■	■	■	■	■	■	■	■			■			■
Score of most essential drugs (a)			19	22	27	16	25	27	15	20	14	16	21	21	22	24
(a) as a percentage of 29			66	76	93	55	86	93	52	69	48	55	72	72	76	83
Total number of items on the list (b)			28	30	38	17	31	35	15	21	24	34	—	34	51	—
(a) as percentage of (b)			68	73	71	94	81	77	100	95	58	47	—	62	43	—

77% resp. of their lists. The lists from Southern Sudan[54] are made up nearly exclusively of top-scorers, but because they are rather short they contain only 52% and 69% resp. of them. The list of Simmonds and Walker[107] is adequate. Of all lists, the 1981 CHAG list has the least correlation with the literature consensus and thus, if literature consensus is taken as criterium, it is the least satisfactory.

A few remarks may be made. Five of the 29 most essential drugs were considered as pharmaceutical preparations)* by the CHAG Drug Committee. These are: oral rehydration salts, antacid, benzyl benzoate, disinfectantia and gentian violet. The CHAG supplied these items through a different channel and for that reason did not put them on the list of essential drugs. When these five are added to the score, the CHAG 1981 list contains 21/29 (72%) of the most essential drugs. Furthermore, the committee improved the list in 1983 and after this review it contained 22/29 of the most essential drugs (76%) which comes to 24/29 (83%) when the pharmaceutical preparations are included.

V.2.3 Evaluation of methods

1) Introduction

The 1981 CHAG list of essential drugs was compiled by the committee, based on the results of the 1980 drug inquiry (III.2.2), dicussions within the committee and feed-back with all hospital pharmacists. The CHAG list of essential drugs was revised in 1983. Each of these elements will be discussed separately.

2) The 1980 inquiry

In preparing the inquiry some mistakes were made. Some drugs were not included and could therefore not score. As a result they were left out of the picture and were not considered for the list of essential drugs. These drugs are: antibiotic eye-ointment (literature score 76%), benzathine benzyl penicillin injection (53%) and laxans (53%). **The conclusion has to be that wherever use is made of a drug inquiry and a choice is offered, this choice should include all possible alternatives.**

Some drugs scored very high in the 1980 inquiry although their literature score is low. Some of them were included in the CHAG list: ampicillin (inquiry: 72%, lit: 39% and even lower on short lists) and pethidine (inquiry: 69%, for hospital 96%, lit: 37%). Others that were not included have been listed in table 11. These examples show that the results of an inquiry such as this can be different from the consensus in literature on essential drugs. The differences could of course express epidemiological variations in respect to the country concerned, but this is not confirmed by the kind of drugs that were preferred. It is more likely that the differences express a kind of collective prescribing practice which is not necessarily optimal. The many syrups that scored high in the inquiry can be taken as an example. **The conclusion is that the results of a drug inquiry cannot be used indiscriminately as the basis for a drug programme.**

)* Pharmaceutical preparations are medical products that can easily be prepared locally from available and/or imported raw materials, e.g. syrups, ointments and mixtures.

3) Drug committee decisions and feed-back

The committee, which had to make the final decisions on the list of essential drugs, made some mistakes. The first mistake was that some drugs that scored high in the inquiry were omitted from the list and it later came to light that these drugs scored high in the literature as well. These drugs are listed in table 28 with reasons for omission stated. In 1981, literature on other essential drugs lists was not available to the committee and could therefore not be considered while preparing the list. It is to be expected that these omissions would not have taken place if literature data had been available. **It can therefore be concluded that literature on other essential drugs lists contains information which is of importance when compiling a list of essential drugs.**

Table 28. Drugs that were omitted from the 1981 CHAG list despite high scores in the 1980 inquiry and that later proved to have high literature scores.

	CHAG 1980 inquiry	*Literature*	*Reasons why excluded in 1981*
chloroquine syr.	56%	53%	expensive, bulky
sulfa tablets	54%	84%	replaced by nitrofuration
paracetamol tablets	46%	50%	expensive

Table 29. Drugs with low literature scores that were included in the 1981 CHAG list of essential drugs, despite low score in the 1980 inquiry.

	CHAG 1980 inquiry	*Literature*	*Reasons why included*
diazepam tab.	32%	28%	pharmacists advise
penicillin syr.	—	28%	cheaper than ampicillin syr.
diethylcarbamazine	34%	26%	for Northern Ghana
pyrimethamin tab.	—	26%	pharmacists advise for clinics
anti TB drugs	37-45%	21-36%	continuity
anaesthetics	18-24%	28-36%	essential for operations

A second mistake was that the committee included in the 1981 list some drugs that scored low, both in the 1980 inquiry and in the literature. These drugs are listed in table 29. Inclusion of these drugs was based on discussions which took place within the committee and also during a meeting with the assembled hospital pharmacists. In part these inclusions were the result of this feed-back and were not based on a country-wide consensus (e.g. in the case of diazepam and pyrimethamin). Diethylcarbamazine is the only drug included because of epidemiological variations within he country (heavy onchocerciasis in Northern Ghana). The remaining three drugs were included purely because of personal preference on the part of the committee. Penicillin syrup

was included because of being cheaper than ampicillin syrup, chloramphenicol syrup being already on the list. Anti-tuberculosis drugs were included because of a preference on the part of the author; their non-inclusion would have hampered the continuous treatment of the TB patient and, being in charge of a large TB clinic himself, he experienced marked feelings of compassion towards the TB sufferer. Anaesthetics were included because they were considered essential to the continued functioning of hospital operating theatres.

This mechanism of personel preferences, channelled by the committee as a whole, is both necessary and inevitable. It is necessary as a means to adapt the list to national or even regional conditions; it is inevitable as a political concession, enabling the committee to function at all. In a consultative meeting e.g. with all hospital pharmacists, one simply cannot discard all suggestions as useless or as not having been confirmed by national consensus.

4) Discussion

In general the committee had been wavering between two different approaches. It had wanted a list that could be used for both clinics and hospitals, not realizing how different these two would be. The result was a list sufficient for use in clinics, although pharmaceutical preparations had not been included[60]. In a later stage these were supplied through a different channel. For hospitals the list was too short. A more or less comprehensive list of hospital drugs should contain 60-80 drugs but for the original CHAG drug programme this was too expensive. For that reason only life-saving drugs could be selected, excluding, as mentioned, the pharmaceutical preparations.

To summarise it can be said that the 1981 list was made as an essential drugs list, being a list of drugs considered essential irrespective of cost; yet, at the same time, it was to be the basis of a drug programme with budgetary limits. These two objectives had not been clearly differentiated from the beginning. **The conclusion is that, before compiling a list of essential drugs, its objectives in regard to target group (clinic, rural health or hospital) and aim (restrictive, selective, or budget-limited) should be clearly defined.**

5) The 1983 revision of the CHAG list

The 1983 revision of the CHAG list was based on the 1982 inquiry and on a limited literature review of some twelve essential drugs lists, together with the 1979 WHO list[18]. Of the 29 most essential drugs, 13 were not on the 1981 list. Of these 13, three had not been included in the 1980 inquiry at all. Only one of these three emerged from the 1982 inquiry: benzathine benzyl penicillin. Two others (antibiotic eye-ointment and laxans) were suggested only once by respondents and were therefore not included in the 1983 list. Of the remaining ten drugs, five were suggested three times or more by respondents and were included; two were not suggested at all and therefore not included (chloroquine syrup and epinephrine injection) and the last three were pharmaceutical preparations, already taken care of through different channels. It should be remarked that oral rehydration salts and antacid, although previously separately considered as pharmaceutical preparations, were now included in the list, facilitating their availibility for clinics without a formulating pharmacy.

After this review in total 22 of the 29 most essential drugs were now on the list (76%) which comes to 24/29 (83%) when the pharmaceutical preparations are in-

cluded. Apart from this, other drugs that score high in inquiry and/or literature have been included (see table 16). In fact, some of the previous conclusions had already been put into practice and the goal of establishing a list of essential drugs was now clearly separated from that of any distribution plan within a limited budget. The final drug choice made, however, can still be considered as based insufficiently on literature and too much on the personal preferences of a small group.

V.3 Evaluation of the CHAG quantification of drug needs

V.3.1 Introduction

In this section the 1981 CHAG quantification of drug needs is evaluated by means of making a comparison with the available literature and also with the results of the 1983 drug utilization study (section IV.3).

V.3.2 Evaluation of results

In table 5 four studies that describe eight essential drugs lists that are being used as a basis for distribution of essential drugs by means of standard packages have been summarised. These were the only publications available up to 1984 in which drug needs have been quantified for a certain type of health institutions per unit of time and/or per number of new patients. The unpublished material of Southern Sudan[54], regrettably, does not state the number of new patients or consultations for which the estimated quantities are intended and can therefore not be used. All other quantifications can be recalculated into drug quantities per 10.000 "Treatment Episodes", which is the unit of comparison proposed by a recent WHO working group on the quantification of drug needs (see section V,4,3,3)[74]. To create a more or less comparable group of lists the list for B-dispensaries from Tanzania[8], being too short, had to be excluded. The five lists that have been used have been indicated in table 5.

In table 30 estimated quantities of 21 drugs or therapeutic groups that appear on most of the lists are presented. To these five lists the 1981 CHAG estimates, including those for some pharmaceutial preparations (Appendix 4) and relevant results of the 1983 drug utilization study (IV.3), have been added. All original figures have been recalculated into quantities per 10.000 "Treatment Episodes" which is the same as "total OPD consultations" in the CHAG concept and "new patients'" in the Kenya and Tanzania plans, so that figures are comparable.

1) Correlation

The linear relationship between each two columns of the table can be expressed by the correlation coefficient r which in case of a positive correlation has a value between O (no correlation) and 1 (maximal correlation). The advantage to be gained by making use of the correlation coefficient is that it is independent of the scale on which the

Table 30. Comparison of estimated drug needs per 10.000 Treatment Episodes between five essential drugs lists that have been used for distribution by means of standard packages, the 1981 CHAG drug need estimates used for the CHAG drug programmes, and the 1983 drug utilization study.

	Simm. & Walker [107]	*Moore*[7, 46] *Kenya*		*Tanzania*[8]		*CHAG 1981*	*CHAG drugut.*
		disp.	*h.c.*	*disp. A*	*h.c.*	*estim.*	*study*
Number of consultations in original publication	10000	2000	3000	1000	2000	10000*	10000
Multiplying factor	1	5	3.33	10	5	.61	1
lidocain 1-2% inj. 50 ml			10	100	100	30	20
aspir. + paracet. tab.□	22000	17500	23333	12000	17000	48800	46000
antihistaminic tab.		2500	1667	1000	1500	1220	5200
broad anthelm. DCD** □	292	125	167	250	375	203	200
piperazin tab. □	2500	5000	3333	1000	1000	406	1500
penicill. tab. □	5000	5000	6667	10000	10000	2440	4000
proc.pen.inj. 3-4 MU □	300	500	333	500	750	488	390
sulfa tab. □	6000	5000	6667	10000	5000	3050	5700
tetracyclin cap.	9000		5000	10000	5000	3660	6700
chloroquine tab. □	2000	15000	16667	20000	20000	18300	22000
iron tab. □	9000	20000	46667	20000	15000	24400	25000
folic acid tab. □	9000	10000	16667	10000	5000	12200	12000
benz.ac.comp.oint.gram	2500	2500	3333	10000	5000	1286	
gentian violet pow.gr.	200	50	33	250	125	64	
antacid tab. □	5000	10000	10000	5000	5000	3050	2400
laxans tab.	500	2500	1667	1000	500	1474	
antibiotic eye oint. tube 5 g. □	400	250	333	250	375	183	69
tranquillizer tab.		6000	8333	2000	2500	8540	11000
antiasthmatic tab.		5000	5000	2000	2000	610	2600
oral rehydr.salt.ltr	5500	750	667	2500	2500	386	
vitamin (multi+BCo) tab.		5000	10000	10000	10000	61000	52000

□ Drugs that have been used for comparison in absolute figures (see Table 32)

* CHAG 1981 estimates were calculated per 10.000 *sick* OPD consultations. In 1981-82 61% of the total OPD consultations were for sick OPD consultations, therefore the multiplying factor is 0.61

** DCD = Defined Curative Dose

table is presented. Thus, the figures of the original publications could have been maintained and the correlation would have been the same. The figures, however, have been reduced to the same denominator for ease of general scrutiny and for comparison in magnitude. This is discussed later in this section.

Table 31 presents the results of the analysis of the correlation between the several columns of table 30. In the first line correlation is expressed between the 1981 CHAG estimates and both available literature and the 1983 drug utilization study (the "observed reality"); in the second line the literature is compared with the drug utilization study.

Tabel 31. Correlation between five essential drugs lists used for distribution by means of standard packages, CHAG 1981 estimates and 1983 drug utilization study. r = Pearson Coefficient of Correlation.

	Simm. & Walker[107]	*Moore Kenya*[7]		*Tanzania*[8]		*1983 drug util. study*
		disp.	*h.c.*	*disp. A*	*h.c.*	
CHAG 1981 estimates	r = 0.8480	r = 0.5564	r = 0.5554	r = 0.5409	r = 0.6819	r = 0.9891
1983 drug util.study	r = 0.8401	r = 0.5864	r = 0.5822	r = 0.6045	r = 0.7314	

All correlations are highly significant (all $p<0.01$). The highest degree of correlation is observed between the CHAG 1981 estimates and the 1983 drug utilization study ($r=0.9891$, $p=0.000$). **This proves that the ratio of figures within the CHAG estimate shows maximum correlation with that of the observed reality.** As mentioned above this does not prove anything about the absolute magnitude of the figures.

Of the five literature studies the 1981 estimates have the highest degree of correlation with that of Simmonds and Walker[107]. There is a very high degree of correlation between the lists of Moore ($r=0.9223$, not in the table), and these lists correlate very well with the lists from Tanzania ($r=0.7918$, not in the table) which between themselves have the highest degree of correlation ($r=0.9139$, not in the table). Of the five studies, Simmonds' and Walker's is the best related to the drug utilization study, followed by the one for Tanzanian health centres.

2) Comparison in absolute figures

To compare the absolute figures of these series is not easy, as not all drugs appear on all lists. However, data from all seven series are available on eleven drugs. These have been marked in table 30. For each list the average value of the figures on these eleven drugs can be calculated and these averages give some idea of the general level of drug quantities used. Results are presented in table 32, in which the result of the 1983 utilization study has been put at 100% for purposes of comparison.

These figures show that in regard to the average level of drug quantities the CHAG estimates are higher than most figures from the available literature. The quantities from Tanzania and Simmonds and Walker are generally lower and the health centre quantities from Kenya are a bit higher. **Very good correlation in average level exists between the 1981 estimates and the 1983 drug utilization study;** the estimates (and

Table 32. Average value of eleven figures indicated in table 30 showing relative level of drug quantities in five essential drugs lists used for the purpose of distribution by means of standard packages, in the 1981 CHAG estimates and in the 1983 drug utilization study which is put at 100% for purposes of comparison.

		Average value	%
Simmonds and Walker[107]		5.590	51%
Moore, Kenya[7]	disp.	8.034	74%
	h.c.	11.894	109%
Tanzania[8]	disp. A	8.091	74%
	h.c.	7.227	66%
CHAG 1981 estimates		10.322	95%
1983 drug utilization study		10.912	**100%**

the subsequent drug distribution programmes) seem to be around 95% of the observed usage.

The conclusion is that correlation between the 1981 CHAG drug need estimates and five of the available lists from the literature is significant ($p<0.01$) and is mostly so with the study of Simmonds and Walker[107]. **The average level of the estimates seems to be higher than that given in most of the available literature.**

3) Comparison between 1981 estimates and 1983 drug utilization study

There is more material available in order to determine whether the correlation level in general between the 1981 estimates and the 1983 drug utilization study is really so good as suggested by the previous rough comparison. For all 1981 drug needs estimates as listed in table 14, comparable data from the 1983 drug utilization study, based on data over 1981-82, are available. As has been mentioned before, the reason to perform that study at all was to check the 1981 estimates and the combination of the two could even be regarded as a prospective study (section IV.1).

The complete comparison is presented in table 33. In a way similar to that in tables 30 and 32 the average values can be compared. Results are presented in table 34 for three groups of figures: the figures for 14 drugs of which the figures are below 1000, 28 drugs with figures below 10.000, and the total group of 33 drugs. This division is desirable as otherwise the result would be influenced mainly by the high figures.

As can be seen the overall correlation in average level is striking. None of the differences is significant. According to this method the 1981 estimates are similar to the observed usage over 1981 and 1982. In the group of 14 drugs of which smaller quantities only are necessary the estimates have been generous. What should be realized is that in this group of drugs one often has to work with minimum packing quantities (e.g. for ether, thiopentone sodium and furosemide injections).

The conclusion that the 1981 CHAG estimates show optimal correlation with the observations over 1981 and 1982 both in ratio between the values as in average level of them is therefore justified.

Table 33. Comparison between CHAG 1981 drug need estimates and the 1983 drug utilization study concerning 1981-82.

Drug	*CHAG 1981 estimates*		*1983 drug util. study per 10.000 treatm. episodes*
	unit per 6 m	*per 10.000 total OPD*[a]	
chloroquine tab. 150 mg base	15.000	18.300	22.000
proc.pen.inj. 4 MU	400	488	390
ampicillin cap. 250 mg	2.000	2.440	6.300
ergometrine inj. 0.5 mg/ml	200	244	140
tetracycline cap. 250 mg	3.000	3.660	6.700
nitrofurantoin tab. 50 mg	5.000	6.100	5.700[c]
phenobarbital tab. 100 mg	3.000	3.660	2.800
folic acid tab. 5 mg	10.000	12.200	12.000
ferrous sulphate tab. 200 mg	20.000	24.400	25.000
multivitamin or BCo tab.	50.000	61.000	52.000
aspirin tab. 300 mg	40.000	48.800	44.000[d]
metrifonate tab. 100 mg	1.000	1.220	920
promethazine tab. 25 mg	1.000	1.220	5.200
chloroquine inj. 200 mg/5 ml	300	366	640
novaminsulphone inj.	500	610	210
antibiotic syr.	200	244	170[e]
mebendazole tab. 100 mg	1.000	203[b]	200[b]
metronidazole tab. 250 mg	1.000	1.220	2.500
penicillin tab. 250 mg	2.000	2.440	4.000
piperazine syr. ltr	10	12	17[f]
diazepam tab. 5 mg	4.000	4.880	7.800
diethylcarbamazine tab. 100 mg	10.000	12.200	9.300
pyrimethamine tab. 25 mg	10.000	12.200	6.100
pethidine inj. 100 mg/2 ml	200	244	210
benzyl penicillin inj. 1 MU	500	610	1.100
chloramphenicol cap. 250 mg	4.000	4.880	3.800
diazepam inj. 10 mg/2 ml	200	244	110
streptomycin inj. 1 g	800	976	710
anaesthetic ether 500 ml	20	24	8
furosemide inj. 20 mg/2 ml	100	122	72
thiopentone sodium inj. 1 g	100	122	33
INH/Thiacetazone 300/150 mg	6.000	7.320	4.100
lidocain inj. 2% 50 ml	25	30	19

a CHAG 1981 estimates were calculated per unit per six months. Two units per year equates 10.000 sick OPD consultations per year, so to calculate quantities per 10.000 sick OPD they have to be multiplied by 2. Sick OPD was 61% of the total OPD during 1981-82 for all CHAG institutions, so to calculate quantities per 10.000 total OPD consultations (= Treatment Episodes) they have to be multiplied by 0.61 as well

b Expressed in DCD (Defined Curative Dose)

c For sulfa plus nitrofurantion

d Aspirin plus paracetamol

e Penicillin, chloramphenicol, ampicillin, tetracyclin and cotrimoxazole

f Tablets plus syrup recalculated in litres

Table 34. Comparison between 1981 estimates and 1983 drug utilization study of averages within three groupes of figures from table 33. All differences are not significant ($p>0.05$).

	Average value in 1981 estimates		*Average value in 1983 drug util.study*	
14 drugs <1.000	281	(128%)	219	(100%)
28 drugs <10.000	2428	(93%)	2608	(100%)
33 drugs (total)	7050	(101%)	6988	(100%)

V.3.3 Evaluation of methods

1) Evaluation of the "consumption-based" method

The 1981 CHAG drug need quantification has been performed according to the "consumption-based" method (I.4.3) measured at central store level. A proper comparison with results obtained through the alternatives, the "population-based" and the "service-based" or "demand-morbidity" methods is not possible as in Ghana no studies of drug need quantification have been carried out in accordance with these methods. Moreover, results could not possibly have been obtained as insufficient reliable data on quantified epidemiology of diseases and on the coverage of existing health facilities are available, and as morbidity statistics from health institutions were too fragmentary to be of any use and also as no standard therapy regimens were in general use. Because of these factors the use of the epidemiological method in calculating drug needs for CHAG institutions has never been a realistic alternative.

Because of the lack of comparable results the only evaluation that can be made is that the results of the 1981 drug need quantification with the "consumption-based" method have been excellent as has been proved in the previous section. Yet it is advisable to review some of the possible disadvantages of this method and the inaccuracies which could occur in its use.

An initial objection to the use of the "consumption-based" method is that measuring drug *use* is not the same as measuring drug *needs*, especially in view of the fact that only a fraction of all sick people in a certain area have access to health facilities. This "coverage" for Ghana has been estimated at 15-30%[186,191,198,199]. The drug needs of people not able to attend health facilities have not been measured and as a consequence total drug needs for the area have been underestimated.

The answer to this initial objection is two-fold. In the first place, knowing the total drug needs for a certain area in the case of a theoretical 100% coverage is not really relevant if no facilities are available to treat the patients and to prescribe and dispense the drugs. Secondly, the actual coverage is the result of several factors, including not only the *accessibility* but also the *acceptability* of health facilities. It is illusory to think that with western style hospitals, clinics, dispensaries and even with village health workers a 100% coverage of all potential patients will ever be achieved. Part of the population will always choose for alternative forms of medicine. For these two reasons, allocating the total drug supply to meet the needs of a certain area to institutions

that have a less than 100% coverage is useless. A proper measurement of drug consumption in well-run health institutions that do not suffer from considerable shortages furnishes a good working estimate of projected drug needs for the immediate future within the existing coverage of the area. Quantified total drug needs for the area as a whole are only useful for long term planning purposes.

A second objection to the use of the "consumption-based" method is that time variation might occur. In other words, patient numbers and coverage might change so that historical measurements of drug use could result in insufficient insight into future needs.

The answer to this second objection is again two-fold. In the first place every prediction of the future is based on the analysis of data from the past, and so are the "population-based" method and the "service-based" method. This is, therefore, no particular shortcoming in the "consumption-based" method. Secondly, drug use has not been expressed as an absolute figure but as related to the number of patients treated. In other words, in the case of an increase in coverage or in the event of a marked increase in patient attendance an adjustment in drug allocation could follow.)* The rate of drug use per patient will not have changed much. In practice, such changes in patient attendance figures would always be relatively slow except in the case of major emergencies such as war or natural disasters. Usually, these slow changes would be covered by in-built reserves in the allocated quantities. Examples of such changes are the slowly developing resistance of P. falciparum to chloroquine and an increasing incidence of schistosomiasis around the Volta Lake.

A third objection to the use of the consumption based method is that epidemiological variations might occur. Drug needs or drug use in one area might not be the same as in other areas because of variations in disease pattern and epidemiological data.

The answer to this objection can be given by asking a counter question: "so the alternative is to measure the epidemiological incidence of all diseases in all areas?" Although this is the back-bone of the "population-based" and the "service-based" method, the question is a rhetorical one as this is, of course, impossible in practice. Even if national drug needs had been calculated using one of these methods, either these epidemiological data would have been collected in a specific study area and would, therefore, not be representative of all other patient populations, or the data would represent a kind of national average in which no provision would have been made for variations between different regions. The ideal of using epidemiological data from all areas, resulting in an adapted supply of drugs to each specific patient population might be justified but is unattainable in tropical countries. A second point to be made is that it remains to be seen whether epidemiological data really differ so greatly in respect to area. Although no such data are available to prove this, it is unlikely to be the case concerning the majority of the common "diseases of poverty" against which most of the essential drugs are used. Perhaps in some countries some rough differences could be observed in different climatological zones e.g. humid lowlands, dry savanna or cooler mountain areas. In the Ghana setting the committee could only think of two drugs: diethyl carbamazine, because there is much onchocerciasis in the North (this is only a

)* The additional allocation of drugs in the emergency situation of Ghanaians expelled from Nigeria back to their home-country is a good example of such an adjustment (see section III.5).

quantitative difference as it is also common in the South and as patients frequently travel to far-away hospitals) and retinol (vitamin A), which is lacking in the common food in the North while sufficiently present in the forest area (palm-oil). So even while the committee was aware of possible epidemiological variations in drug needs, on the final 1983 version of the CHAG list, of 51 drugs only these two were included because of that reason. It remains to be proved that the necessary range and quantity of essential drugs to treat the diseases of poverty would be different for other areas of the country or other West African or even sub-Saharan countries, and in particular that these differences would be of a different order than those variations caused by prescription habits or by inadequate administration, stock control or supervision.

A fourth objection to the "consumption-based" method could be that, by measuring drug use, current prescription habits are accepted, while all over Africa these are usually sub-optimal[3,48,186,200-206].

The answer is that even when a kind of general prescription level is measured (in IV.3 this has been tried) and if this level is considered to be wrong, the way to change it would be by adapting professional and postbasic training to that effect[139] and not by cutting the drug supply, as this would simply result in the stock being exhausted earlier.

In the African world of thought which does not really care about dead things such as drugs or statistics, quantification is a difficult concept: something *is*, or *is not*. This is related to the fact that the African concept of time is different. In Western cultures the concept of time is prospective, in non-western cultures it is usually retrospective or circular. Planning recognizes the concept of there being a future and that one even has a grip on it. This type of thought is typically western. The African however is not so convinced that he can influence the future; it does not interest him and he is therefore less interested in planning. In practice this means that, in general, the level of consumption is hardly ever influenced by the level of stock on hand and that a certain consumption pattern will continue until suddenly the shelf is empty. For this reason the level of drug allocation will hardly have any corrective effect on prescription patterns. Of course some influence is possible, in particular when a limited quantity of selected drugs is distributed and at the same time careful re-training on indications for use and standard therapy is given. Moreover, in the selection and allocation of drugs some influence can be exerted. The committee did so by omitting some drugs from the list although the results of the inquiry suggested that many institutions preferred to use them (see table 11). Other drugs were purposely under-allocated e.g. chloroquine injection, ampicillin and various syrups. Still there is sufficient reason to doubt whether the few chloroquine injections that were allocated really have been reserved for the vomiting comatose child for which they were meant.

A fifth objection to using the "consumption-based" method for estimating future drug needs is that the figures do not differentiate between consumption by the patient and losses due to wastage and theft.

The answer here runs parallel to that of the previous objection. First, losses and theft are very difficult to measure[117] while measuring drug use at pharmacy, ward or patient level is unpractical if not impossible. Secondly, it is unrealistic to assume that allocating quantities exactly sufficient for patient needs would reduce pilfering! In view of what was mentioned above these two bear no relation to each other and the result would only be that stocks would be exhausted earlier. Even within an institution a

reduction in or the exact allocation of drug supplies to wards or pharmacy would have only a limited effect on pilfering as then the patient would probably receive less than prescribed. Corruption and theft are complicated problems[117-119] that are not solved by simply reducing the supply. This means that it is a realistic approach to estimate drug needs based on measurements of drug consumption plus losses (together then called "drug use").

A sixth and last point has to be discussed here. For both the 1981 estimates and the 1983 drug utilization study, drug use has been measured at stock level and has been related to number of patients treated (III.3 and IV.3). For the CHAG distribution programmes drug use has been related to number of *sick* OPD consultations (III.3), in the literature to *new* patients (V.3.2) and in the drug utilization study, in principle, to both. As far as measurement of drug use is concerned this makes no real difference. The measurement is the same, only the presentation of the results is different.

Summarising, one can say that for the CHAG the "consumption-based" method was the only realistic possibility and that it has given good results. The method assumes negligible epidemiological variations and variations in time; it measures actual drug use which is the total drug use within existing patterns of coverage, prescription and losses.

2) Evaluation of the choice of the sample

We have seen that the results of the drug utilization measurement in the two hospitals used as a basis for the 1981 CHAG drug need estimates were more or less identical with those from the drug utilization study in seventeen institutions. The question has to be discussed as to why this result was so good and whether this could have been an effect of pure chance. In other words, could Agogo and Dormaa hospitals have been predicted to be representative for the total?

The criteria for selecting the two hospitals were: a strong hospital management resulting in a sound administration of stores and drug supplies, reliable patient statistics, a rational and supervised pattern of prescription by screening nurses, medical assistants and junior doctors, a continuous stock of essential drugs and a reduced risk of excessive losses.

As in the drug programmes hospitals were to receive more than three quarters of all supplies (table 13) it was logical to concentrate on hospitals when estimating drug needs; moreover, as has been mentioned, administration is often less reliable in clinics (table 19). For these two reasons the decision to take hospitals as a sample is justified.

It is not possible to compare the patient populations in the two hospitals with the CHAG average, for two reasons: for Dormaa hospital no separate patient attendance data for sick OPD consultations and the child welfare clinic are available and in Agogo the picture is not clear as big ophthalmological and surgical clinics form part of the hospital. Given these limitations some data on patient populations have been summarised in table 35.

As can be seen from the table, in some respects Agogo and Dormaa hospitals are on opposite sides of the CHAG average and the combination could be respresentative of the total.

The next question to be answered is whether the level of drug use in the sample of two could have been predicted to be representative for the seventeen. The answer to this question presents a problem, because drug use in Ghanaian doctor hospitals has

Table 35. Comparison of patient population of Agogo and Dormaa hospitals with averages of 22 CHAG hospitals and 44 CHAG institutions from which reliable data are available, in percentage of total OPD consultations, over 1981-82.

	Sick OPD %	*CWC %*	*ANC %*	*Total OPD %*	*Adm. %*
Agogo*	67.7	25.6	6.7	100	2.5
Dormaa	83.1		16.9	100	6.6
22 CHAG hosp.	64.5	22.9	12.6	100	4.5
44 CHAG inst.**	61.0	25.7	13.3	100	

* excluding eye patients
** hospitals and clinics
OPD out-patients department
CWC child welfare clinic / under fives clinic
ANC ante natal controls
Adm. admissions

proved different from that in expatriate doctor hospitals (IV.3) whilst both hospitals in the sample belong to the latter group. To what extent this difference is due to a different pattern of prescription alone or to a more general difference in management, as other factors like store control and theft are also involved, does not fall within the scope of this study. Not all the six GD hospitals from the study show signs of overconsumption and some of them are well managed. For this reason the effect on the results of a limited number of hospitals with overconsumption in general, be it because of overprescription or through other causes, got lost in the material from many more institutions with rational prescribing practices and reasonable consumption rates. The conclusion is that the sample of two has been representative of the seventeen because the number of institutions with a deviating pattern is limited; the fact that the institutions with a deviating pattern are to be found mainly within the group of Ghanaian-doctor hospitals has been sufficient to distinguish this group as being markedly different.

Another bias which might make it likely that the results obtained in two institutions would be identifical with those obtained from seventeen is that the first observations could have been made within the same selection parameters as the second, i.e. a selected group of well-run institutions. As has been mentioned in section IV.2.1 this is not the case insofar as size, origin of doctors and/or relation to church is concerned. Yet it can be expected that the control of drugs and perhaps even the prescription habits are less careful in the less well-administered hospitals and that, for that reason, losses and overall drug use might be higher. No procedure exists to measure this as the reliable administration necessary to check it is the very thing that is lacking. When the total functioning of these institutions is considered to be sub-optimal, it is defendable to omit them from the survey and concentrate on data collected from well-administered and better functioning institutions. In using the data from these institutions as a basis for estimating future drug needs the criteria established to select these institutions have set something of a "standard". **In the process of actually choosing the sample it**

is difficult to separate the two objectives, "representativity" and "desirability", and in practice the latter will also be of influence.

3) Conclusion

Data from a carefully chosen sample of two hospitals, selected on a basis of good management, sound administration of stores and drugs, reliable statistics on patient attendance, continuous supply of essential drugs and limited chance of excessive losses, were found to correspond closely with the data from a group of fifteen hospitals and two clinics over the following two year period; this group of seventeen institutions can be considered as representative for the total of the 66 CHAG institutions.

V.4 Evaluation of the CHAG allocation system

V.4.1 Introduction

In this section the results of the CHAG system of allocation are evaluated by comparing quantities actually allocated with actual average drug consumption in each of seventeen CHAG institutions. The method of allocation will be evaluated by discussing the parameters used for dividing institutions into four categories of size.

V.4.2 Evaluation of results

1) Results

For each of the seventeen institutions for which the average drug use was known from the drug utilization study (IV.3), six month quantities to be allocated had been calculated by multiplying drug quantities from the distribution unit (table 14) by one, three, six of ten according to category of size (tables 12 and 21). Combining these figures of allocated drug quantities with the individual average drug use per 10.000 total OPD consultations as known from the drug utilizations study and with the average number of patients over 1981-82 made it possible to calculate for each of the institutions and for each drug the number of months for which the allocated quantity would be sufficient, assuming that the rate of drug use after receiving the drugs would be the same as the rate measured in the drug utilization study over 1981-82.

For each institutions these results have been expressed in number of drugs sufficient for at least four, six, nine or eighteen months. In table 36 these data have been presented. As can be seen, 430 drug use data are available from seventeen institutions with an average of 25.3 per institution.

Of these 430 drug use data, 344 (80%) show that the quantity was sufficient for four months. 282 (66%) drug quantities were sufficient for six months and 194 (45%) for more than nine months. The margins of acceptability around the target of six months could be set at four and nine months. In this case the difference between 80% and 45%, that is 35%, is the percentage which can be considered to have hit the target.

Table 36. Number of months that drugs allocated to last for six months would actually be sufficient, based on drug use and patient attendance statistics over 1981-82 for 17 institutions.

CHAG Cat.	*Institution*	*Number of drug data available*	*Drugs to last*				*(%) at 6 m*
			4 m	*6 m*	*9 m*	*18 m*	
A	Akwatia	7	6	4	2	—	57%
	Nkawkaw	24	17	11	6	3	46%
	Agogo	32	30	23	10	4	72%
	Berekum	30	23	22	15	10	73%
B	Kpandu	28	16	10	7	5	36%
	Koforidua	24	19	17	13	4	71%
	Asikuma	29	28	25	16	7	86%
	Maase-Ofinso	30	23	17	11	6	57%
	Dormaa-Ahenkro	32	27	24	17	8	75%
	Duayaw-Nkwanta	23	19	15	14	6	65%
	Hwidiem	27	25	23	19	9	85%
	Techiman	30	23	18	13	6	60%
C	Adidome	24	14	9	9	—	39%
	Nsawam	18	17	16	13	4	89%
	Agroyesum	31	21	19	15	9	61%
	Pramso	28	23	19	11	7	68%
D	Bolgatanga	13	13	10	8	5	77%
	total	430	344	282	194	93	
	%	100%	80%	66%	45%	22%	

For 93 allocations (22%) the ball went far over the goal with allocated drug quantities lasting for over eighteen months.

Within the existing variation of drug use in all the institutions these results are very acceptable. **Twothirds of the drugs have been allocated in sufficient quantities.**

In general a slight tendency to over-allocate can be observed: only 20% of drugs have been under-allocated while 45% lasted for over nine months. However, only 22% were really overallocated in such a way that expiry dates might start to play a role.

Both under and over-allocating will be discussed separately.

2) Under-allocating

In three hospitals less than half of the allocated quantities of drugs could be expected to be sufficient for six months (see table 36). These are: Nkawkaw, Adidome and Kpandu hospitals. Nkawkaw is a very large and busy expatriate doctor hospital with an average of 133.170 sick OPD consultations per year recorded over 1981-82, which is the highest number of all the CHAG hospitals. Although receiving the maximum (ten unit) allocation of drugs this apparently has not been enough. Overprescribing might constitute an aggrevating factor. Kpandu and Adidome are both Ghanaian-doctor Ghanaian management hospitals with extremely high levels of drug use. Adi-

dome with an average of 26.062 sick OPD per year over 1981-82 is rightly placed in distribution category C but Kpandu with an average of 46.700 received the benefit of the doubt and has been placed in category B meant for 50-100.000 sick OPD per year (table 12). The observation that these two have been rather under-allocated is of course related to the observation that their drug use was extremely high)*. Apart from these two there is a third Ghanaian doctor hospital with a high level of drug use. This hospital, Maase-Ofinso, ended up with only 57% of the allocated drugs being sufficient for six months. However, with an average of 35.516 sick OPD per year recorded over 1981-82 it is extremely well off in category B so that in this case we have to conclude that over-allocation has partly compensated for severe over-consumption.

Summarising one can say that of three hospitals with high consumption levels, two have been put into higher categories than their number of annual sick OPD patients would have justified thus allocating to them relatively generous quantities of drugs. Even then for one of these two and also for the one that was not "up-graded" actual allocation was not enough within the existing rate of drug use. Apart from these and the one extremely big hospital that was already receiving the maximum allocation, for all hospitals allocation has been sufficient for most drugs. **In general, the CHAG system of allocation of drugs has achieved the result that two thirds of the drug allocations have reached the original objective of a six months supply, with a tendency to over-allocating.**

3) Over-allocating

It is advisable to have a closer look at the group of drugs that, in practice, were greatly over-allocated. For this purpose, for each drug the number of times it appeared in the group of "over eighteen months" in table 36 was counted. Drugs that appeared five times or more are listed in table 37. Of each of these the ratio between the *quantity allocated* per 10.000 total OPD consultations (second column in table 33) and the *average use* per 10.000 total OPD for all seventeen institutions over 1981-82 (third column of table 33) is given. This ratio is called "over-allocation ratio" and drugs are listed in descending order of this ratio.

Before commenting on individual examples some general observations can be made.

There is of course a parallel between drugs having been over-allocated as listed in table 37 and the ratio of over-allocation as derived from the comparison between the 1981 drug allocation and the 1983 drug utilization study (table 33). Of six drugs in which the ratio between allocation and average use is more than 2.0, five appear again in table 37 as having been overallocated in at least five institutions. While this could have been expected, the fact is striking that, of six drugs or therapeutic groups that have been mentioned in table 29 as drugs selected by personal preference or committee decisions rather than being supported by results of the 1980 inquiry, *four* re-appear in table 37 as drugs having been greatly over-allocated! This shows that drugs for which no general needs emerged from the inquiry were, indeed, hardly used outside a few institutions. This shows that there is a relation between the rate of drug use and the selection of drugs because extreme below-average drug use may indicate low priority.

)* This observation was made during the drug utilization study. Specified data on drug use in individual hospitals could not be included in this book.

Table 37. Drugs that were greatly over-allocated to at least five of seventeen CHAG institutions with ratio of average over-allocation and analysis of underlying decision.

Drug	*Over-alloc ratio**	*Decision influenced by*	*Comment on decision*
antibiotic eye-ointment	5.32	comm**/CBM***	CBM advise; no data available by then to estimate the needs.
thiopentone sodium inj. □	3.69	comm.	allocation (and choice?) based on Agogo consumption pattern (surgery?).
novamin sulphone inj.	2.86	46% inq. '80	
anaesthetic ether □	2.67	comm.	
pyrimethamin tab. □	2.01	comm/phar	apparently use in Agogo and Dormaa is not representative for other institutions.
ergometrin inj.	1.74	69% inq. '80	
antibiotic syr. □	1.43	comm.choice	pen.syrup: 10-15 x too much chl.phen. 1.9 x too much epidemiological variation.
diethylcarbamazine tab. □	1.31	comm./pharm.	
pethidin inj.	1.14	96% inq. '80	no reliable data available; variation in consumption rate?

□ Drugs that were mentioned in table 29 as being selected without support from the 1980 inquiry

* Over-allocation ratio is the ratio between the actual allocation and the average use per 10.000 total OPD consultations (see table 33)

** comm. = drug committee decision not supported by results from the 1980 inquiry

*** CBM = Christoffel Blind Mission who donated essential drugs valued at DM 500.000 on the condition that antibiotic eye ointment should be included

The two drugs that were included in the 1981 list of essential drugs with low scores both in the 1980 inquiry and in the literature, that did *not* reappear as being greatly over-allocated, are diazepam, which was under-allocated and tuberculostatics that were mildy over-allocated. **In all other cases the selection of drugs from table 29 was not justified, or at least not in the quantities that were finally allotted.**

Coming back to table 37 some of the items will now be discussed separately. The case of the antibiotic eye-ointment seems clear: the committee made the mistake of not including it in the 1981 list, after having forgotten to include it in the 1980 inquiry; this mistake was corrected by CBM when donating a large quantity of essential drugs on the condition that antibiotic and atropine eye-ointments would be included; the necessary quantities were only roughly estimated as by then no reliable data were available, and too much was put into the basic distribution unit. However, there is another side to this mistake: the author, who was by then the only medical officer on the committee, hardly ever saw an eye-patient, as attached to the Agogo hospital there is a

big eye department with two ophthamlologists in attendance. This explains in part why the need for the selection of an antibiotic eye-ointment could have escaped the attention of the committee; moreover, as the operation of the eye department is completely independant from the general hospital, no consumption data on eye-ointments appeared in the general Agogo store records and this is an additional reason as to why they might have been lost sight of.

A somewhat similar thing happened in regard to the anaesthetics. Perhaps the author had unconsciously in mind the role anaesthetics and novamin sulphone injection play in Agogo with its big specialist surgical department, and this might have been an extra reason to include these borderline drugs in the 1981 CHAG list. Certainly the higher rate of consumption in Agogo pushed up the quantity that was chosen for the basic unit, although the existence of fixed, rather large minimum packing quantities was also a factor.

These examples show that a hospital with specialist departments constitutes a bias when measuring drug utilization with the intention to estimate drug needs for a group of non-specialist institutions.

The case of the antibiotic syrups also needs some explanation. For economy's sake penicillin and chloramphenicol syrup were chosen for the 1981 list; this was based on the assumption that, in many cases, ampicillin syrup could be replaced by the much cheaper penicillin with the chloramphenicol syrup on hand for serious cases. However, the use of penicillin proved to be extremely low and informal contacts with member institutions revealed that prescribers were not happy with it. This is an example which illustrates that changing prescribing patterns from above is not easy. The decision to exchange the two syrups for ampicillin on the 1983 list seems to have been justified.

To summarise, the committee's personal choices as shown in table 29 have been of limited value. A specialist hospital is not an optimal basis on which to estimate the drug needs of a group of non-specialist institutions.

V.4.3 Evaluation of methods

1) Introduction

Discussing the results of the CHAG system of allocation we have already slipped into discussing some of the methods used.

In general one can say that the results have been acceptable, with at least two thirds of the drug quantities being sufficient in view of the objectives set. Though the results as they stand are acceptable one may still attempt to evaluate the methods used and see whether any lessons can be learned from them. It might even be the case that satisfactory results were achieved despite serious errors in the methodology. The issue to be discussed can be summarised as follows: effectivity being established, how was the efficiency? In other words, could we have done better or could we have arrived at the same results with less effort?

The main elements of the method of allocation, it will be recalled, where the distribution of supplies in standard packages and in specified quantities according to categories of size. These categories have been defined within three parameters: number of beds; annual number of sick OPD consultations; annual number of deliveries (table

12). The reasons for choosing these parameters have been given in section III.3. We will first try to evaluate the use of these categories by discussing the selection of parameters for hospitals and clinics. Secondly, the use of only four categories of size will be evaluated.

2) The selection of parameters for hospitals

Each parameter used should ideally express a clearly defined separate factor in the rate of drug use. To evaluate the parameters to this criterium would require more specified data on drug consumption as related to various categories of patients (e.g. out-patients, in-patients, preventive services etc) than the drug utilization study can offer. The reason for these data not being available, as has been mentioned before, is that drug use was measured at the central drug store level of which drug flow to different categories of patients cannot be measured separately.

Table 38. Statistical data for 14 CHAG hospitals for which complete and reliable data over 1981 and 1982 are available. For comparison data on 19 CHAG clinics over 1982 have been added.

	8 large hospitals	*6 small hospitals*	*19 clinics*
Total OPD consultations x 1000	2 044	725	1 170
Av.number of beds per institution	151	101	15
Av.number of total OPD consultations per year	128 000	58 000	62 000
% Sick OPD	**71%***	**58%***	59%
Beds per 10.000 total OPD	**12**	**17**	2.4
Beds per 10.000 sick OPD	17	30	4.1
Av.number of admissions per year	5 000	3 700	
% Admissions per total OPD	**3.9%****	**6.5%****	
% Admissions per sick OPD	**5.5%*****	**11.0%*****	
Admissions per bed per year	33	37	
Av.number of deliveries per year	1 360	620	525
% Deliveries per total OPD	1.5%	1.8%	1.5%
% Deliveries per sick OPD	1.1%	1.1%	1.1%

* significant ($p<0.02$), Students t-test: $t=2.728$
** significant ($p<0.01$), Students t-test: $t=5.183$
*** significant ($p<0.01$), Students t-test: $t=3.518$

Another procedure which could be used to establish the effectivity of the parameters is to analyze whether the figures in some categories of patients might be related to each other. The method of evaluation used here will be to survey all categories of patients insofar as they have been differentiated in CHAG statistics and to see whether their effect on drug use has been sufficiently expressed in the choice of parameters.

The first question to be answered here is whether it was justified to omit the parameter "in-patients" or "admissions", the reasons for which were that the recorded figures were unreliable because its definition is subject to variation and that the actual number of admissions, when strictly defined, would be a more or less constant fraction of the number of out-patients (III.3).

To check on the veracity this assumption the hospital statistics of 14 CHAG hospitals that were both reliable and complete over 1981 and 1982 have been combined. The group has been divided into smaller and larger hospitals with 50.000 sick OPD consultations per year as the limit between the two groups (table 38).

Three main differences can be observed. The first difference is that smaller hospitals show a lower percentage of sick out-patients than larger hospitals (58% versus 71%). This difference is significant ($p<0.02$). In other words, in smaller hospitals a larger proportion of the total out-patient numbers is accounted for by "preventive" services such as child welfare clinic and ante natal controls. A second observable difference is that in smaller hospitals the bed/OPD ratio is higher than in large hospitals (17 versus 12). This means that in smaller hospitals more beds are available in relation to fewer OPD patients. The third observation to be made, which is related to the second, is that in smaller hospitals the number of admissions is 11% of the sick OPD number as compared to 5.5% for larger hospitals. This difference is also significant ($p<0.01$). This means that in smaller hospitals a larger proportion of the sick out-patients is indeed admitted.

The result of these differences between smaller and larger hospitals is that smaller hospitals have *per number of sick OPD* both relatively more preventive services and more admissions. The choice of taking sick OPD as a measure for drug consumption seems therefore not a fair one as it puts smaller hospitals in a disadvantageous position.

To reflect in brief on the practice of the CHAG system, the effect has not been dramatic as in many small hospitals the relatively high number of beds (when compared to OPD) has resulted in the up-grading of the hospital to a higher category, especially in upgradings from B to C. This shows that the number of beds has been a more important factor than the committee ever realized.

The conclusion is that sick OPD is not a fair criterium for estimating drug needs as it puts smaller hospitals in a disadvantageous position. This effect can be compensated for by taking as well the number of beds as a criterium.

We can ask ourselves whether the total number of OPD consultations would be a better parameter than the number of sick OPD consultations. The smaller hospitals have a lower percentage of sick OPD (58%) and a higher percentage of admissions (6.5%) while the larger ones have a higher proportion of sick OPD (71%) and relatively fewer admissions (3.9%). If categories of size and therefore drug allocation would be related to total OPD the smaller hospitals would have proportionately more admissions and the larger ones would have proportionately more sick OPD. As both admissions and sick out-patients are likely to need more drugs than the average "total

OPD" patients these extra claims on supplies could at least compensate each other. In other words, an imaginary extra reserve would then, in smaller hospitals, be used for the extra proportion of admissions while in larger hospitals it would be necessary to meet the needs of the extra proportion of sick OPD consultations.

An attempt can be made to estimate the degree to which these two effects could compensate each other. Per 100 total OPD consultations the difference in drug use of (71-58) patients, being the extra number of sick out-patients in larger hospitals, should ideally be compensated for by that of (6.5-3.9) extra patients being admitted in smaller hospitals. This would be the case when an admitted patient would need 13/2.6 = 5 times as many drugs as an out-patient. This is not an unreasonable assumption, so we can state that whenever total drug needs are related to the total number of out-patient consultations the effects of proportionately more admissions in smaller hospitals are more or less compensated for by those of proportionately more sick out-patients in the larger hospitals.

The conclusion is that when no other parameters are used the total number of out-patients ("total OPD") is a better parameter for estimating drug needs than the number of sick out-patients ("sick OPD").

We will now concentrate on the question whether the number of admissions would not be a better parameter to express in-patient care than the number of beds. It should again be stressed that the data on the number of admissions have to be used with caution.

We have seen that in smaller hospitals a larger proportion of sick out-patients is admitted than in larger hospitals. This difference was significant ($p<0.01$). This means that the number of admissions is insufficiently expressed by taking the number of sick out-patients as a parameter. Therefore, in one way or another, in-patient care has to be translated into a separate parameter.

The CHAG has done this by taking the number of beds into account. As the number of admissions per bed is more or less the same for smaller and for larger hospitals (see table 38) this seems to be not a bad approach. The lack of reliable data on admission numbers prevents any further conclusions on the question as to whether this was the best possible decision. No hard evidence is available to prove that one of the two is better. The observation that the number of admissions is an unreliable figure, as no straight definition of "admission" exists, remains valid although it cannot be further tested. As for smaller hospitals both number of admissions and number of beds are higher per number of out-patients, it probably does not make much difference which of the two is considered as a parameter. In this situation secondary criteria start to play a role. **As the number of beds is the more uniform, the more stable and the better verificable it seems a more easy and reliable parameter to use to estimate the role of in-patient care in quantifying drug needs than the number of admissions.**

There remains a brief discussion on the remaining categories of patients. The number of child welfare clinic attendances is badly correlated to any other category of patients. In a group of 41 CHAG institutions with reliable relevant statistics over 1982 no significant correlation with any other category of care could be established. A reason for this might be that the term child welfare clinic or under-fives clinic is not very well defined. Are these only *healthy* children under five or simply all consultations involving children under five, including the sick? The CHAG system considered their collective drug use in the case of the former as negligible and in case of the latter as a

proportionate spin-off of the sick out-patients. Because we are confronted with a vague definition it might be better to use the total number of out-patients, so that all consultations are counted.

The number of ante natal controls shows a very high correlation with the number of deliveries in 28 CHAG institutions on which reliable data are available over 1982 ($r=0.86$, $p=0.000$). In the CHAG system the number of deliveries was used as a parameter so that this category of care has been expressed sufficiently.

The number of deliveries itself shows a high correlation with the number of sick out-patients in 32 CHAG institutions over 1982 ($r=0.72$, $p=0.000$). This means that information according to this parameter has a tendency to follow that on the number of sick out-patients. Correlation between the number of deliveries and the total number of out-patients is, regrettably, not known but the fact that the number of deliveries is around 1.1% of total out-patient numbers in both large and small hospitals and in clinics (see table 38) suggests that the number of deliveries is probably also correlated with the total number of out-patients. For this reason one could consider leaving out the number of deliveries as a separate parameter.

The number of major operations show high correlation with the number of beds in 16 CHAG hospitals for which data were available over 1982 ($r=0.71$, $p=0.0001$). As such, it was expressed within the CHAG system of allocation although the committee did not realize this and had discarded the data as being badly defined and strongly dependent on motivation and the skill of available manpower.

In summarizing we can say that the parameter "number of beds" expressed both the number of admissions and the number of major operations, and that the parameter "deliveries" expressed both the number of deliveries and ante natal controls and followed the parameter "sick out-patients". The number of under-five consultations is not very accurately expressed by any of the parameters, yet its drug requirements are not specific enough to make the introduction of a separate parameter necessary, especially if the parameter "total number of out-patients" is used.

The conclusion reached is that the three parameters used, the number of beds, the annual number of deliveries, and the annual number of sick out-patient consultations, sufficiently represent the various categories of patients, although using the total number of out-patient consultations instead of the number of sick out-patient consultations should be considered.

3) The use of parameters

Something has to be said on the use of the parameters in relation to clinics. Within the CHAG system there was no clinic with more than 50 beds, so that the parameter "beds" was never of any use. This is of course related to the fact that in clinics no emphasis is placed on in-patient care apart from emergency and maternity cases.

As the number of deliveries (and the number of ante natal controls) seems strongly related to the number of out-patients, one could ask oneself whether this parameter could not be left out as well. **Much is to be said in favor of using a single parameter in the case of clinics, dispensaries and rural health programmes.** Because the percentage of preventive services can safely be assumed higher in these institutions than in hospitals and because differentiation between sick out-patients, ante natal controls and under-fives both in practice and in statistical recording will be less, it is more logical to take the total number of out-patient consultations as a parameter to express the use of and the need for drugs and medical materials.

This has in fact been done in the essential drugs programme in Kenya[7] and Tanzania[8] and in the publications by Walker[107,111]. As mentioned before, a recent WHO working group on the estimation of drug requirements[74] advised that drug needs should be expressed per 1000 Treatment Episodes. The working definition was put at: "each patient contact for an episode of illness, requiring a new course of treatment". Patient contacts for ante natal controls and under-fives requiring treatment are included. Although it remains unclear how healthy under-fives are counted, the CHAG description of "total number of out-patients" comes very close to this new concept, the application of which seems very useful in respect to basic out-patient care. **It is advisable to use "total number of out-patient consultations" or "treatment episodes" as a single parameter both for hospitals and clinics and rural health programmes. For institutions with in-patient care "number of beds" can be used as a supplementory parameter.**

4) The use of four categories of size

The committee decided to establish four categories of size for allocating drugs and medical materials. The question as to whether this was optimal has to be answered. Going from one category to the next implied an enormous difference in allocated quantities (from D to C meant a three-fold and from C to B a two-fold increase). The alternative could be to establish more than four categories, e.g. ten. The problem arises that in such a system one could hardly use more than one quantitative parameter without running into serious trouble in indicating the relative value of, perhaps, contradictory parameters. Such a system could, in fact, only work with one parameter and that could then only be the total number of out-patients, as we have seen in the previous section. That would imply that categorisation would run parallel to total number of out-patients, e.g. one unit per 10.000 total out-patient consultations or so. This system was considered but has been decided against for the time being, for two reasons. The most important reason is that it would become very attractive to make annual statistics a bit more favourable in order to receive one or two units more. Secondly, it would have made the categorization rather unstable and would require yearly adjustments. In general it would give rise to continuing discussions and negotiations.

The disadvantage of big jumps in allocated quantities has been accepted by the committee because it was never claimed that the method of calculating and distributing drug quantities would be accurate. In fact a variation of at least ± one third was assumed. In general the idea was to calculate minimum quantities and to create a reserve capacity by using the inaccuracies of rounding up figures for the quantities per distribution unit and categorization in four categories. For this reason any rounding up and any doubtful categorization has received the benefit of the doubt. It is very well possible that, more than anyhing else, this decision has compensated for all possible shortcomings. It might also explain why more drugs have been over-allocated than under-allocated.

The conclusion reached is that the use of four only categories for distribution has here been acceptable as long as the accuracy of the rest of the allocation system was not known and as long as borderline cases received the benefit of the doubt.

For this reason few complaints have been received. The system was considered accurate enough and nearly all the institutions accepted it readily. Being rather stable it was very useful, not least for the staff in the CHAG warehouse who could use the system any time materials had to be allocated (see section III.5).

5) Conclusion

Concluding the evaluation of results and methods of the CHAG system of allocation we can say that two thirds of all drug allocations have reached the set objective with a slight tendency towards over-allocating. Under-allocating was mainly observed in hospitals with extremely high levels of drug use. Over-allocating was partly due to the lack of information in the case of some particular drugs, to selection of drugs of low priority, and to the fact that the selection and the quantification of drug needs were in some cases based on data from a specialist hospital. A more general reason was that, purposely, a certain reserve was created by rounding figures up in case of doubt.

Regarding the choice of the parameters to define the four categories of size we can say that these parameters have sufficiently expressed the various categories of patient care within hospitals. It is preferable to use the parameter "total number of out-patient consultations" instead of "number of sick out-patients consultations". This is the case in particular for clinics, dispensaries and rural health programmes in which the total number of out-patient consultations can be used as a single parameter. For institutions with in-patient care the number of beds can be used as a supplementary parameter. The use of "total number of out-patient consultations" comes very near the recent WHO advise to relate basic drug needs to the number of "treatment episodes".

The use of only four categories of size for allocation purposes has made the system stable and easy to use and was acceptable as long as borderline cases received the benefit of the doubt. It gave rise to a certain degree of over-allocation.

V.5 Summary of the conclusions

V.5.1 Selection of drugs

Whenever use is made of an inquiry to select drugs, this inquiry should be well-prepared. Whenever a choice is offered, this choice should include all possible alternatives. The results of such a drug inquiry cannot be used indiscriminately as the basis for a drug programme as it is an expression of general prescription patterns which are not necessarily optimal (V.2.3.*2*).

Literature on essential drugs lists contains important information when compiling or checking a list of essential drugs (V.2.3.*3*).

Before compiling a list of essential drugs, its objectives in regard to target group (clinic, health centre, hospital) and aim (restrictive, selective or budget-bound) should be clearly defined (V.2.3.*4*).

The 1981 CHAG list of essential drugs was influenced too much by existing preferences and budgetary limits and was insufficiently based on literature on the selection of essential drugs (V.2.3).

V.5.2 Quantification of drug needs

The 1981 CHAG drug need estimates show optimal correlation with the results

of the 1981-82 drug utilization study, both in ratio between the values and in their average level (V.3.2).

In obtaining these results, the use of the "consumption-based" method has been the only realistic alternative. This method assumes negligible epidemiological variations and variations in time; it measures actual drug use which is the drug use within existing patterns of coverage, prescription and losses (V.3.3.*1*).

The carefully chosen sample of two hospitals has been representative for the total group of seventeen institutions; this group can be considered as representative for the total of 66 institutions (V.3.3.*3*). In chosing the sample a standard is set in which the two elements, representativity and desirability, can not always be separated (V.3.3.*2*).

V.5.3 Allocation of drugs

The CHAG system of allocation has achieved that in two thirds of cases allocated quantities of drugs have been sufficient, with a slight tendency to over-allocation (V.4.2).

The parameters used to define categories of size have sufficiently expressed the various types of patient care (V.4.3.*2*). The system could be simplified by introducing "total out-patient consultations" or "total treatment episodes" as single parameter for all types of health institutions, to be supplied with the parameter "number of beds" for hospitals (V.4.3.*3*).

The system of allocation according to four categories of size has been effective as long as borderline cases have received the benefit of the doubt (V.4.3.*4*).

Chapter Six

DISCUSSION

Of the many essential drugs lists that have been published it is hardly ever known on what grounds they have been constituted. The list of Simmonds and Walker[107] in which the selection of drugs is based on the demand-morbidity method, is the best and very nearly the only example.

The analysis of the decisions leading to the 1981 list of the CHAG and its 1983 revision is instructive. We have concluded that the results of drug inquiries have to be used with caution as they tend to express a collective pattern of prescription that is not necessarily optimal. A second conclusion was that personal preferences of the drug committee and the feedback from representatives from the institutions which were intended to adapt the results of the inquiry into a workable set of essential drugs did not produce an optimal effect either. Knowledge of available literature is an essential element in checking whether proposed essential drugs lists are complete and whether all proposed drugs are really necessary.

The summary of essential drugs lists for use in Africa as given in section I.3 can be a very useful instrument to any person or group of persons involved in preparing a list of essential drugs. It seems likely that, for the common range of diseases of poverty that constitute such a big proportion of the health problems in Africa, a core list of essential drugs could be applicable to the needs of nearly all sub-Saharan countries. Epidemiological variation is likely to occur in respect to some specific tropical infections only, of which schistosomiasis and onchocerciasis are typical examples. It should however be realized that drugs against these conditions are usually not regarded as "core" drugs but as drugs "just outside"; the decision as to their inclusion should be made on the basis of local conditions. The core list of 29 "most essential drugs" (table 2) is to be used as a starting point. It is interesting to note that both the Kenyan[7] and the Tanzanian[8] list contain 27 of the 29 core drugs and very few others (table 27).

The first six items on the core list, being drugs found on more than 75% of all available lists, can be considered as the "kernel in the core". This might be illustrated by the fact that recently a small range of drugs has been selected for village health workers in Yemen which includes exactly these six drugs plus piperazine and multivitamin[74].

The core list can be used to check in how far a given drug list corresponds with other lists from Africa. If this process of checking would have been possible for the CHAG Drug Committee, the 1981 list would have been much better insofar as the choice of drugs was concerned.

The three methods discussed of quantification of drug needs are not always equally useful or easy to carry out. To calculate future drug needs for a country as a whole irrespective of the coverage by existing health services, the population-based method is to be preferred. It assumes that reliable epidemiological data are available and the results produced are useful in long-term planning.

For developing countries the service-based or demand-morbidity method is to be preferred, mainly because it produces results that can be used immediately and are also preferable, as an optimal pattern of prescription and losses is assumed. It is an idealistic method because it implies taking action against overprescribing and pilfering and because it has as its ultimate objective the responsible use of scarce resources. An extensive programma of training and re-training of first-line health workers in the use of a limited range of essential drugs in reasonable quantities is essential to optimal effectivity. Experience with such a programme has been gained in Kenya[7,45,46,207] and a similar programme has been planned for Tanzania[8,49,143]. The source of the morbidity data which are used as basis for the drug need quantification is the Achilles heel of the method. It is very difficult to obtain reliable and comparable data from a large number of health institutions and, in particular, from a whole region or country. The main problem is that at primary health care level usually symptoms instead of diseases are treated. The lack of a strict diagnoses and, in most cases, the recording of symptoms alone make morbidity records fragmentary and can even be misleading in the event that recorded symptoms are, in a later stage, translated into diagnoses.

This situation leaves only two possible procedures of data collecting open for the demand-morbidiy method. The first method is to study a carefully chosen sample of a few institutions in which recording is optimal. This has usually been the method used. A second, more long-term possibility is to devise a simple record form listing a set of symptoms/diseases running parallel with a standard treatment regime that in its turn runs parallel with a set of essential drugs. This close combination of drugs, standard therapy manual and record form, together with a forth element in the form of a wall-chart[160] listing all essential drugs, indications for use, necessary precautions and standard dosage as standardized information both for health workers and the general public, is probably the better and is at present being tested in the Tanzanian programme.

The demand-morbidity method cannot always be used, e.g. in the case of lack of reliable epidemiological data or lack of morbidity records from health institutions, or when no possibility exists of inducing a rationalization of the existing prescription pattern, because without this rationalization drug supplies will run short. For the CHAG both these elements presented problems. In our case-study reliable morbidity data were not available and, even more important, the CHAG is not a governmental body with legislative power but a voluntary association of church related hospitals and clinics. As has been shown, the prescription pattern between the institutions varied. In accepting the assignment to plan and coordinate drug supplies for its member institutions it was neither possible nor acceptable for the CHAG to express a strong opinion on overprescribing. The CHAG is a Ghanaian organisation of Ghanaian health institutions serving the Ghanaian population. Therefore the expatriate advisers on the drug committee had to be careful in gainsaying a Ghanaian manner of prescribing when the need to change it was not felt. We have indeed seen that both in selection and in quantity of essential drugs the CHAG not only had a tendency but, to a degree, also had the duty to accept more or less the existing situation.

A final point to be considered in weighing the service-based method against the consumption-based method is to be found in the nature of the health institutions to be served. The East African programmes concentrate solely on dispensaries and health centres. The consumption-based method would probably not have been possible, as

stock administration is usually lacking in these institutions and shortages frequently occur. Some form of morbidity records is more likely to be present and can serve as a basis for calculating drug requirements. The CHAG drug programme on the other hand has mainly concentrated on hospitals. Estimating future drug needs by means of the demand-morbidity method might very well be increasingly difficult in the case of an increased number of diagnoses and necessary drugs. It remains to be proved that the method is applicable at all to hospital care involving a range of 60-80 drugs. Up till now (1984) no example has been recorded. In Ghana we preferred to use the consumption-based method and this study indicates that it can work. It would be interesting to have for comparison an example of drug need estimates for hospitals obtained through the demand-morbidity method.

Distinguishing between the two levels of drug use has been very useful and this may give insight into the order of difference between the prescribing by Ghanaian and by expatriate doctors, and its financial consequences. It also preserves the option to choose which of the two prescription levels to accept as a standard for the allocation of drugs. This is information useful to both health planners within the country and to donor agencies be they governmental or voluntary.

Just as it seems likely that the core list of essential drugs will be useful to other sub-Saharan countries, it might very well be that the drug requirements per number of treatment episodes for these core drugs are also more or less the same for countries in a situation comparable to Ghana's. This hypothesis can however not be tested with the data presently available. Some difference in the general level of drug need estimates exists between the demand-morbidity calculations from Tanzania and Kenya and the consumption-based results from Ghana, but these differences are not impressive. The CHAG drug use for the lower prescription level as observed in expatriate doctor hospitals has to be put at about 70% of the average CHAG figure for hospitals in general (see table 23) and this 70% level comes very close to the level calculated in the studies made in East Africa (table 32).

We can conclude that a service-based calculation of drug needs which assumes an acceptable pattern of prescription and losses, comes very close to the observed low-level variation in observed drug use in Ghana.

An interesting conclusion to be drawn from this study is that the carefully chosen sample of two hospitals made it possible to predict fairly accurately the drug use in seventeen institutions over the two years following. We cannot draw a definitive conclusion and state that this will always be the case in other sub-Saharan countries, but the fact that it has been possible in Ghana can lead to the indicative conclusion that it might very well be possible elsewhere. Assuming it is possible would make measuring drug use in other countries an easy and hardly labor-intensive exercise.

It would be very interesting to perform drug use measurements according to the method described in this study in some selected health institutions in other sub-Saharan countries. If the use of essential drugs in several other countries was found to be of the same order as that indicated by the results from Ghana it would constitute a strong argument in favour of the hypothesis that requirements of the most essential drugs are more or less uniform in sub-Saharan Africa.

The last word has not been spoken on the subject of allocation and distribution of essential drugs. It is only since 1981 that a hesitant start has been made in establishing systems of distribution based on standard packages. The eighties will probably see more use made of it as it seems at present the most promising procedure to supply rural health institutions in an easy and practical way. Probably the most substantial advantages of the system are that it recognises that rural health facilities have a right to their own fair share of health resources, and the complete separation from the supply of district hospitals.

Allocation using standard packages will nearly always generate a certain surplus of some drugs. This "loss" is inherent in the method and is even so readily acceptable as the advantages of the system carry much more weight. Nevertheless these losses will increase as the system is perfected and as interruptions to the flow of supply diminish. The better the system works the more the need will arise to incorporate a mechanism of correction to compensate for these losses. This would most likely lead to a system of returning surplusses or of exchanging surplus drugs for other drugs. This would complicate the system extremely. Moreover, it would only work whenever the drugs from the standard package have had to be paid for and the exchange also takes place on a monetary basis. With drugs distributed free of charge it is unlikely that surplusses will ever be returned.

For the CHAG the drug needs were so urgent and reserve stocks in the institutions so low that this point of returning surplusses hardly ever came up. Moreover, the drugs were either donated or sold to the CHAG institutions at low prices. If a permanent drug supply for hospitals would be established using these standard packages a mechanism for the returning of surplusses would have to be established. This would imply the need for qualified personnel in the CHAG office and warehouses.

No other experience with the system of allocating a number of distribution units dependent on size of the receiving institution, as has been practised in Ghana, has been reported. In most studies the quantities of drugs have been related to a fixed average size of institution, e.g. dispensaries of 2000 and health centres of 3000 treatment episodes per month in Kenya[46]. The CHAG system, with its four categories of size, was rough but satisfactory as it deliberately created certain reserves. If it were to be used on a long term basis it would certainly need a system to enable its adjustment or for the exchange of surplusses as has been mentioned above.

As the supply of essential drugs using standard packages will probably be practised more and more, the need will arise to refine the system. The drug needs of an individual health station can for this purpose best be expressed by calculations based on the number of treatment episodes. In the case of the presence of in-patient care as well (e.g. hospitals), the number of beds can be used as a second parameter.

The difference between the CHAG system and the East Afrian programmes can be summarized as follows: the CHAG system has concentrated more on hospitals, while the East African programmes concentrate exclusively on dispensaries and rural health centres. The CHAG system worked with a four-tier system of allocation based on size of the institution while the East African system worked with fixed quantities per type of health station.

The question as to whether drug use in the CHAG institutions has changed, or more precisely, has increased after having received essential drugs in sufficient or even gen-

erous quantities is a subject of interest and worthy of future study. Such a study would give a final insight in the effectivity of the essential drugs programme. It is to be hoped that the six-months quantities that have been distributed have not induced a higher rate of prescription and of losses. If this should prove to be the case the conclusion would have to be made that drugs should be distributed in smaller, e.g. one-month quantities with all the consequent management problems.

Africa is in confusion. Colonial powers have left but their influence has been strong enough to destabilize most of the traditional values[208]. What is left is not a harmonious new entity but a mixture of old African traditions and incohesive pieces of western civilization from which the Africans are still engaged in selecting the elements they like.

Drugs are an important factor in speeding up the process of the disappearance of diseases, the incidence of which is already decreasing because of social and hygienic improvements[63,209]. In Africa the antibiotic bullet is still very effective in reducing morbidity and mortality. As a consequence the "pills for all ills" have not failed to make their impression. It is however necessary to realize that the African has, in fact, little reason to appreciate the form western medicine has taken in most of his villages.

> "Why should I waste time going to the clinic while I have something to do. You spend hours waiting to see the doctor and when you finally see him he may not even look at your face let alone examine you. He simply writes something and tells you to go and collect some medicine which almost always turns out to be APC or codeine".

This quotation from a patient who treated himself at home instead of going to a clinic was made by Gabriel Fosu[210] from Ghana. The scant ritual associated with western medical treatment[211] and the formal and mechanistic approach to disease without connection to its cause[210], in addition to the sometimes rude treatment in general are frequent complaints and are often the reason that patients consult a doctor only in a later stage of the disease, if at all. Even then patients often do so only for symptom relief while they trust the traditional healer to effect the actual spiritual cure[210,211]. In this way the function of western medicine has been reduced to treatment of symptoms and the observation seems true that *confidence in western drugs is greater than confidence in doctors*[211]. The doctor is a necessary adjunct to the distribution of medicines.

This can give us a better understanding of what Van der Geest[119] called the "third field of medical behavior" (besides traditional and western medicine): modern self-care, over the counter medicine, injection doctors etc. This behavior constitutes an example of the confused African balancing between traditional and western values. The advantages of this "third field" are many: its services are omnipresent, quick, and not stressful as usually no social distance exists[119,212,213].

It should be realized that this third form of medicine could very well be a typically African answer to meeting health needs, born of the unhappy marriage of Africa and the western world. The general concept of this third form of medicine should not be discarded too quickly as it has already been considered as a possible way to improve drug supply to rural areas. Morley[214] mentioned the possibility of re-training pharmaceutical retailers to treat some basic diseases, Van der Geest in another publication[118] mentions this as a viable possibility in view of present drug shortages, the logical preference for self care and the unavailability of qualified medical services, and Mozam-

bique seems to have started with licensed shops selling subsidized essential drugs over the counter[36]. Experience with "pro-pharmacies" in Cameroon has lead to the recommendation that these should be private enterprises with a reasonable profit margin[215].

It was necessary to mention all this in order to make us aware of the relative value and limited impact of our western medical system in Africa. This study has described and evaluated the activities of the CHAG in trying to supply its member institutions with sufficient essential drugs. Whenever one accepts the presence and value of mission hospitals with their external resources, partly expatriate staff and western influences, it is also understandable and acceptable that these institutions try to function optimally according to technological concepts of efficiency and effectivity. Therefore the activities of the CHAG drug committee were a consequence of the presence of mission hospitals and church related health care. The justification for the CHAG activities and also for this study is subject to the justification of the role that churches, with their overseas connections, play in Africa.

Church related health institutions have existed in Ghana for nearly a hundred and fifty years[189,190,216]. They contribute about one third of all public health care[193] and are generally well-accepted[217,218], both by the general public and by the government. They have the duty to be pioneers[219], to be wherever the local government cannot (yet) be[86]. They should translate love for one's neighbour into health terms and should pursue justice in health[157]. In a paper from the Christian Medical Commission of the World Council of Churches their activities have been summarised as: "supportive action in favor of those who are socially, economically or geographically marginal, and action to stimulate a government to a policy of a spirit of justice and equity"[157]. In practice church related health care should offer a limited range of cost-effective medical approaches, should offer possibilities for adapted locally applicable training and should always keep an eye open for social injustices[218].

The relations between the western and the Ghanaian churches or, in general, between the western and the African countries should be characterized by what Soeteman[220] called a "critical dialogue", a third stage after a first historical phase of patronage and a second phase of keeping silent at a distance. This critical dialogue is possible as part of an open relationship not confused by feelings of superiority or inferiority and without false modesty. As part of such a dialogue between equal partners this study can be justified. It can offer some information which could serve as a tool for the use of health planners in African countries that have chosen to meet the basic needs of the majority of the population.

SUMMARY

The concept of a selection of essential drugs to satisfy the health needs of the majority of the population developed in the seventies and is being taken up by more and more developing countries. Many lists of essential drugs have been published. The number of publications on the quantities of essential drugs that are necessary is however very limited.

The Christian Health Association of Ghana Drug Committee studied the essential drug needs for 66 church related hospitals and clinics in Ghana which constitute more than one third of all public health care available in the country. It concentrated on three main questions: which drugs should be considered essential, how much of each would be necesary, and how could they be distributed using the existing logistic means?

To find out which drugs were essential an inquiry was held to which 75% of all institutions responded. Based on the results and on feed-back from all pharmacists from the institutions the committee drew up a list of essential drugs.

To define the quantities of these drugs that would be necessary, drug use in a chosen sample of two hospitals, Agogo and Dormaa, was measured. This measurement was performed using the *consumption-based method,* by adding up all drug quantities issued by the central hospital store and linking these drug use data with the number of out-patient consultations in the same period. Selection criteria for the sample were: sound management resulting in an effective administration of stores and drug supplies, reliable patient statistics, a rational and supervised pattern of prescription by screening nurses, medical assistants and junior doctors, a continuous stock of essential drugs and a limited risk of exessive losses.

All drugs for the relief programmes were obtained through overseas suppliers. It was decided to have them prepacked in standard units. Each unit contained calculated quantities or different essential drugs. Health institutions were divided into four categories of size receiving 1, 3, 6 or 10 basic units. Every unit was calculated as being enough for 10.000 out-patient consultations which should be sufficient for about six months. Certain reserves were built in. During 1982-83 several drug conseignments were distributed to all CHAG institutions according to this system.

To check whether the allocated quantities had been correctly estimated a drug utilization study was performed over two administrative years (1981-82) involving 2.5 million patient contacts. These data were also collected by the consumption-based method in fifteen hospitals and two clinics. The results have been studied by computer analysis. The statistics on average drug use (drug consumption by the patient plus losses by bad prescription habits, pilfering and wastage) in these seventeen institutions is the most reliable recorded information currently available on drug utilization in Ghana. It could be proved that the average drug use in Ghanaian doctor hospitals had been about twice as high as the drug use in expatriate (mostly western) doctor hospitals.

The selection of CHAG essential drugs has been evaluated by means of comparison with a quantified consensus of 38 available essential drugs lists made in or for African

countries. The number of times a certain drug was included in each of these lists was counted. Drugs that appeared on more than 50% of these lists were considered "core-drugs" and called "most essential drugs".

The CHAG list contained at first only 14 of the 29 most essential drugs. After a later revision of the list this was increased to 24. An analysis of the decisions involved in selecting essential drugs for the first CHAG list revealed that the results of the drug inquiry had reflected the existing prescription patterns to a degree that would restrict its overall usage, and that the feed-back from hospital pharmacists and also the inclusion of personal preferences within the committee had not produced optimal results. The conclusion is that knowledge of the existing literature on essential drugs is essential in checking whether proposed essential drugs lists are complete and whether all proposed drugs are really necesary. If this information had been available to the CHAG Drug Committee the list of essential drugs would have been more inclusive.

The list of 29 most essential drugs can be used as a starting point for essential drugs lists in other sub-Saharan countries, to be made up, when necessary, by drugs against specific infections prevalent in the region.

Besides the consumption-based method, two other ways of estimating drug needs are mentioned in the literature. The *population-based method,* used to calculate drug needs for a whole country, irrespective of the coverage of the existing health services, assumes a basis of reliable epidemiological data and produces results that are useful in long-term planning only. The *service-based* or *demand-morbidity* method estimates drug requirements by multiplying recorded morbidity patterns among patients attending health institutions with a proposed standard therapy. It is an idealistic method as it implies taking action against overprescribing and pilfering. An extensive programme of re-training first-line health workers is a precondition for satisfactory effectivity. It is difficult to obtain reliable and comparable data on morbidity pattern of patients in a large number of health institutions. These are usually obtained from a small selected sample.

In Ghana the demand-morbidity method could not be used as no reliable records on morbidity were available and as the CHAG was not in a position to change patterns of prescription. Moreover, it remains to be proved that the demand-morbidity method can be used in hospitals with their many diagnoses and different treatment regimes as, up till now (1984), it has only been practised in the case of drug supply to in dispensaries and health centres.

The 1981 CHAG drug needs estimates have been compared with the three available studies from the literature and with the results of the drug utilization study concerning the years 1981-82. This comparison revealed that the estimates show a very close correlation with the drug use as measured through the drug utilization study both in the ratio between the figures and in absolute size. The general level of the CHAG estimates is a bit higher than that of the results shown in the studies from East Africa, which have all been calculated through the demand-morbidity method. This difference can be partly attributed to the sub-optimal prescribing and the losses that are included in the CHAG consumption-based drug use measurements. It is however interesting to see that the general level of drug use in the "low-level" variety of drug use in Ghana, as observed in expatriate doctor hospitals in the drug utilization study, approaches the level given in the studies from East Africa. This seems to indicate that the required quantities of essential drugs are more or less the same for many sub-Saharan countries, as is the core-list of most essential drugs.

In the studies from East Africa, drugs have been allocated in fixed quantities per type of health institution. In the CHAG system, a four-tier level of allocation was used with a standard selection of 24 essential drugs for all institutions and an extra 10 for hospitals only. To express drug needs as dependent on the size of the institutions three parameters had been used. Analysis of each of these parameters showed that the total number of out-patient consultations is the most useful. It can be used as a single parameter for all types of health institutions. In the case of drug use for in-patient care having to be expressed as well, the number of beds is a simple and reliable second parameter. The parameter "total out-patient consultations" is nearly identical to "treatment episodes", the unit of expressing drug needs proposed by the WHO.

The drug use in seventeen CHAG institutions which can be considered as representative of all the institutions has been predicted by a study in a carefully chosen sample of two hospitals. This indicates that drug use in an entire country could be measured by this method. As very little information is available on the essential drug requirements in other sub-Saharan countries it would be both useful and interesing to collect material from these countries for comparison.

SAMENVATTING

Het concept van een lijst van essentiële geneesmiddelen voor de basisbehoeften van de meerderheid van een bevolking stamt uit de zeventiger jaren en wordt door steeds meer ontwikkelingslanden overgenomen. Hoewel er inmiddels zeer veel verschillende lijsten van essentiële geneesmiddelen zijn gepubliceerd is er weinig bekend over de hoeveelheden waarin deze essentiële geneesmiddelen nodig zijn.

De Medicijnen Commissie van de Christian Health Association of Ghana (CHAG) heeft in 1980-81 de vraag bestudeerd welke geneesmiddelen essentieel zijn voor de 66 kerk-gebonden gezondheidsinstellingen in Ghana, welke tezamen meer dan een derde deel van alle publieke gezondheidsvoorzieningen uitmaken. De commissie heeft zich op drie hoofdvragen geconcentreerd: welke medicijnen moeten als essentieel worden beschouwd, in welke hoeveelheden zijn deze medicijnen nodig en hoe zouden zij gedistribueerd kunnen worden binnen de bestaande logistieke voorzieningen.

Om de eerste vraag te beantwoorden werd er in 1980 een schriftelijke enquête gehouden waarop 75% van alle CHAG instellingen heeft geantwoord. Gebaseerd op de resultaten ervan en in overleg met hoofden van apotheken van CHAG instellingen stelde de commissie een CHAG lijst van essentiële geneesmiddelen op.

De hoeveelheden waarin die geneesmiddelen nodig zouden zijn werden bepaald door het medicijngebruik te meten in twee ziekenhuizen, Agogo en Dormaa Hospital. De meting werd verricht met de zgn. *consumptie-methode*, door alle hoeveelheden medicijnen op te tellen welke gedurende een bepaalde periode door het centrale ziekenhuis magazijn aan de ziekenhuis apotheek uitgegeven waren. Deze hoeveelheden werden gerelateerd aan het aantal polikliniek consulten over dezelfde periode. Selectiecriteria voor de keus van de twee ziekenhuizen waren: een sterke ziekenhuisleiding met daardoor een goede administratie van magazijnen en medicijnvoorraden, betrouwbare patienten statistieken, een rationeel en goed gecontroleerd voorschrijfpatroon door "screening nurses", "medical assistants" en junior doktoren, een ononderbroken medicijnvoorziening en een beperkt risico van diefstal.

Alle medicijnen voor de noodhulpprogramma's in Ghana werden geleverd door overzeese bedrijven. De medicijnen werden voorverpakt in standaardeenheden. Elke eenheid bevatte bepaalde hoeveelheden van verschillende medicijnen. Gezondheidsinstellingen werden verdeeld in vier grootte-categorieën die 1, 3, 6 of 10 eenheden ontvingen. Elke eenheid bevatte voldoende essentiële geneesmiddelen voor 10.000 polikliniekconsulten en de bijbehorende opnames, voor een periode van ongeveer zes maanden. Zekere reserves werden ingebouwd. In 1982 en 1983 werd een aantal medicijnzendingen op deze manier aan alle CHAG instellingen gedistribueerd.

Teneinde na te gaan of de toegewezen hoeveelheden medicijnen goed geschat waren werd achteraf een studie verricht naar het medicijngebruik in CHAG instellingen over de administratieve jaren 1981 en 1982 (2.5 miljoen consulten). Deze gegevens werden in vijftien ziekenhuizen en twee klinieken verzameld volgens de consumptiemethode. De resultaten werden per computer geanalyseerd. Het gemiddeld medicijngebruik (medicijnconsumptie van de patienten plus verliezen door teveel voorschrijven, diefstal en bederf) in deze zeventien instellingen is de nauwkeurigste meting van

medicijngebruik in Ghana die op dit moment beschikbaar is. Er kon worden bewezen dat het gemiddeld medicijngebruik in ziekenhuizen met Ghanese doktoren ongeveer twee maal zo hoog was als in ziekenhuizen met westerse doktoren.

De CHAG lijst van essentiële geneesmiddelen werd geëvalueerd door een vergelijking met een "kern"lijst van 29 "meest essentiële geneesmiddelen"; dit zijn geneesmiddelen die voorkomen op meer dan 50% van een groep van 38 lijsten van essentiële geneesmiddelen die gepubliceerd zijn in of voor Afrika. De CHAG lijst bevatte aanvankelijk slechts 14 van deze 29 meest essentiële medicijnen, maar na een latere revisie steeg dit aantal tot 24. Een analyse van de beslissingen die ten grondslag lagen aan de eerste CHAG lijst bracht aan het licht dat de resultaten van de medicijnen enquète teveel een uitdrukking waren van de bestaande voorschrijfpatronen om zonder meer te kunnen worden gebruikt, en dat overleg met hoofden van ziekenhuisapotheken en persoonlijke inzichten van commissieleden zelf de resultaten niet hadden verbeterd. De bestaande literatuur over essentiële medicijnen blijkt een zeer noodzakelijk gegeven om te controleren of een bepaalde lijst van essentiële medicijnen werkelijk volledig is en of alle voorgestelde geneesmiddelen inderdaad essentieel zijn. Als deze informatie beschikbaar was geweest voor de CHAG commissie zou de CHAG lijst completer zijn geweest.

De kernlijst van de 29 meest essentiële medicijnen kan gebruikt worden als uitgangspunt voor lijsten voor andere landen bezuiden de Sahara. Waar nodig moet deze kern-lijst worden uitgebreid met enkele medicijnen tegen infecties specifiek voor de betreffende regio.

Naast de consumptiemethode worden in de literatuur nog twee andere methodes beschreven om de benodigde hoeveelheden essentiële geneesmiddelen te schatten. De *populatie-methode* wordt gebruikt om hoeveelheden te schatten voor een heel land, onafhankelijk van het percentage van de bevolking dat bereikt wordt door de bestaande gezondheidsinstellingen. De methode gaat uit van de aanwezigheid van betrouwbare epidemiologische gegevens en geeft resultaten die bruikbaar zijn voor planning op lange termijn. De *morbiditeits-methode* schat de benodigde hoeveelheden door een vastgesteld gemiddeld morbiditeitspatroon van een patientenpopulatie te vermenigvuldigen met een voorgestelde standaard behandeling. Dit is een idealistische methode aangezien uitgegaan wordt van actie tegen slechte voorschrijfpatronen en diefstal. Voorwaarde voor goede effectiviteit is daarom een veelomvattend programma van omscholing van eerste-lijns gezondheidswerkers. Het is daarbij moeilijk om betrouwbare en vergelijkbare gegevens te verzamelen over het morbiditeitspatroon van patienten in een groot aantal gezondheidsinstellingen. Gewoonlijk zijn de gegevens afkomstig van een kleine steekproef.

In Ghana kon de morbiditeitsmethode niet gebruikt worden omdat er geen betrouwbare morbiditeitsstatistieken beschikbaar waren en omdat de CHAG niet in de positie was om het voorschrijfpatroon te veranderen. Bovendien is nog niet bewezen dat de morbiditeitsmethode gebruikt kan worden voor ziekenhuizen met hun grotere aantallen diagnoses en verschillende behandelingsschema's. Tot nu toe (1984) zijn alleen voorbeelden bekend van de morbiditeitsmethode waar deze gebruikt is om de medicijnbehoefte voor plattelandsklinieken te schatten.

De CHAG schattingen van de benodigde hoeveelheden medicijnen werden vergeleken met drie gepubliceerde studies uit Oost Afrika en met de resultaten van de studie naar medicijngebruik in Ghana. De CHAG schattingen bleken een zeer goede

correlatie te vertonen met het gemeten medicijngebruik in de twee navolgende jaren zowel in verhouding tussen de getallen als in de absolute waarden ervan. Het gemiddeld niveau van de CHAG schattingen bleek iets hoger te liggen dan de getallen uit Oost Afrika, die overigens alle berekend waren met de morbiditeitsmethode. Dit verschil moet gedeeltelijk worden toegeschreven aan de verliezen door sub-optimaal voorschrijfpatroon, diefstal en bederf die in de door de CHAG gebruikte consumptiemethode worden meegeteld. Het is daarbij interessant om op te merken dat het gemiddeld niveau in de "lage" variant van medicijngebruik in Ghana, zoals die gemeten is in de ziekenhuizen met westerse doktoren, dicht in de buurt komt van het niveau van de schattingen uit Oost Afrika. Dit maakt het aannemelijk dat de benodigde hoeveelheden essentiële medicijnen min of meer identiek zijn voor veel landen bezuiden de Sahara, net zoals dat het geval lijkt voor de kern-lijst van meest essentiële geneesmiddelen.

In de studies uit Oost Afrika werden de medicijnen gedistribueerd in vaste hoeveelheden per type gezondheidsinstelling. De CHAG gebruikte een vier categorieën systeem met een standaard lijst van 24 essentiële geneesmiddelen voor alle instellingen en 10 extra medicijnen voor ziekenhuizen alleen. Om de medicijnbehoefte te relateren aan de grootte van de instellingen werden drie parameters gebruikt. Analyse van elk van deze parameters toonde aan dat het totaal aantal polikliniekconsulten de beste is. Deze grootheid kan gebruikt worden als enige parameter voor alle types gezondheidsinstellingen. Wanneer de medicijnbehoefte van intramurale zorg ook moet worden uitgedrukt is het aantal bedden een simpele en betrouwbare tweede parameter. De parameter "totaal aantal polikliniekconsulten" is vrijwel identiek met "treatment episodes", de eenheid voorgesteld door de WHO.

Het is mogelijk gebleken het medicijngebruik in 17 CHAG instellingen, die representatief zijn voor alle 66 CHAG instellingen, goed te voorspellen door een zorgvuldig uitgekozen sample van twee ziekenhuizen te bestuderen. Dit maakt het aannemelijk dat medicijngebruik in een ontwikkelingsland als geheel op deze manier eenvoudig kan worden gemeten. Aangezien er zeer weinig informatie beschikbaar is over de hoeveelheden medicijnen nodig voor andere landen bezuiden de Sahara is het aan te bevelen materiaal uit deze landen te verzamelen ter vergelijking.

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(numbers correspond with literature references)

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APPENDICES

APPENDIX I

Quantitative analysis of consensus in 38 essential drugs lists made in or for sub-Saharan African countries, divided for short (0-50 items), medium (51-100 items) and long (over 100 items) lists, presented in order of 1983 WHO classification.
Number of lists the drug is included in expressed as percentage of the maximum possible. Drugs not on 1983 WHO list of essential drugs[6] in brackets.

WHO class.	*Drug*	*Total score in 38 lists*		*22 short lists*		*9 medium lists*		*7 long lists*	
		nr	*(%)*	*nr*	*(%)*	*nr*	*(%)*	*nr*	*(%)*
1.1	ether	7	(18)	0	(0)	1	(11)	6	(86)
	thiopentone inj.	9	(24)	1	(5)	2	(22)	6	(86)
1.2	lidocain 1-2% inj.	20	(53)	6	(27)	7	(78)	7	(100)
2.1	ac.salicylic acid	38	(100)	22	(100)	9	(100)	7	(100)
	paracetamol	19	(50)	10	(45)	4	(44)	5	(71)
	phenybutazone	8	(21)	2	(9)	3	(33)	3	(43)
2.2	morfia or pethidine	14	(37)	3	(14)	5	(56)	6	(86)
	nalaxone inj.	7	(18)	2	(9)	0	(0)	5	(71)
3	chlorophenamine	11	(29)	3	(14)	3	(33)	5	(71)
4	atropine inj.	15	(39)	4	(18)	5	(56)	6	(86)
5	diazepam inj.	14	(37)	4	(18)	5	(56)	5	(71)
	phenobarbital	24	(63)	8	(36)	9	(100)	7	(100)
	phenytoin	6	(16)	0	(0)	2	(22)	4	(57)
6.1	mebendazole	14	(37)	7	(32)	3	(33)	4	(57)
	piperazine	25	(66)	13	(59)	5	(56)	7	(100)
	niclosamide	17	(45)	5	(23)	6	(67)	6	(86)
	tiabendazole	13	(34)	5	(23)	3	(33)	5	(71)
	(TCE)	9	(24)	2	(9)	3	(33)	4	(57)
	(levamisole)	8	(21)	4	(18)	2	(22)	2	(29)
	(broad anthelmintic)	28	(74)	15	(68)	7	(78)	6	(86)
6.2	metronidazole	20	(53)	10	(45)	5	(56)	5	(71)
	emetine inj.	10	(26)	3	(14)	1	(11)	6	(86)
6.3.1	ampicillin cap.	15	(39)	7	(32)	3	(33)	5	(71)
	syr.	9	(24)	3	(14)	1	(11)	5	(71)
	benz.benz.pen.inj.	20	(53)	7	(32)	6	(67)	7	(100)
	benz.cryst.pen.inj.	18	(47)	7	(32)	4	(44)	7	(100)
	phenoxymeth.pen. tab.	22	(58)	12	(55)	5	(56)	5	(71)
	proc.pen.inj.	25	(66)	12	(55)	6	(67)	7	(100)
6.3.2	chloramphenicol cap.	19	(50)	6	(27)	6	(67)	7	(100)
	syr.	9	(24)	2	(9)	2	(22)	5	(71)
	inj.	10	(26)	3	(14)	3	(33)	4	(57)
	erythromycin	7	(18)	2	(9)	1	(11)	4	(57)
	sulfadimidin	27	(71)	15	(68)	5	(56)	7	(100)
	(other sulfa)	6	(16)	2	(9)	3	(33)	1	(14)
	(all sulfa)	32	(84)	17	(77)	8	(89)	7	(100)
	co-trimoxazole	11	(29)	3	(14)	4	(44)	4	(57)
	tetracycline	30	(79)	16	(73)	7	(78)	7	(100)
	nitrofurantoin	10	(26)	2	(9)	4	(44)	4	(57)

WHO class.	Drug	Total score in 38 lists		22 short lists		9 medium lists		7 long lists	
		nr	(%)	nr	(%)	nr	(%)	nr	(%)
6.3.4	ethambutol	8	(21)	3	(14)	1	(11)	4	(57)
	isoniazid	10	(26)	3	(14)	2	(22)	5	(71)
	streptomycin inj.	17	(45)	6	(27)	4	(44)	7	(100)
	INH/thiacetazone	14	(37)	4	(18)	3	(33)	7	(100)
6.4	diethylcarbamazine	13	(34)	5	(23)	3	(33)	5	(71)
6.5	griseofulvine	7	(18)	0	(0)	2	(22)	5	(71)
6.6	sod.stib.gluc.inj.	4	(11)	1	(5)	1	(11)	2	(29)
6.7	chloroquine tab.	39	(95)	22	(100)	8	(89)	6	(86)
	syr.	20	(53)	8	(36)	7	(78)	5	(71)
	(inj.)	23	(61)	10	(45)	7	(78)	6	(86)
	quinine inj.	11	(29)	0	(0)	5	(56)	6	(86)
	amodiaquine	7	(18)	1	(5)	3	(33)	3	(43)
6.8	metrifonate	6	(16)	2	(9)	1	(11)	3	(43)
	(niridazole)	13	(34)	5	(23)	4	(44)	4	(57)
	(either)	17	(45)	7	(32)	5	(56)	5	(71)
10.1	ferrous sulphate	32	(84)	17	(77)	8	(89)	7	(100)
	(fumarate)	5	(13)	2	(9)	1	(11)	2	(29)
	(either)	34	(89)	18	(82)	9	(100)	7	(100)
	folic acid	22	(58)	11	(50)	4	(44)	7	(100)
	hydro.cobal.inj.	8	(21)	3	(14)	1	(11)	5	(71)
	iron dextran inj.	10	(26)	3	(14)	1	(11)	6	(86)
10.2	vitamin K inj.	11	(29)	4	(18)	2	(22)	5	(71)
11.1	dextran 70 inf.	8	(21)	1	(5)	2	(22)	5	(71)
12.3	reserpine	9	(24)	3	(14)	2	(22)	4	(57)
	(all antihypert.)	11	(29)	3	(14)	3	(33)	5	(71)
12.4	digoxin tab.	11	(29)	3	(14)	2	(22)	6	(86)
	inj.	11	(29)	1	(5)	4	(44)	6	(86)
12.5	epinephrine inj.	19	(50)	8	(36)	5	(56)	6	(86)
13.1	benzoic ac.comp. oint.	16	(42)	6	(27)	5	(56)	5	(71)
13.2	neomyc.bacitr.oint.	8	(21)	4	(18)	1	(11)	3	(43)
	(gentian violet)	19	(50)	9	(41)	6	(67)	4	(57)
13.6	benzyl bezoate	25	(66)	13	(59)	7	(78)	5	(71)
	lindane	11	(29)	3	(14)	3	(33)	5	(71)
15	chlorhexidine	15	(39)	5	(23)	5	(56)	5	(71)
	iodine	19	(50)	8	(36)	5	(56)	6	(86)
	(either)	23	(61)	11	(50)	6	(67)	6	(86)
16	furosemide tab.	10	(26)	4	(18)	1	(11)	5	(71)
	inj.	10	(26)	1	(5)	4	(44)	5	(71)
	hydr.chl.thiazide	10	(26)	2	(9)	4	(44)	4	(57)
	(either diur. tab.)	16	(42)	5	(23)	6	(67)	5	(71)
17.1	alum.hydr.	17	(45)	7	(32)	6	(67)	4	(57)
	magn.hydr.mix	18	(47)	7	(32)	4	(44)	7	(100)
	(either)	27	(71)	12	(55)	8	(89)	7	(100)
17.2	promethazine tab.	16	(42)	5	(23)	5	(56)	6	(86)
	syr.	9	(24)	2	(9)	1	(11)	6	(86)

WHO class	Drug	Total score in 38 lists		22 short lists		9 medium lists		7 long lists	
		nr	(%)	nr	(%)	nr	(%)	nr	(%)
	either tab /syr	18	(47)	6	(27)	6	(67)	6	(86)
	(papaver bellad)	11	(29)	2	(9)	6	(67)	3	(43)
17.5	senna	13	(34)	6	(27)	3	(33)	4	(57)
	other laxans	10	(26)	2	(9)	3	(33)	5	(71)
	(either)	20	(53)	8	(36)	5	(56)	7	(100)
18.1	hydrocortisone inj	11	(29)	1	(5)	3	(33)	7	(100)
	prednisolone	10	(26)	2	(9)	2	(22)	6	(86)
18 4	insulin comp.zinc inj.	5	(13)	0	(0)	0	(0)	5	(71)
	insulin inj.	8	(21)	1	(5)	1	(11)	6	(86)
19 1	antivenom serum	7	(18)	0	(0)	1	(11)	6	(86)
	tetanus antitoxine	9	(24)	0	(0)	3	(33)	6	(86)
19 2 1	BCG vaccine	9	(24)	1	(5)	3	(33)	5	(71)
	DPT vaccine	10	(26)	2	(9)	3	(33)	5	(71)
	measles vaccine	8	(21)	1	(5)	3	(33)	4	(57)
	poliomyelitis vaccine	9	(24)	2	(9)	3	(33)	4	(57)
	tetanus vaccine	11	(29)	3	(14)	4	(44)	5	(57)
21 1	sulfacetimide eye oint.	7	(18)	3	(14)	1	(11)	3	(43)
	tetracycline eye oint	17	(45)	6	(27)	7	(78)	4	(57)
	(other AB eye oint)	15	(39)	9	(41)	2	(22)	4	(57)
	(either)	29	(76)	14	(64)	8	(89)	7	(100)
21.4	pilocarpine eyedr.	7	(18)	0	(0)	2	(22)	5	(71)
21.5	(hom)atropine eyedr.	7	(18)	0	(0)	2	(22)	5	(71)
22	ergometrine tab	14	(37)	6	(27)	2	(22)	6	(86)
	inj.	20	(53)	7	(32)	7	(78)	6	(86)
	either	24	(63)	11	(50)	7	(78)	6	(86)
	oxytocin inj.	10	(26)	0	(0)	4	(44)	6	(86)
24	chlorpromazine tab.	17	(45)	5	(23)	5	(56)	7	(100)
	inj.	15	(39)	5	(23)	4	(44)	6	(86)
	diazepam tab.	12	(32)	4	(18)	3	(33)	5	(71)
25 1	aminophyllin tab	14	(37)	4	(18)	4	(44)	6	(86)
	inj.	15	(39)	2	(9)	6	(67)	7	(100)
	salbutamol	8	(21)	0	(0)	3	(33)	5	(71)
	ephedrine	16	(42)	7	(32)	3	(33)	6	(86)
	(either)	26	(68)	10	(45)	9	(100)	7	(100)
25 2	codein	10	(26)	1	(5)	4	(44)	5	(71)
	(other)	9	(24)	4	(18)	3	(33)	2	(29)
	(either)	17	(45)	5	(23)	6	(67)	6	(86)
26.1	oral rehydr.salts	28	(74)	15	(68)	8	(89)	5	(71)
26 2	glucose 5% inf	10	(26)	2	(9)	2	(22)	6	(86)
	sod chl 0.9% inf.	11	(29)	3	(14)	2	(22)	6	(86)
	water for inj.	17	(45)	7	(32)	5	(56)	5	(71)
27	ascorbic acid	11	(29)	4	(18)	2	(22)	5	(71)
	retinol	18	(47)	7	(32)	5	(56)	6	(86)
	(multivitamin)	18	(47)	6	(27)	6	(67)	6	(86)
	(vitamin B-Co)	15	(39)	6	(27)	5	(56)	4	(57)
	(either)	23	(61)	10	(45)	7	(78)	6	(86)

APPENDIX 2

List of CHAG Member Institutions and annual statistics over 1982. Figures between brackets are estimates.

	name	rel	kind	cat	Beds	OPD	CWC	ANC	Deliv.	Surg.	Xray	Phar
VR	Battor	Cath	hosp	B	130	83 739	8.632	14.888	1011	708	X	HPh
	Kpandu	Cath	hosp	B	213	52.800	(15.000)	2.600	824	527		HPh
	Adidome	EPC	hosp	C	133	18.838	7.133	4 092	320	237	X	HPh
	Dodi Papase	Cath	hosp	C	127	20.170	7.628	5.020	427	173		HPh
	Dzodze	Cath	hosp	C	150	(32.000)	(5 500)	(3 800)	(600)	(500)	X	HPh
	Abor Weme	Cath	clin	B	49	63.077	26.416	12.315	1228	—		(CPh)
	Nkwanta	Cath	clin	B	37	76.832	(6 500)	13.318	411	—		(CPh)
	Anfoega	Cath	clin	C	93	(46.000)	(13.000)	(6.000)	800	—		CPh
	Ho	EPC	clin	D	—	—	2.599	—	—	—		
	Vane	EPC	clin	D	(6)	(6.000)	(6.000)	(2.000)	(200)	—		
ER	Akwatia	Cath	hosp	A	291	126.413	(8.084)	21.149	1686	952	X	HPh
	Nkawkaw	Cath	hosp	A	166	143.545	29.745	27.738	2656	624	X	HPh
	Koforidua	Cath	hosp	B	130	89.104	25.242	—	—	453	X	HPh
	Kwahu Tafo	Cath	clin	B	30	104 144	14.557	16.743	1866	—		CPh
	Agomanya	Cath	clin	C	26	49.156	5.201	20.590	1230	—		
	Anum	S.A.	clin	C	9	20.756	13.577	3.628	384	—		
	Begoro	S.A.	clin	C	10	36 600	15.520	6.453	687	—		
	Nsawam MC	Cath	M.cl	C	—	22.981	5.330	(6.000)	—	—		
	A. Ofoase	Cath	clin	C	8	41.076	500	2.146	—	—		
	A. Swedru	Cath	clin	C	8	37.068	933	750	—	—		
	Boso	S.A.	clin	D	6	3.983	6.244	968	—	—		
	Nsawam Orth	Cath	clin	D	(30)	—	—	—	—			
	Ntronang	Cath	clin	D	6	4.094	6.389	2.197	—	—		
	Wenchi	S.A.	clin	D	6	20.205	3.987	1.483	134	—		
CR	Asikuma	Cath	hosp	B	96	(61 726)	(20.575)	19377	1023	371	X	HPh
	Asin Foso	Cath	hosp	B	85	(49.265)	(16.422)	14 314	818	441	X	
	Apam	Cath	hosp	C	105	(10 000)	(13.000)	(4.500)	(200)	—		HPh
	Duakwa	S.A.	clin	B	12	54.095	18.274	20.070	716	—		
	Ba	S.A.	clin	D	6	12.724	13.303	3.630	1	—		
	Dunkwa	Pent	clin	D	6	(6.000)	(6.000)	(2.000)	(200)	—		
WR	Eikwe	Cath	hosp	B	95	72.169	3.515	9.500	600	205	X	HPh
	S. Asafo	Cath	hosp	B	84	89.482	33.738	(5.000)	403	511	X	
	S Bodi	Angl	clin	D	6	(6 000)	(6.000)	(2.000)	(200)	—		
	Sec. Takoradi	Cath	clin	D	6	(6.000)	(6.000)	(2.000)	(200)	—		
Ash	Agogo	Pres	hosp	A	185	112.605	40.182	10.417	1193	1451	X	HPh
	Maase-Ofinso	Cath	hosp	B	160	36.193	5.589	5.976	1234	411	X	DHP
	Agroyesum	Cath	hosp	C	92	16.610	25.479	7.435	421	85		DHP
	Pramso	Cath	hosp	C	75	44.076	21.068	8.443	630	233		DHP
	Agogo R.H.	Pres	R.H.	B	38	88.070	12.200	10.715	1130	—		
	Wiamuasi	S.A.	clin	C	10	45.452	24 856	7.902	582	—		
	Abira	Cath	clin	D	2	10.836	7.015	2.283	195	—		DHP
	Bosumtwi	Meth	clin	D	10	(18.500)	(14.500)	(3.000)	(160)	—		
	Donyina	Cath	clin	D	6	(6.000)	(6.000)	(2.000)	(200)	—		DHP
	Essienempong	Cath	clin	D	6	(6.000)	(6.000)	(2.000)	(200)	—		DHP
	Mampong	Angl	babyh	D	20	—	—	—	—	—		

	name	rel	kind	cat	Beds	OPD	CWC	ANC	Deliv	Surg	Xray	Phar
BA	Berekum	Cath	hosp	A	155	95 245	25 528	15 025	2047	796	X	HPh
	Dormaa-Ahenkro	Pres	hosp	B	140	(48 000)	(16 000)	12 629	1081	326	X	HPh
	Duayaw-Nkwanta	Cath	hosp	B	142	41 731	17 349	10 349	688	396	X	DHP
	Hwidiem	Cath	hosp	B	106	39 082	22 761	13 828	719	460	X	DHP
	Techiman	Cath	hosp	B	88	55 812	25 173	15 286	1401	219	X	HPh
	Nkoranzaman	Cath	hosp	C	40	(21 000)	(9 000)	(4 500)	(170)	(150)		DHP
	Wenchi	Meth	hosp	C	74	(32 540)	(10 850)	5 693	550	85	X	
	Dormaa R H	Pres	R H	C	—	(34 000)	16 736	3 585	—	—		
	New Drobo	Cath	clin	C	26	27 543	17 080	12 034	1182	—		DHP
	Abease	Cath	clin	D	6	(6 000)	(6 000)	(2 000)	(200)	—		DHP
NR	Damongo	Cath	hosp	C	131	29 052	20 167	(6 000)	396	553	X	HPh
	Nalerugu	Bapt	hosp	C	75	(20 000)	(10 000)	(5 000)	(400)	(300)		HPh
	Wapuli	EPC	clin	D	3	(4 000)	(1 400)	184	—	—		
UR	Bawku	Pres	hosp	A	229	(55 000)	(90 000)	(13 000)	(1300)	(350)		HPh
	Jirapa	Cath	hosp	B	20	(15 000)	(13 500)	(12 000)	(1300)	(600)		DHP
	Nandom	Cath	hosp	B	130	(30 000)	(15 000)	(9 000)	(1000)	(150)		DHP
	Bawku R H	Pres	R H	B	40	63 837	106 192	37 983	484	—		
	Bolgatanga	Pres	R H	D	—	4 398	22 555	3 829	—	—		
	Lawra	Meth	clin	D	—	(3 000)	(3 000)	(1 000)	—	—		
	Wa R H	Cath	R H	D	—	(6 000)	(10 000)	(5 000)	—	—		DHP
	Wiaga	Cath	clin	D	12	(14 000)	(14 000)	2 794	—	—		
	Total	66	instit		4386	2 495 633	1 005 724	493 841	37 688	12 267		

OPD All sick patients (adults and children above 5 years)
CWC Under Five Clinic/Child Welfare Clinic
ANC Ante Natal Controls
Surg Major Surgery only
X-ray Functioning X-ray present
Phar HPh hospital-pharmacy, CPh Clinic pharmacy, DHP Diocesan Hospital Pharmacy

APPENDIX 3
CHAG list of essential drugs, 1983

standard	extra	unit per 10.000 patients	CHAG total annual consumption
anaesthetics (1)			
licocain 2% inj. 50 ml		50 V	15.000 V
	licodain 5% inj. heavy	50 V	10.000 V
	ether 500 ml	20 b	4.000 b
	thiopentone sodium inj.	50 V	10.000 V
	ketamine (ketalar)	25 V	5.000 V
analgesics (2,3)			
aspirin		60.000	18.000.000
paracetamol		30.000	9.000.000
inj. analgesic		300 A	90.000 A
	pethidine inj.	200 A	40.000 A
anthelmintic (7)			
piperazine tab.		5.000	1.500.000
metronidazole (flagyl)		5.000	1.500.000
mebendazole (vermox)		2.000	600.000
metrifonate		2.000	600.000
diethylcarbamazin (banocide)		10.000	3.000.000
antibacterial (7)			
penicillin tab.		5.000	1.500.000
procain penicillin inj.		800 V	240.000 V
benzath. benzylpenicillin (penadur)		100 V	30.000 V
	pen. G. inj. (cryst.)	1.500 V	300.000 V
tetracycline cap.		15.000	4.500.000
ampicillin caps.		10.000	3.000.000
ampicillin syr. (60 ml)		200 b	60.000 b
	chloramphenicol caps.	8.000	1.600.000
	cloramphenicol inj.	500 A	100.000 A
sulfadimidine		10.000	3.000.000
nitrofurantoin		6.000	1.800.000
antimalarial (7)			
chloroquine tab.		50.000	15.000.000
chloroquine inj.		500 A	150.000 A
pyremethamin (daraprim)		10.000	3.000.000
antituberculosis (7)			
	streptomycin inj.	1.200 V	240.000 V
	INH/Thiacetazone	6.000	1.200.000
vitamins, minerals (11, 28)			
folic acid		40.000	12.000.000
ferrous sulphate		50.000	15.000.000
multivitamin		100.000	30.000.000
vitamin A cap.		1.000	300.000

standard	extra	unit per 10.000 patients	CHAG total annual consumption
cardiovascular, diuretics (13, 16)			
hydrochlorthiazide		5.000	1.500.000
	furosemide inj.	100 A	20.000 A
reserpin		5.000	1.500.000
	digoxin tab.	2.000	400.000
gastrointestinal (17)			
aluminiumhydroxyde tab.		5.000	1.500.000
oral rehydration salts (for 1 ltr)		500	150.000
	atropin inj.	100 A	20.000 A
oxytocics (22)			
ergometrine tab.		2.000	600.000
ergometrine inj.		300 A	90.000 A
	oxytocin inj.	100 A	20.000 A
psychotherapeutics (24)			
diazepam tab.		15.000	4.500.000
diazepam inj.		200	60.000
	chlorpromazine inj.	200	40.000
various (17, 25)			
promethazine tab.(phenergan)		10.000	3.000.000
	prednisolone tab.	5.000	1.000.000
aminophylline tab.		1.000	300.000
	aminophylline inj.	100	20.000

The standard-drugs are for all CHAG-institutions (hospitals and clinics). The extra-drugs are for hospitals only.
Infusions, mixtures and topical preparations are not included in the list. The list is based on CHAG-questionaires of 1981 and 1983, the WHO list of essential drugs, and literature-references.
Numbers in brackets refer to categories of drugs in the WHO list of essential drugs.
The total annual consumption is calculated on the basis of 300 standard-units and 200 extra-units per year.
The total annual costs, including transport and insurance, are estimated at DFl 2,200.000.— (prices 1983, IDA).

APPENDIX 4

CHAG list of essential pharmaceutical preparations, 1983
The total is based on 300 units.

Preparation		Quantity per 10.000 patients	CHAG per year
Ointments:	Sulphur	25 kg	7 500 kg
	Whitfield	25 kg	7 500 kg
	Ichtammol	10 kg	3 000 kg
	Liniment	50 kg	15 000 kg
	Gammexane	25 kg	7 500 kg
Applic/lotions:	Calamine	50 ltr	15 000 ltr
	Gentian Violet	25 ltr	7 500 ltr
	Pot. perm.	25 ltr	7 500 ltr
	Eusol	100 ltr	30 000 ltr
	Iodin tict.	25 ltr	7 500 ltr
Mixtures:	Kaolin	150 ltr	45 000 ltr
	Antacid	250 ltr	75 000 ltr
	Cough	250 ltr	75 000 ltr
	Iron tonic	50 ltr	15 000 ltr
	Antispasmodic	50 ltr	15 000 ltr
	Oral Rehydration	750 ltr	225 000 ltr
Various:	Eye drops B. Ac.	10 ltr	3 000 ltr
	Nosedrops Ephedr	5 ltr	1 500 ltr
	Eardrops B. Ac.	10 ltr	3 000 ltr
	Lysol conc. for	1000 ltr	300 000 ltr
	Chloralhydrate	1 kg	300 kg

STELLINGEN

I

Het is zeer waarschijnlijk dat de behoefte aan die medicijnen welke essentieel zijn bij de voorkoming en behandeling van de meest voorkomende armoede ziekten, voor veel landen in Afrika gelijk is.

II

Om medicijngebruik te vergelijken is de "Defined Daily Dose" (DDD) een goede maateenheid. Voor bepaalde therapeutische groepen, zoals anthelmintica, is het gebruik van "Defined Curative Dose" (DCD) te prefereren.

III

De beste en meest simpele parameter om de medicijnbehoefte van een gezondheidsinstelling uit te drukken is het totaal aantal geregistreerde consulten. In geval ook intramurale zorg aanwezig is kan het aantal beschikbare bedden als tweede parameter gebruikt worden.

IV

Het vestigen van een geneesmiddelenindustrie in een ontwikkelingsland verschuift de afhankelijkheid van geneesmiddelen naar een afhankelijkheid van grondstoffen, reserveonderdelen en technische hulp. De geneesmiddelenvoorziening wordt hierdoor niet goedkoper.

V

De World Health Organization is als geen andere organisatie in staat en verplicht internationale normen voor medisch gedrag vast te stellen.

VI

Hoewel antilichamen tegen Leptospira soorten bij volwassenen veelvuldig kunnen worden aangetoond wordt icterus in Ghana slechts zelden door leptospirose veroorzaakt.

VII

In ontwikkelingslanden is bij een patiënte met een matige bekkenvernauwing en een obstetrische toekomst symphysiotomie te verkiezen boven sectio caesarea.

VIII

Een dieet zonder rode peper draagt niet bij tot de genezing van een ulcus duodeni.
(Kumar N et al. Br Med J 1984; 288:1803-4)

IX

Aangezien patiënten met vier of meer okselklier metastasen vaak ook reeds op afstand zijn gemetastaseerd draagt routinematige bestraling van regionale klieren na mamma-amputatie in deze gevallen weinig bij tot vergroting van de overlevingskans. De indicatie voor deze bestraling dient derhalve opnieuw te worden bezien.

X

Er gaat meer troost uit van een acceptatie van het verdriet van een patiënt dan van een ontkennen van de reden ervan.
(Leer JWH. In: Begeleiding van patiënten met kanker. Stafleu, 1982)

XI

Trommelvliesbuisjes bij de behandeling van otitis media met effusie ("glue ear") verbeteren de uiteindelijke kwaliteit van het gehoor niet.
(Brown MJKM. J R Soc Med 1978; 71:353-6)

XII

De term "stethoscoop" is onjuist aangezien niet gekeken maar geluisterd wordt.

XIII

"MUSIC MINUS ONE" grammofoonplaten geven de orchestrale begeleiding van bekende concertstukken weer. Het hoge tempo waarin de ontbrekende solo-partij moet worden meegespeeld is niet in overeenstemming met de te verwachten capaciteiten van de doelgroep.

H.V. Hogerzeil
12 december 1984