A Developing Country's University Oriented toward Strengthening Health Systems: Challenges and Results

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ABSTRACT

Objectives. The Aga Khan University in Karachi has a mission to educate leaders and to contribute to the development of health systems for Pakistan amid challenges of scarcity and complexity.

Methods. Its key activities are (1) to design and test urban and rural health system prototypes, (2) to develop faculty in medical and nursing postgraduate community health sciences programs, and (3) to design and implement community-based undergraduate medical and nursing curricula.

Results. The university has developed equity-based, cost-effective primary health care prototypes in Karachi slums. With government counterparts it has tested village-, facility-, and district-level interventions in a poor rural district. Federal policymakers have taken models from each for widespread replication. The university is training 49 medical and 19 nursing faculty for postgraduate programs in community health sciences. Most faculty retain institutional leadership positions, including teaching community-based, problem-solving, community health sciences as 20% of the medical and nursing undergraduate curriculum.

Conclusions. The mission and experience of the Aga Khan University in population-based health systems design and health sciences education can guide universities in both developing and developed countries. (*Am J Public Health.* 1993;83:1537–1543)

The Aga Khan University: Challenges, Mission, Objectives

A university in a developing country faces a particularly daunting task as it seeks development amid pervasive underdevelopment. The familiar landscape is a web of scarcity and complexity, the most obvious components of which are widespread ill health; unchecked population growth; and inequitably distributed, largely ineffective health services. Present mortality and morbidity are likely to remain high, given demographic trends and the context of political instability, economic stagnation, inappropriate technology, and value transfers, all of which exist against a backdrop of habitual disregard for or exploitation of the poor.

The Aga Khan University is the first private university in Pakistan. Because it is 10 years old, its facilities, faculty, research capacity, and institutional maturity seem a limited match for the country's formidable problems. This tension between calling and capacity leads to an inquiry into the university's role.[1] Should it venture into society, risking failure and even its stability? Or should it remain cloistered, risking relevance and missed opportunity? Grappling with these issues, the health sciences faculty has advocated concerted interaction with communities, government, and the health system,[2] both public and private. This role is thus reflected in the university's mission statement:

> The Aga Khan University Medical Center is dedicated to providing exemplary education, research and service, oriented toward finding and disseminating innovations to improve the health of the people of Pakistan and the developing world. (Report of the Aga Khan University Medical Center Committee of the Board of Trustees, March 1993.)

The Department of Community Health Sciences has two main objectives: (1) to strengthen the development of health systems in Pakistan through education and research, with emphasis on the development and implementation of health system prototypes in collaboration with local and national authorities; and (2) to educate health personnel for leadership in dealing with health and development problems, particularly those of the more deprived communities of Pakistan. To what extent has the university accomplished these goals? How generalizable are the findings? Enough has now been learned to justify a report on the university's experience in developing health systems and in educating health personnel. The following analysis examines the problems that were addressed, the university's programmatic response, the results to date, and a commentary.

Health System Development

The university has pursued the development of health system prototypes in both urban and rural settings. Each setting has been uniquely challenging; both have been essential for progress toward health.

The University's Urban Primary Health Care Program

The problem: Given the extensive needs of urban populations living in extreme poverty, coupled with serious inadequacies of governmental health services, is it possible for the university to develop prototypes of urban primary health care[3,4] systems that are effective, affordable, and amenable to large-scale replication?

Karachi is a rapidly growing, sharply changing city with a population that approaches 10 million. The millions of underprivileged people pose a chronic crisis, a "paradox of development that perpetuates under-development."[5(p18)] Large portions of the burgeoning population coalesce into

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TABLE 1—Selected Baseline Health and Demographic Indicators: Aga Khan University's Urban Primary Health Care Prototypes[a]

Indicator	Group A[b] Prototypes						Group B[b] Prototypes	
	Orangi	Chanessar Goth	Grax	Essa Nagri	Azam Basti	All Five Sites	Baba Island	Karimabad
Infant mortality rate	110	121	170	144	93	126	210	33
Under 5 yrs of age mortality rate	130	171	224	239	111	177	NA	NA
Crude birth rate	41	41	44	44	41	41	39	16
Crude death rate	10	11	15	18	11	10	20	56
Contraceptive prevalence rate	NA	7	6	12	15	...	13	56

Notes. NA = not available.
[a]Baseline surveys were carried out at one to two sites yearly, 1985 to 1988.
[b]Group A = University-led prototypes (more complete data); group B = community-led prototypes.

katchi abadis, slums characterized by poverty, lack of education, contamination, political instability, ethnic violence, and drug running. In the urban setting, government services are fragmented, skewed toward large hospitals, and unable to meet the needs of the poor.

Thus, the university has developed health system prototypes: small, community-based systems that are amenable to study, adaptation, and ultimately large-scale replication. It has seven such modules scattered in Karachi. Six are located in the katchi abadis, each serving a community of about 10 000. Baseline socioeconomic, health, and demographic surveys of these prototypes (Table 1) show high crude birth rates, high infant mortality rates, and high prevalences of infectious diseases and malnutrition (the impact indicators), along with low incomes, overcrowding, illiteracy, and lack of civic amenities.

The seventh site, Karimabad, is a lower-middle-income area. Its lower birth and infant mortality rates, higher contraceptive prevalence rates, and disease patterns similar to those of industrialized countries attest to its progress through the demographic and epidemiological transition.[6] We have coined the term *child mortality burden*[7] as an indicator of the health transition; it is defined by the percentage of total annual mortality affecting children under age 5. In the slums this figure exceeds 50%; at Karimabad it is 18%.

The response: The university has taken three approaches to primary health care in these urban settings: a university-led, a community-led, and a joint health promotion/disease prevention program.

- The university-led model. Five of the urban modules (Table 1, group A) follow the university design of community-based programs, incorporating the World Health Organization's principles of health for all: universal coverage, care according to need, and community participation. This health care system has three tiers of health personnel. At its base are community health workers: women recruited from and trained in the community. These workers are supported by paramedical lady health visitors, who are supervised by a community health nurse and a community health doctor.

The community health workers are the key to equity and coverage, as each worker monitors approximately 125 households, visiting each household monthly. Those people who are ill or at risk are given priority attention. These workers emphasize immunizations, growth monitoring, oral rehydration therapy, and early recognition of acute lower respiratory infections among children; additionally, they identify high-risk pregnant women and advise on family planning.

Simple curative services are available in small health centers. Community participation is encouraged in the programs, as are other health-related activities like income generation, education, and pressing for adequate supplies of clean water and sanitation. To track coverage, effectiveness, and costs of the program, a management information system uses the community health workers' data. Nurses review and aggregate the data; feed it back to the primary health care team; and forward it to the university for computerization, further analysis, and feedback.

- The community-managed model. The model on Baba Island (Table 1, group B), home to fishermen and their families in Karachi harbor, differs from the university-led model. A strong local nongovernmental organization, the Fishermen's Welfare Association, stimulated the community to want to understand the causes for its ill health. Since the decision making was shared between the university and the community, health system development evolved more slowly than in the university-led model.
- The health promotion/disease prevention model. The Karimabad health promotion/disease prevention program (Table 1, group B) enlists community volunteers and private medical personnel as agents for early identification of risk groups, improved health and disease awareness, changed attitudes and practices, and improved management of "posttransition" diseases.

The university-led urban programs have demonstrated improvements in coverage and impact indicators. The infant mortality rate has fallen from 126 to 64; the under 5 mortality rate, from 177 to 83; and the 1 to 4 mortality rate, from 51 to 19 (Table 2).

In 1991, annual costs of these university-led systems averaged US $3.12 per person in the population, or US $12 per woman of childbearing age and child under 5. Backup, off-site managerial costs increased the per capita cost to US $4.00 (Table 3). Table 4 shows the cost allocation to individual components, including curative care, 39.5%; child nutrition, 20.4%; and immunizations, 16.6%.

Although these communities have had gratifying reductions in the infant and young child mortality rates at affordable costs, these quasi-experiments have had no comparison populations in which health status was monitored without interventions. Thus, additional qualitatively comparable katchi abadis communities are being studied to clarify secular trend questions. Nevertheless, on the basis of these prototypes, the government of Sindh Province has asked the Aga Khan University to assist in developing a large-scale urban health care system, financed by the government and the World Bank.

The University's Program for Rural Health System Development

The problem: Given the extreme problems of underdevelopment in impoverished rural settings and an inadequate health system, is it feasible for a university to help strengthen the governmental health system?

Collaborating with the government to improve health in rural settings is a great challenge. Poverty, inequity, insecurity, women's seclusion, and a woefully inadequate infrastructure for communication, transportation, and education make rural primary health care a task well beyond the capabilities of traditional health interventions.

The government has built a substantial health services infrastructure, but this is beset by deep-seated problems of finance, vision, management, accountability, program content, and staffing. For example, there are few female health staff members, a critical problem in this society. Services are marginally acceptable because of drug shortages and the uneven quality of care; this, in turn, has resulted in their paradoxical underuse by an underserved, unhealthy population. Despite a dismal infant mortality rate of 172, health services use is as low as 0.2 visits per person per year.

The response: The university has worked with the government to advance its capacity for conceptualizing, staffing, and managing the system, including reaching communities with primary health care. This was a top priority because a university-led rural prototype developed independently of the government would have little relevance for sustainability or large-scale replication. The preimplementation phase has been qualitative, emphasizing relation building, method testing, and system strengthening. The follow-on implementation phase, now under way, will test and quantitatively monitor interventions undertaken jointly with the government.

Our health systems research project in Thatta District (population of about 1 million), designed in collaboration with the government of Sindh Province to strengthen the health care system, explores interventions at three levels: district, facility with catchment population, and village. These three levels of approach are being compared in their capacities to improve health status. The district level focuses on strengthening district health management, especially management information systems, and on developing female health personnel. Facility-level interventions include center- and community-based primary health care services and a first referral-level hospital. The village focus is to improve health through schools and to enhance village self-development ability.

The outcomes to date include (1) a better understanding of the sociopolitical context of government personnel and rural communities, (2) a modification of the training and system design consistent with extreme underdevelopment and political instability, (3) improved governmental and community capacities, and, importantly, (4) changed governmental attitudes. Less prone to hopelessly lament their limited resources, doctor-managers now consider using such resources more efficiently. The university's capacity and educational programs have also grown. Junior faculty have learned operations research firsthand. Medical and nursing students who might rarely leave Karachi have experienced the challenges of meeting health needs amid rural poverty. Specific programmatic achievements are as follows.

- At the district level. The District Health Management Team evolved over 2 years, through a series of phases, from the districtwide management training component (see Appendix A). By recognizing and encouraging the early interest of participants, the university enhanced those participants' confidence and leadership capacity. The initial training in management encompassed both technical issues and more abstract topics, such as concept development, communication, and community involvement. Indeed, using these

TABLE 2—Impact Indicators for Five Urban Field Sites (Group A): 1991 Compared with 1985–1988 Baseline

Indicator	1985–1988 n	1985–1988 Rate[a]	1991 n	1991 Rate[a]	% Change in Rate
Population	38 151	...	47 260	...	...
Births	1 556	41	1 442	31	−24
Deaths					
<1 y	196	126	92	64	−49
<5 y	275	177	120	83	−53
1 to 4 y	79	51	28	19	−63
All deaths	400	10	281	6	−40

[a]Rates per 1000.

TABLE 3—Costs by Budget Line for Five Urban Field Sites (Group A), 1991

Expenses	%	Amount Pak Rupees[a]	US $
Salaries	75.1	3 011 246	$120 450
Drug, vaccines, medical supplies	10.3	414 705	16 588
Other supplies	4.0	161 749	6 470
Building	5.8	231 781	9 271
Transport	1.9	75 765	3 031
Training	0.3	12 497	500
Depreciation	2.5	99 925	3 997
Total	100.0	4 007 668	160 307
Total less cost for nonregistered area clients		3 676 537	147 062
Per capita		78	3
University management and faculty expenses		1 064 690	42 588
Total cost per capita		100	4

[a]US $1 = Pak rupee 25 (1991).

TABLE 4—Costs[a] by Program Component for Five Urban Field Sites (Group A), 1991

Component	%
Basic curative care	39.5
Child nutrition	20.4
Immunizations	16.6
Antenatal care	11.7
Family planning	5.9
Health education—additional topics	2.9
Oral rehydration/diarrhea control	3.0

[a]Total cost = US $147 062.

ideas, the trainees became part of the evolving management team, which is now a model of participatory health system problem solving for the province.

Female health personnel have received special training, encouragement, and security assurance. Their knowledge as measured by pre- and posttests has improved, and use of their services has increased. In another initiative, 112 village health volunteers from the catchment area of 20 facilities were trained in basic health activities. Unfortunately, because of inadequate supervision, only 18% remained active after 1 year. But although the program could not be sustained in this form, the government has endorsed its value by seeking outside funding to strengthen it. A major achievement is the university's contribution to the Health Management Information System, which spans the facility and the district and has been accepted for national use.

- At the facility level. In the catchment areas of two facilities, 35 villagers received basic primary health care training. After 2 years with minimal support, 50% of these villagers remain active, and they are enthusiastic about their new capacity for contributing to socioeconomic progress. In another example, usage rates for facility-based antenatal care have increased by 64%. This care is accepted if female staff are reliably available, a crucial strategy to reduce the estimated maternal mortality rate of 1%.
- At the village level. Despite a rural educational system that is even weaker than the health care system, a pilot program has trained 12 teachers in interactive teaching methods. In turn, these teachers have designed and taught modules of six health promotion lesson plans to eager children. Village development workshops have encouraged rural women to identify their own problems, formulate solutions, and take collective action. Because of the lengthy preparatory work required in a setting of feudal inertia, the effects of these workshops at the geographic periphery have thus far been confined to promotion of some health activities and enhanced awareness and organization of certain social groups.

Overall, a strengthened health system is emerging that can initiate and track interventions. Although quantitative evidence for effective, affordable, lasting change awaits further experience, the process has been noted by policymakers. The Thatta project has become the prototype for the government of Pakistan's World Bank-supported Family Health Project, which will serve the 18 million people in every rural district of Sindh Province.

Training and Education for National Health Development

Our programs for human resource development address postgraduates and undergraduates.

Faculty Development: The Aga Khan University Scholars in Community Health Sciences

The problem: Symptomatic of underdevelopment is a scarcity of skilled manpower in community health. How can the Department of Community Health Sciences train leaders in community health and health system development?

The response: The strategy to accomplish this ambitious goal is the Aga Khan University Scholars faculty development track. Now in its ninth year, the program began with a handful of senior faculty and some young Pakistani health professionals. These initial instructor trainees entered a long-term career development track at the completion of which was an uncertain job market. The training they undergo and the wide-ranging jobs these instructors are trained for are described below.

- Community health doctors. Upon entering the program, each physician attends a 6-week "mini–master's degree in public health" orientation to community health. Then, as community health doctors, they join either a rural or an urban field team; as instructors, they teach classroom and field tutorials in the medical college and attend weekly seminars that anticipate teaching responsibilities.

After 3 years of increasing responsibility in the classroom, field, and department, the average instructor has served as a team director and a tutor while developing areas of research and clinical interest. Those recognized as having outstanding research or teaching potential are designated as Aga Khan University Scholars, invited to remain as department faculty, and supported to get a master's degree in their fourth year. Others with different talents needed in Pakistan, such as skills in health system development, primary health care technology, and field work, are assisted in career planning.

Upon their return from master's degree studies, senior instructors assume larger responsibilities in teaching, mentoring, health system development, and research. Many young faculty fill key roles in program development. Years 5 to 7 are spent perfecting skills and defining areas of interest as each instructor plans for doctoral studies and further career development.

- Community health nurses. The community health nurse scholar career development track is smaller, newer, and equally important. Because the nursing profession in Pakistan has long been scorned as unsuitable for young, single Muslim girls, the challenge is both to train nursing leaders[8] and role models *and* to change entrenched attitudes.

Community health nurses join the department after 3 years of diploma nursing and 1 year of midwifery training. As field team members, each works in service, teaching, and management. After 2 years, the nurse enters the 2-year bachelor of science in nursing program. She then works for 2 years refining skills in management, teaching, or field supervision, after which she may apply for master's studies.

To date, the programs are training 49 physician leaders and 19 nurse leaders, numbers that are increasing annually. The faculty development program has a good retention record: more than 45 doctors and nurses are currently in this program, some for as long as 9 years.

The faculty trainees have been monitored rigorously, both internally and externally. Prior to being selected as university scholar in the third year, each trainee receives a series of exacting annual appraisals—qualitative and quantitative evaluations by self, peers, and seniors. Focused, accountable correctives are instituted for lagging performance while acceptable progress is rewarded with new responsibilities. The validity of the internal evaluations is confirmed by virtually every scholar who has excelled in competitive master's programs (such as Harvard, Johns Hopkins, and London). Some scholars have earned degrees with distinction and prizes for scholarship.

The quality of these emerging professionals is confirmed by the array of career opportunities that lie open to them. Nongovernmental organizations and the government have sought consultancies and short-term placements. However, as a gratifying indicator of the scholars' views of this career development track, only 2 of 31 have left the program. Yet, they, too, have assumed important positions in health and development in Pakistan, and the department seeks honorary designations for them. In sum, these young fac-

ulty are the key to the university's innovations in community-based, health system-oriented medical and nursing education, as well as in health system development.

Finally, the instructor/scholar sequence is expensive, averaging US $20 000 per year abroad. The need for an in-country graduate program is obvious. Additionally, the department envisions shorter certificate courses to help educate government and nongovernmental organization personnel who are already committed to working in Pakistan.

Medical and Nursing Undergraduate Education: A Community-Based Approach

The problem: Community health has been accorded low priority and little respect in Pakistan's medical and nursing education. Is it feasible for the university to train its own doctors and nurses for leadership in this field? Can it influence other universities' programs or national health education policy?

The response: Medical and nursing education benefits from the interaction between faculty and health system development. Population-based prototypes serve multiple purposes: they are vehicles for the health and development of deprived populations, training sites for faculty, and settings for students to learn the attitudes and activities of community health from the first month of their medical and nursing careers. Because much of the work is unique and uncharted, communities, students, and young faculty learn as they solve problems together.

- Community health sciences in the medical curriculum. The 20% of the curriculum devoted to community health allows for student learning in socially sensitive and methodologically sound ways that are problem oriented, student centered, competency based, and community based. The 5-year teaching-learning sequence follows a problem-solving process known as the community health planning cycle: community assessment, problem identification and prioritization, vertical and then integrated planning, implementation, and evaluation (Appendix B).

The curriculum is divided into preclinical and clinical phases, 2.5 years in each. Community health sciences are taught through each of the 6 preclinical terms: 2 hours per week in lectures and 5 hours per week in small group tutorials or fieldwork (Appendix B). During the clinical years, quantitative skills are applied to carry out small research projects or health system evaluations. Likewise, clinical skills, taught jointly with the Departments of Pediatrics, Obstetrics/Gynecology, Family Medicine, and Community Health Sciences, are learned through clerkships at several field sites.

Each added field site is unique, as successive classes have learned through community assessments, interventions, and studies. Students benefit from the studies of these field sites. A group of 5th-year students tactfully pretested quality assurance instruments; another group analyzed the potential for using prototypes for large-scale, sustainable replication.

- Community health in the nursing curriculum. The Aga Khan University School of Nursing is unique in Pakistan in that it designates 15% of its diploma curriculum to community health. Educational opportunities for nurses expanded with the 1988 introduction of a two-year postbasic bachelor of science in nursing degree program. Offering the only university degree available for nurses in the country, this program devotes 26% of its curriculum to community health covering fields such as management, education, research, and surveillance. Moreover, the School of Nursing has advised the Pakistan Nursing Council regarding the content of the national community health nursing curriculum and has trained the first tutors.

The undergraduate programs in medicine and nursing can be assessed in terms of the graduates' acquired knowledge, attitudes, skills, and career choices. While educationists grapple with methods to assess the quality of medical curricula,[9] our graduates have a strong foundation in basic, clinical, and community health sciences for addressing the health needs of Pakistan. Desiring to compare their academic performance to an international standard, the first graduating class of medical students asked to take the Canadian Comprehensive Examination. They performed, on average, slightly better than their North American peers (S. C. Robinson, personal communication, 1992).

How the graduates will use their community health experience is less clear. Only five classes of medical students have graduated, and most of those students have opted for postgraduate studies in the United States or United Kingdom. Most speak of returning to confront Pakistan's health problems. Some talk of community health; more imagine a dual focus of a clinical specialty linked with community health, such as community pediatrics. Our medical graduates, like those elsewhere, face multiple factors influencing their career choices: personal and family values, uncertainty of career opportunities, faculty role models, economic considerations, and national need.

Similar comments apply to nursing, which also offers a strong undergraduate program in community health nursing, followed by an uncertain process for graduates sorting out further training needs, career options, and family decisions.

The contrasting commitment between the undergraduate and postgraduate programs no doubt relates to differing selection criteria, professional commitments, and evolving career opportunities. Tracking our graduates' career plans and choices continues.

One strategy for achieving the university's mission in medical education reaches beyond the institution to collaboration with other universities in health and development. For example, the 1993 Workshop on National Priorities in Health Sciences Education called for major nationwide curriculum changes toward population-based orientation, and the Pakistan Medical and Dental Council is asking the university to help develop the implementation strategies.

Conclusions

The Aga Khan University, a university in a developing country, is addressing the problems of severe underdevelopment in the health sector through health system development and education for leadership in the field. In each case, we have defined the dominant problem, reviewed our programmatic response, and analyzed the effectiveness of the results. In several instances, the university's work on prototypes of health systems and educational programs has resulted in policy changes by the government.

Of note, the university's activities are not confined to educational and system development. The department actively conducts research that is guided by health system questions and that guides curriculum. For example, inquiries into maternal management of child illness and household risk factors for child death probe the social determinants of the health transition. And students conduct focus group discussions probing into mothers' perceptions of and response to childhood diarrhea. On a national scale, the department oversees the Maternal and Infant Mortality Survey of 40 000 households in all four

provinces, the results of which will strengthen the university's linkages with the government and guide policy. Moreover, the Pakistan Medical Research Council has asked the department to advise it regarding research priorities and capacity building for research.[10]

What can be said about the *generalizability* of our experience to other universities in developing countries? The salient question is, how feasible is it for universities to engage in health system development? It is feasible, depending on the extent of university interest, commitment, and resources. Faculty and staff must have—or be willing to develop—the relevant disciplinary backgrounds: health system planning and management, epidemiology, and sociopolitical skills to interact with communities and government. Financial resources are necessary for fieldwork and system development; however, field activities can be undertaken at low cost and can greatly stimulate a university's thinking in system development. The *process* of pursuing constructive change under conditions of underdevelopment requires faculty who sensitively press for change and an institutional orientation that rewards advances in education and health system development as well as more conventional research.

Regarding faculty development, our experience can guide similar universities' institutional growth in this field. The lack of trained, interested faculty is a commonly cited obstacle that precludes a university's pursuit of health system development. But our university did not begin with strong expertise in this field. Instead, a few committed senior faculty recruited interested young people and trained them in the field to learn of individual, community, and health system problems and opportunities, while supporting and monitoring their professional maturation. Note that our university is not unique in health system development activities. Many universities in both developed and developing countries have similar missions.[11,12]

The undergraduate educational programs are also generalizable to other universities in developing countries. While other universities have more experience in innovative teaching methods, our strength is our extensive involvement in community-based education in the context of health system development.

This paper adds to the current debate on change in medical and nursing education, including the growing practice of universities to establish community- and population-based education and health care programs.[13] Such institutions accept responsibility for the health of a defined population, this responsibility includes not only involvement in health care guided by epidemiological methods but also advocacy for those populations.[14] The Aga Khan University's experience should encourage other like-minded universities in both developed and developing countries. Indeed, here universities share a common agenda regardless of their societies' development. □

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APPENDIX A—Management Training Evolves into a District Health Management Team (DHMT)

Initiation of training
1. Initiating management training: 22 medical officers selected by participatory approach
2. Trainees planning training: need for trainee participation recognized after first workshop

Growth of individuals
3. Making case studies: "resource trainees" volunteer to help make real-life case studies
4. Making/facilitating modules: resource trainees help design and implement whole modules
5. Identifying new issues: issues beyond the curriculum—transfers, political interference
6. Training trainers: DHO seeks plan, curriculum, and trainers for World Health Organization's VHV Programme

Growth of the team
7. Defining DHMT: as program evolves—new name (DHMT) and terms of reference
8. Expanding role: problem solving—reporting defaulters, low utilization, etc.
9. Increasing participation: female and community participation debated and female joins
10. Team approach: DHMT responds to 2^0 hospital's request for situation analysis
11. Meeting policy makers: DHMT concept approved for Sindh Province
12. Institutionalizing DHMT: DHMT and DG Health-Sindh review institutionalization

Note. DHO = district health officer; VHV = village health volunteer; DG Health-Sindh = director general of health of Sindh Province.

APPENDIX B—Medical Curriculum: Preclinical and Clinical Courses by Year of Study and Content

Course	Year	Content
		Preclinical phase
Community, health, and development	1	Introduction to development, risk groups, and primary health care in the context of Pakistan and Aga Khan University
Community assessment	1	Epidemiology, biostatistics, demography, and qualitative methods to design/implement/analyze field survey
Health services assessment; occupational health	2	A macroview of assessment and an introduction to Pakistan's occupational health challenges
Primary health care technologies	2	Biomedical, technical, social, and managerial aspects of primary health care components
Planning	2	Equipped with micro- and macroassessment tools plus ranges of strategies and activities, students design a response
Biomedical ethics and clinical epidemiology	3	The ethical and epidemiological dimensions of the clinical and community encounter—a bridge to the clinical years
		Clinical phase
Primary health care technologies	3	Student groups explore technologies: appropriateness, effectiveness, and affordability over 2 months
Research methodology	4	Student groups design, implement, analyze, and report a supervised study over 1 month
Evaluation methodology	5	Student groups perform a detailed evaluation of part of an existing health system over 3 months