Dental Manpower Requirements in Emerging Countries

N. R. E. FENDALL, M.D., B.Sc., D.P.H.

THE PREVALENCE of dental disease throughout much of the underdeveloped areas of the world, its interrelationship with general health, the paucity of dental manpower at professional level, and the competing demands of other needs render the acceptance, training, and use of dental auxiliaries an urgent necessity.

It became apparent when I visited countries of Latin America, Africa, and Asia during a study of health manpower, 1964–66, that outside of the dental profession itself dental disease excites little interest. National health authorities tend not to recognize that planning for dental health services is a priority need, nor that serious dental disease, such as "noma" or cancrum oris, is an overt expression of an underlying problem of socioeconomic origin, nor that dental disease contributes to childhood morbidity and mortality.

Epidemiology of Dental Disease

Information on the extent of dental disease by statistically valid dental health surveys is sadly lacking. My opinions were formed from studying general health and nutrition reports in which facts on the lack of dental care emerged as incidental intelligence and from discussing the problem with informed persons in the dental profession of each country.

Jamaica. In Jamaica the recruitment drive for soldiers for World War II led to the discovery that 50 percent of men, otherwise fit, were rejected because of dental disease. In 1954, 1957, and 1960, three separate studies and reports on dental manpower needs were undertaken (*1–3*). Considerable dental ill health, particularly among the lower social groups, occurs as periodontal infections, caries, trauma, and squamous cell oral carcinoma.

Guatemala. In Guatemala, surveys (*4*) have revealed caries to be the most common dental disorder, followed by periodontal infection, malocclusion, and enamel hypoplasia. Calcium defects are particularly prevalent in children. Among Indian children a specific disorder, named "cauque lesion" (*5*), occurs extensively. This disorder is an erosion of the milk teeth, that, if untreated, perforates the alveolar bone. Early but simple preventive treatment is effective, but neglect results in considerable dental destruction and deformity, which leads to malnutrition. Of all cancer diagnosed, 0.36 percent is oral cancer.

Dental disease in Guatemala is complicated by nutritional, social, ethnic, and cultural fac-

Dr. Fendall is a former director of medical services, Kenya, and is now regional director for Africa and the Middle East, The Population Council, New York City. He is a member of the panel of experts of the World Health Organization, has served on an expert committee on the training of auxiliaries, has been a consultant to WHO in Southeast Asia and to the South Pacific Commission, and was staff member of the Rockefeller Foundation.

tors as well as by geographic barriers. Rates of dental caries in deciduous teeth are higher than those in the United States and are comparable to those in the United Kingdom and Iceland. Fluoride is excessive in one or two local areas, but mostly it ranges from 0.4 to 1.5 ppm.

Africa. A health survey of Senegal in 1959–60 (*6*) used dental caries as one indicator of health. In the deciduous teeth, dental caries was rampant throughout the country; whereas in the permanent dentition caries was negligible except in the southern zones. Periodontal disease, osteitis, and loss of teeth were all of high incidence. Malocclusion and malformation lead to considerable open bite in the population, and a relationship with malnutrition was postulated. Fluorosis was focal, and dental mottling was found in the teeth of persons living adjacent to phosphate mines. Serious oral pathologic change, such as noma and cancer (particularly of the ethmoid and maxillary regions), was not infrequent.

In Ethiopia, however, a survey made in 1958 by the Interdepartmental Committee on Nutrition for National Defense reported a low incidence of dental caries, but periodontal disease was widespread (*7*).

In Kenya endemic dental fluorosis is a recognized public health problem (*8–10*) where there is excessive fluoride content in water from volcanic areas. Dental caries is prevalent in Kenya, as it is in Tanzania. Malignant neoplasms of the mouth and pharynx are not infrequent.

Thailand. In Thailand information on the extent of dental caries is conflicting. The Ministry of Public Health in its 1963 annual report recorded dental caries in more than 80 percent of the school children. A nutrition survey (*11*) in 1960, however, concluded that dental caries was practically nonexistent in young people but became more prevalent with age. Periodontal infection was described as one of the most serious oral health problems in Thailand. Some two-thirds of the persons over 40 have irreversible periodontal disease. Dental fluorosis was also prevalent, particularly in the northern regions.

Dental Services

Dental services are inadequate everywhere to cope with needs, and separate organized services generally are not available. Clinic services of varying standards of competency may be found in the larger hospitals of the country. The dentists in private practice are concentrated in the larger urban centers. In Jamaica, for example, hospitals, particularly the newer ones, offer substantial services; whereas at the health centers, a dental extraction service may be available once a week.

A thorough study in Guatemala (*12*) showed that the majority of the dental programs were in the capital where 56 percent of the dentists serve 15 percent of the national population. In five districts with a population of nearly three-quarters of a million, there were no dental services. Programs were offered by the Ministry of Health and Ministry of Defense; 56 percent of these were offered in the morning only and 24 percent in the afternoon. Of 86 dental programs the state offers 58, private sources 20, and autonomous institutions eight. Three-quarters of the programs give 5 to 14 hours of service weekly.

In Africa public dental services are virtually nonexistent. A dental service may be offered at the main hospital in the capital, such as exists at Dakar and Nairobi. The people outside of the capital obtain dental extractions through medical auxiliaries at hospitals, health centers, and dispensaries—more often than not without the benefit of local anesthesia.

Such services may constitute a substantial part of the outpatient treatment in the hospitals, health centers, and dispensaries. For example, official statistical reports show that in Senegal, 149,236 persons, or 4.5 percent of all outpatients, had dental attention, mostly extractions; in Kenya, 48,221, or 3.5 percent of outpatients; and in Tanganyika, 54,617, or 2.4 percent of outpatients.

The only extensive preventive dental services were in Thailand's schools. But even in Thailand, dental care was totally inadequate and consisted mostly of examinations with no curative or conservative followup treatment available. For example, in 1962 of a school population of some 5 million children, only 25,601 were given dental examinations. The staff consisted of 14 dentists and 10 dental hygienists. Work output per staff member was poor, and the equipment was often antiquated or nonfunctioning because of lack of repairs. A school dental service

Table 1. Gross national product, population, and population growth rate

Country	Gross national product per capita	Population (millions)	Population growth rate (percent)
Jamaica	$316	1. 8	1. 7
Guatemala	189	4. 3	3. 2
Senegal	180	3. 1	2. 3
Kenya	90	8. 7	3. 1
Thailand	96	29. 0	2. 2

without adequate supportive, preventive, or treatment facilities is of questionable value.

In terms of cost, the fees of private dentists are usually high compared to the per capita income (table 1). For example, in Guatemala an extraction costs as much as $2, a filling twice as much; the per capita income is only $189 per annum. Nationally it has been calculated that 2.5 million extractions, costing $1.4 million, and 34 million fillings, costing $113 million, and 11,237 dentists are required.

The overall national health budget in Guatemala amounts to $10 million or $2.50 per person. Neither the national resources nor the private family purse is able to purchase dental care at these prices.

Similar observations may be made about the other countries. In Jamaica, for example, the dentists complain that the public is patronizing quacks because they are cheaper than registered dentists. In part it explains the subsidizing of more than 50 percent of the dental care of civil servants in Thailand—prosthetics cost $60 to $100 in a country where the per capita income is less than $100 per person.

The cost of dental care partly explains the concentration of dentists in the larger urban centers where a monetary economy exists. It accounts for the use of "fetishers" by the people in Africa for extractions, incision of abscesses, and for making simple prosthetics. One may say that, in general, those persons who live in the large urban centers, who can afford to pay, are well and conveniently served; those persons who cannot afford to pay are ill or meagerly served; and those persons living in the rural areas, seldom served.

Manpower and Education

In Western countries a ratio of 1 dentist to 2,000 persons is advocated. The underprivileged countries have hardly begun to approach this figure and at present production rates have no hopes of attaining such a ratio. The countries visited varied from a ratio of 1 to 15,000 to 1 to 250,000 (table 2).

Jamaica. Even Jamaica, perhaps the most favored of the countries studied, with an expanding economy, a relatively good flow of university caliber students, and a relatively slow rate of population increase, could not meet the total demand. At present, there are 117 dentists, of whom three-fourths are practicing, for a population of 1.8 million. The population is expected to double in 30 years requiring 1,800 dentists, necessitating an annual production rate of about 60 dentists per year. Since 1954 recommendations have been made to establish a dental school as part of the University of the West Indies, and as yet nothing has been achieved. Yet this proposal was a modest one; to commence with 10 students at a capital cost of about $56,000 and a recurring cost of about $35,000 annually.

Guatemala. In Guatemala in 1963 there were 176 dentists compared with 142 in 1959, and 85 in 1948 (table 3). The dentist-to-population ratio has improved over the years, but projec-

Table 2. Schools, output of dentists, cost of education, and ratio of dentists to population

Country	Dental schools	Average annual output of dentists	Output of dentists per million persons	Education cost per dentist	Ratio of dentists to population
Jamaica	0	10–12	5–6	----------	1: 14, 500
Guatemala	1	7–9	1	$23, 000	1: 19, 800
Senegal	1	1–2	<1	----------	1:160, 000
Kenya	0	2–3	<1	----------	1:247, 000
Thailand	1	30–35	1	5, 600	1: 77, 000

tions show a worsening situation despite the output of five to six dentists for the years 1951–53 that increased to 11 per year a decade later.

Only 100 dentists have graduated in 14 years (1948–62). Of the 50 to 60 students starting the dental course of study per year only 7 to 9 finish—a loss of more than 75 percent. This loss rate is largely responsible for the high production cost of $23,000 per graduate.

During the next 25 years the population of Guatemala is expected to double, reaching nearly 9 million, and 4,500 dentists will be required for a ratio of 1 to each 2,000 persons. Allowing for a loss of one-third and subtracting the present number of dentists, Guatemalans will require nearly 6,000 dentists, or more than 250 per year. There were 17 graduates in 1963. Even by reducing the heavy attrition rate in the university, enough dentists could not be trained to meet the needs without considerable increase in costs.

Africa. In Senegal, where dentistry is taught by a combined faculty of the schools of medicine, pharmacy, and dentistry, there is little prospect of rapid expansion in the number of students. The school opened in 1964, replacing the subprofessional school started in 1950, which was closed because of lack of recognition from the French authorities.

The present program envisages 3 years' training at Dakar, after which the student will go to Paris for the final year of study. There are now 10 students, not one of whom is a Senegalese. If the costs parallel those for the medical student in Senegal, about $85,000 per graduate, the prospect for expansion is severely curtailed by cost alone. None of the other countries studied in Africa are even contemplating starting dental schools at their universities.

Elsewhere in Africa the situation is no better. Dental schools are few and far between—seven for the whole continent—and the countries depend on their dentists being trained overseas. Between 130 and 150 dentists graduate each year in Africa from the seven dental schools (*13*). The situation is dramatized by Ghana, which has 36 dentists for 7.5 million people, and 10 of these dentists are non-Ghanians. In Kenya a similar situation exists: 35 dentists, the majority non-Kenyans, attempting to serve 9 million people!

Table 3. Growth of dental manpower in Guatemala

Year	Population (in millions)	Dentists	Ratio of dentists to population
1948	2, 641	85	1:13, 500
1959	3, 651	142	1:26, 000
1963	4, 087	176	1:23, 000
1970 [1]	5, 068	206	1:24, 500

[1] Projection.

Thailand. Thailand with 378 dentists and 881 "modern second-class dentists," trained in a severely truncated course, has a stated objective of 1 dentist per 6,000 persons. The country requires some 5,000 dentists now. By 1990, with the population expected to double, some 10,000 dentists will be needed. Allowing for those leaving the profession, a net annual output of 500 dentists per year is necessary. Only 30 to 35 dentists are graduated per year at a cost of $5,600 per graduate (table 2). A fifteenfold increase in the production rate and an annual expenditure of $3 million would be needed—obviously an unrealistic program. During the past quarter of a century, the country has produced 336 dentists, 225 modern second-class dentists, and 179 dental hygienists. The production cost of a dental hygienist is half that of a dental surgeon.

The present dental school maintains a high standard of education that has been built up slowly and carefully over the past quarter of a century. Any effort to expand, either by increasing the annual intake of the school to 100 or starting four or five new dental schools, is undoubtedly impractical and would probably result in a disastrous fall in quality. To attain a ratio of 1 dentist to 2,000 persons is patently a long term process!

Maldistribution

The shortage of dentists is even more aggravated by maldistribution than is the shortage of physicians. In Thailand 79 percent of the country's 378 dentists live and work in Bangkok (table 4). In Senegal of the 19 dentists, five are in government service, and 14 in private practice (table 4). Only four work outside of Dakar, two in Saint-Louis, the second largest

city, and one each in two other large towns, which leaves the rest of the country without dental care. Only three of these dentists are Senegalese.

In Guatemala the capital has 137 (81 percent) of the dentists, six are out of the country, which leaves 33 for the rest of the country (table 4). Thus the city has a dentist-to-person ratio of 1 to 4,700 persons and the remainder of the country 1 to 100,000; 11 out of the 23 administrative areas had no dentist for a total population of 1.2 million. In the 11 other administrative areas, the range is from 1 to 25,000 to 1 to 290,000.

In 1962 in Kenya of the 35 dentists (20 Asians, 13 Europeans, two Africans), 18 were practicing in Nairobi City and five in the second largest town, Mombassa; the rest were scattered at one to two per large town.

Two-thirds, or 74, of Jamaica's 117 dentists serve the capital, Kingston, and its corporate surroundings; 11 were out of the country, leaving 32 for the remainder of the country. These 32 dentists lived and practiced in the county towns.

Meeting the Needs

The demand for curative dental care is increasing—the need for community preventive measures, such as fluoridation and defluoridation, apparent, and the need for preventive measures for children, urgent. Yet the manpower situation, in relation to growing populations, is either stagnating or worsening. The costs of educating professional dentists at an adequate rate are prohibitive, and part of the void between demand and service is being met by traditional and illegal practitioners.

In Jamaica there are at least 400 illegal practitioners in addition to the registered dentists and 30 dental technicians. In 1905 illegal practitioners were registered and at other periods from 1927 to 1943. The situation is obviously a cyclical phenomenon which will persist as long as graduate dentists remain in short supply.

Table 4. Number of dentists in country and percent practicing in capital

Country	Number of dentists	Percent of dentists in capital	Percent of population in capital
Jamaica	117	63	25
Guatemala	176	81	15
Senegal	19	79	12
Kenya	35	52	4
Thailand	[1] 378	79	8

[1] Excludes 881 "modern second-class dentists."

Illegal practice is invariably associated with the nonavailability of recognized dental services and the inability of the public to purchase such services. A distinction can be drawn between sophisticated urban wants and the more modest rural ones, although the needs do not differ! The less expensive though inferior service can exist only if it fulfills a want of the people.

In Thailand the shortage of dentists is partly met by the traditional dentists, some 881 second class dentists produced as a wartime emergency measure, and 179 dental hygienists. These second-class dentists are found predominantly (80 percent) in the rural areas. In Guatemala, 71 percent of the dental programs use auxiliary personnel of one sort or another (*12*). In Senegal it is said the fetishers extract teeth, incise abscesses, remove cervical glands, and make simple prosthetics.

Where Chinese culture exists, one finds the dental cosmetician who performs "gold capping," as for example, in Indonesia. In Africa, teeth are extracted by medical auxiliaries (the infirmier, the medical assistant, and dresser). This category of worker may have received 3 or 4 weeks of formal training or may have been given inservice training. In most dispensaries a pair of dental forceps may be found.

Planning for the Future

Plans for the future will require studies of dental epidemiology, educational and economic resources, and the population growth rate if a realistic solution to the shortage is to be propounded. A three-phased program is suggested, the phases being consecutive but overlapping.

The first phase is to train a minimal corps of superbly trained and dedicated dentists. This corps should know both the wants of the individual patient and the needs of society for preventive health service and conservative care for children.

The initiation of national dental epidemiologic studies is a prerequisite to showing governments the need for an improved public dental

service. Perhaps the first step is to strengthen departments of social medicine in medical schools and the health departments of ministries of health, by appointing health-minded dental surgeons to make these studies. The results of such studies should lead to a coordinated program for expanding services and an increased production of trained manpower.

The second phase is to educate professional dentists in small but increasing numbers and to increase outreach by supplementing the training of existing paramedical and auxiliary health personnel. Facilities and services at this stage will necessarily be minimal, but will rapidly achieve an extension of coverage.

The third phase is to improve the quality of such a service by training a specific cadre or cadres of dental auxiliaries.

Discussion of a fourth phase where reliance is placed entirely upon a cadre of professional dentists is unrealistic in a world where few countries have surpassed a ratio of 1 dentist to 3,000 persons, and where the major part of the world has yet to achieve elemental dental care. Plans for the education of professionally trained dentists need to be related to the ability of the country to provide the appropriate working environment and facilities, and to the ability of the country to provide the necessary educational institutes and economic rewards.

The number of dental schools in the world increased from 320 to 371 from 1958 to 1963 (*13*); meanwhile, world population had increased by some 265 million—hardly a notable improvement. More than half the countries of the world have no dental school nor any prospects of immediately attaining one.

The most that can be hoped for is a system of regional dental schools attached to existing medical schools or reliance on overseas training—in countries which themselves are still short of dental manpower.

An immediate if unorthodox partial solution is to train some dental students along with medical students, as is done in the preclinical years in Thailand, providing the necessary clinical facilities at the main teaching hospital. An anomaly of our educational system is that it requires an ophthalmologist to be a general physician before specializing, but not a dentist!

The Dental Auxiliary

In the underdeveloped parts of the world dentists will need to be supported by lesser trained persons if any substantial gain is to be achieved in dental coverage. It is patently obvious that with a rising demand for dental care in these parts of the world, and with the costs of training rising, professionally trained dentists will be in short supply for some time to come.

The basic dental wants of persons living in the less privileged countries are extractions to relieve pain, incision of abscesses, treatment of oral infections, and provision of simple dental prosthetics.

With the exception of prosthetics, much of this demand can be met by supplementing the training of existing paramedical and auxiliary personnel. Practical chairside training for 6 weeks to instill minimal knowledge and skills is sufficient to achieve an immediate objective of modest care with extensive outreach. The inclusion of this training in the initial training of the dispensary attendant, medical assistant, and professional and practical nurse is particularly desirable where dental help is not available. Such instruction has been an integral part of the health center concept in training medical assistants and dressers of Kenya, both during initial training and as part of the retraining course (*14*).

As a second step, the training of specific types of dental auxiliaries is a necessity if total outreach is to be attempted, with a more ambitious objective than that stated previously. This training would envisage the introduction of simple preventive dental care programs. The use of such auxiliaries, however, must not precede an adequate number of professional dentists, capable of supervising them.

A dental service devised on the screening and referral principle enunciated for medical care is envisaged (*15*), with the auxiliary performing simple skills and screening those patients in more urgent need. The training in dentistry proposed at the University of San Carlos in Guatemala would appear to be admirably designed for the dental surgeon. The dentist also must be trained in the management of the auxiliary.

The pattern being followed in Thailand of training both cadres by the faculty of dentistry at the University of Medical Sciences offers the best hope of an understanding of their roles and functions by the dentists and auxiliaries. This combined training will also engender mutual respect and preserve the high standards of training.

In discussing how the dental staff may be trained to meet needs, the relative priorities of three age groups must be considered. In order of precedence, these are the needs of the school child, the preschool child, and the adult.

The adult needs emergency and palliative care—the relief of pain by extractions, periodontal care, treatment of abscesses, temporary dressings, scalings, oral hygiene, local anesthesia, and the recognition of more serious oral pathology. Children need early preventive care, simple cleaning and scaling, application of fluoride, treatment of gingivitis, simple cavity cleaning and repair, and instruction in oral hygiene. There are, of course, the more serious needs, such as correction of malocclusion, orthodontics, and the correction of congenital abnormalities.

Adults also have a growing demand for adequate but inexpensive dentures. The services of dental technicians are obviously needed, and it is encouraging that both Tanzania and Nigeria are training such cadres. Unless such training programs are devised, ill formed and ill fitting dentures made by untrained practitioners will be inevitable.

As in medicine there are two different approaches to the type of auxiliary required. One approach is through fragmenting dentistry vertically into its component technical skills, such as scaling, amalgam fillings, and impression taking. The other approach is by an age-group division. The dental auxiliary is trained in a broad range of skills but to a limited depth.

What, in effect, has happened in practice (apart from the dental technician) is to train either a dental hygienist or a dental nurse. The hygienist has a general education equivalent to the general certificate of education and 2 years' technical training. The dental nurse is a fully qualified nurse with 2 years' technical training in dentistry. The work performed by the auxiliary is confined to cleansing, scaling, filling, simple extractions, and the making of simple prosthetics. Major oral surgery is forbidden.

In Thailand the distinction between the dental hygienist and dental nurse is that the hygienist is permitted private practice and is not restricted to specific age groups. The dental nurses are specifically restricted to public service and to treating children.

Single Skill Auxiliary

Proponents of vertical segmentation, that is, the training of auxiliaries in the single mechanical skill, foresee a dental health service confined to clinics and health centers. One dental surgeon would supervise directly several single skill auxiliaries; his role would be to diagnose and prescribe treatment, plan advanced procedures, perform complicated dental work, and do oral surgery. Every patient, new and repeat, would have to be seen by the dental surgeon. One dental surgeon with six auxiliaries would serve an estimated population of some 25,000. This system, it is averred, would insure the status of dental surgery and prevent the establishment of an inferior standard of dental care and at the same time it would be economical.

Proponents of this system state that it would be difficult to limit or to restrict by law the activity of the broadly trained auxiliary, who once established, would be difficult to abolish. The single skill auxiliary could be trained for 2 years in the same dental school as graduate dentists. The proposal is certainly feasible, representing a practical dilution of skilled labor in countries where there is a sufficiency of dental surgeons to perform the direct supervision and, where money is available, to provide sophisticated dental clinics.

However, it contributes to the inevitable problem of how to attract the graduate dentist to the rural area. Such a program might be feasible for say, Jamaica, but not for Nigeria, with its 40 to 50 dentists, its vast geographic spread, and its strictly limited health economics—a situation that pertains in most of Africa.

Some of the difficulties that severely limit the benefits of a highly organized but widely scattered dental units are as follows: the value of the service in relation to travel (the outpatient gradient of visits being in inverse proportion to the distance), transportation costs, and the time

needed to go to the dental unit by an already overburdened peasant wife and mother.

Training a battery of single skill auxiliaries allows the selection of recruits from the middle school level, where there is a large pool of unemployed. It is hardly an occupation that would satisfy a secondary school graduate, who has succeeded in the abrasively competitive schools of underprivileged countries.

Multiple Skill Auxiliary

The alternative approach is to train a dental assistant in multiple skills. Producing dental hygienists and dental nurses, though ideal for industrialized countries where there is a readily available supply of secondary school graduates, is not always practical.

Using nurses as dental auxiliaries would seem to be extravagant and wasteful of nurses. In most underprivileged countries this proposal, if adopted, would severely limit the output of dental hygienists for many years to come. Moreover, it ignores the cost of training a nurse. In Thailand, training the nurse as a dental hygienist costs $2,500 to which must be added the $1,200 cost of nursing training. This $3,700 compares with $5,600 for training a graduate dentist. Training dental hygienists directly from secondary school graduates has proved practical in countries that have an adequate supply of these graduates.

The demands on secondary school graduates, both for continuing on to a university education and for other vocations are great, and in many underprivileged countries, the supply is not equal to the demand. If total outreach is to be achieved under these circumstances, it will be necessary to recruit dental auxiliaries from the pool of the less educated. Where the auxiliary midwife and medical assistant already exist, it would be irrational, and poor health planning or administration, not to draw upon students of the same educational attainments.

In these circumstances, it is suggested that a dental auxiliary could be accepted for technical training with about 8 years of general education. To offset the lack of general education, technical instruction could be lengthened to 3 years to incorporate sufficient courses in the basic sciences at institutions where other auxiliaries are being trained. Training would follow the same general pattern and concepts outlined for the auxiliary health staff (*16*). Emphasis should be placed on the acquisition of limited vocational skills at the chairside, the referral concept, supervision, and the dual role of assistant or substitute.

The training of two types of dental auxiliary is advocated; one oriented to child dental care, mainly preventive, and the other to adult dental requirements for curative care. The production of these two types of dental auxiliary would allow the organization of a dental health service supervised by a central staff some distance away, which would permit a wider outreach into rural areas. Emphasis should be given to child dental care and to less expensive apparatus and facilities.

Such dental auxiliaries can be used in two ways—as chairside assistants and as semi-independent chairside operators. As semi-independent operators, they will be giving direct clinical care, under supervision which may be either close or remote, depending on the availability of professional dentists and the geographic isolation of the clinic. Further training, after some experience, may be found necessary to fit an auxiliary to be a semi-independent chairside operator, that is, the substitute role. The essence of the auxiliary concept, however, rests on their being used in the two distinct roles—that of assistant and that of substitute. The use of a dental auxiliary, who has neither direct patient contact nor responsibility, is of limited value to rural dental programs in emerging countries.

The potential role of the quack, and the illegal, nontrained, or traditional practitioner should not be overlooked. Restrictive legislation in itself will not succeed in abolishing the illegal practitioner. Programs of sandwich courses, night schools, and on-the-job training have obvious possibilities, but they do not appear to have been successfully exploited in any of the emerging countries. Perhaps the best way to deal with the traditional practitioners is the training as rapidly as possible of sufficient auxiliaries. It is a good omen for dental health programs that there seems to be no insuperable difficulty to training the graduate dentist, the dental hygienist, and the dental auxiliary in a composite institute under the same administration.

Conclusion

In planning dental health programs, illiteracy, educational resources, cultural behavioral patterns, demographic trends, economic aspects, and the pattern of dental disease must be considered. Community dental health services can only grow out of the attempt to provide the individual person with a dental care service.

A different pattern of dental organization and personnel will be needed by emerging countries (*17*). In general the following three stages may be envisaged: (*a*) auxiliary and paramedical staff trained in dental first aid and emergency treatment, (*b*) dental auxiliaries trained in specific skills, and (*c*) dental health services manned by graduate dentists and dental hygienists of paramedical status. Throughout all these stages the dental surgeon is essential for planning, supervision, and consultation, as well as for his higher level of technical skills.

Summary

The training and use of dental auxiliaries in newly emerging countries are proposed as the solution in such countries to the prevalence of dental disease, the paucity of professional dentists and dental schools, and the competing demands on their economies.

Statistically valid dental health surveys of many countries do not exist, but scattered evidence from Jamaica, Guatemala, Thailand, Senegal, and Kenya, among others, indicates that caries and periodontal infections are widespread, and malocclusion, malignant neoplasms of the mouth, and calcium defects are not infrequent. The ratio of dentists to population varies from 1 to 15,000 in Jamaica to 1 to 250,000 in Kenya.

Only 130 to 150 dentists are graduated each year from Africa's seven dental schools; half the countries of the world have no dental school and no prospects of attaining one. The cost of producing one professional dentist is prohibitive—$23,000 per dentist in Guatemala, for example.

Auxiliaries can fulfill many basic dental needs of both children and adults in these countries. A program with three consecutive but overlapping phases is suggested. Phase one is to produce a small corps of superbly trained dentists. Phase two is to supplement this corps by giving existing paramedical and auxiliary health personnel 6 weeks of practical chairside training to increase outreach. Phase three is to develop specific cadres of trained dental auxiliaries.

Single skill auxiliaries can be trained in 2 years. A dental surgeon and six such auxiliaries can serve an estimated 25,000 persons. Multiple skill auxiliaries with 8 years of general education need 3 years of technical training, preferably in an institution where graduate dentists and dental hygienists are also prepared.

The auxiliary's role is both as assistant to the dentist and, where supervision is remote, as his substitute. Producing two types of auxiliaries, one oriented to the dental care of children, mostly preventive, and the second to the curative care of adults, would permit the organization of dental health services on a rational priority basis.

REFERENCES

(*1*) Volker, J. F.: Brief survey of dentistry in Jamaica. University of Alabama, University, 1954. Mimeographed.

(*2*) Chaves, M. M.: WHO report on dental practice in Jamaica. Ministry of Health Archives, Jamaica, 1957. Mimeographed.

(*3*) Hovel, J. H.: Report on dental survey of Jamaica. Ministry of Health Archives, Jamaica, 1960. Mimeographed.

(*4*) Villasenor, R. P.: Problema de salud oral del Guatemalteco. 7th Congresso del la Federacion Odontalogica Centro America y Panama, Sanidad Publica, 1964. Mimeographed.

(*5*) Menendez, O. R.: Fenestracion osea por raices of dientes primarios. Acta Odontólogica Venezolana 2: 3–12, August 1964.

(*6*) Government of Senegal: Rapport general sur les perspectives de développement du Senegal. Rapport Hygiene Santé, 1963. Mimeographed.

(*7*) Report by the Interdepartmental Committee on Nutrition for National Defense: Nutrition survey (Ethiopia). U.S. Government Printing Office, Washington, D.C., 1958.

(*8*) Fendall, N. R. E.: The incidence and epidemiology of disease in Kenya. Pt. 1. J Trop Med Hyg 68: 77–84, April 1965.

(*9*) Ockerse, J.: Chronic endemic dental fluorosis in Kenya. E Afr Brit Dent J 95: 57–60, August 1953.

(*10*) Williamson, M.: Endemic dental fluorosis in Kenya. A preliminary report. E Afr Med J 30: 217–233, June 1953.

(*11*) Report by the Interdepartmental Committee on

Nutrition for National Defense: Nutrition survey (Thailand) 1960. U.S. Government Printing Office, Washington, D.C., 1962.
(*12*) Medrano, J. A.: Analysis de los programas de servicios odontologicos de Guatemala. Thesis. University of San Carlos, Guatemala, 1963.
(*13*) World Health Organization: Trends in dental health and education. WHO Chron 21: 527–530 (1967).
(*14*) Fendall, N. R. E., et al.: A national reference health centre for Kenya. E Afr Med J 40: 118–123, April 1963.
(*15*) Fendall, N. R. E.: Organization of health services in emerging countries. Lancet 7352: 53–56, July 1964.
(*16*) Fendall, N. R. E.: Auxiliary health personnel: training and use. Public Health Rep 82: 471–479, June 1967.
(*17*) Williamson, M. M.: Dental health in Kenya. E Afr Med J 37: 162–166, March 1960.

Cohen Recommends Major Changes in Federal Health Effort

Secretary Cohen sent to the White House in mid-June and the President promptly accepted a report containing sweeping recommendations to improve the coordination of the total Federal health effort.

The Secretary offered five recommendations, two of which have already been implemented. One, urging establishment of a Consumer Protection and Environmental Health Service, took effect July 1 when the Food and Drug Administration, National Center for Air Pollution Control, and other environmental health programs of the Public Health Service were consolidated in the new Service under the leadership of Mr. Charles C. Johnson, Jr.

Another recommendation already acted upon called for transfer of the regional medical programs from the National Institutes of Health to the Health Services and Mental Health Administration.

Three of Secretary Cohen's recommendations, approved by the President, required further action. The President was urged to designate the Secretary of Health, Education, and Welfare as his chief adviser on Federal health policy and programs estimated at $15.6 billion. The Secretary's report pointed out that some 70 percent of all Federal health dollars are spent through programs administered by the Department.

The Secretary also recommended that an Interdepartmental Health Policy Council be created, with the Secretary as chairman, to advise the President and to seek improved coordination of wide-ranging Federal activities in the health field.

The Secretary also called for congressional action establishing the post of Under Secretary for Health and Science in the Department. His report noted the greatly increased policy and operating responsibilities that have been assigned to the Assistant Secretary for Health and Scientific Affairs, Dr. Philip R. Lee.

In recommending these changes to the President, Mr. Cohen called attention to the growth and shift in emphasis of Federal efforts to meet the health needs of the nation. He stated:

"To effectively implement these programs and to provide an organizational basis for the additional improvements which must be taken in the future, changes in the organizational structure must be made so that the Federal Government may effectively work with State and local governments and the private sector in bringing high quality health care to all the American people."