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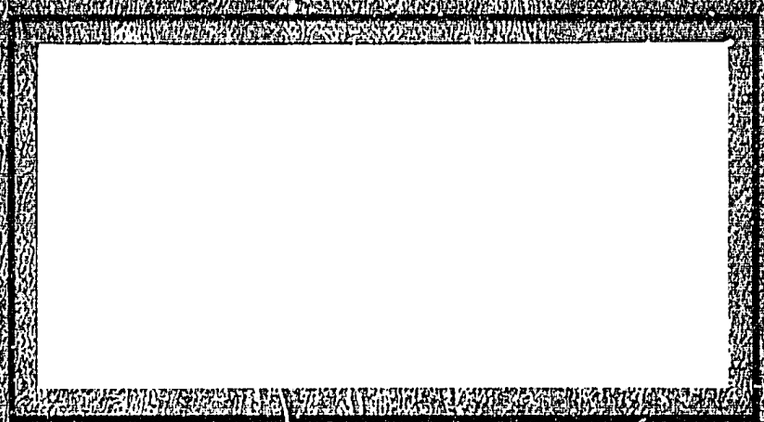

A REVIEW OF PROPOSED STRATEGIES TO PROVIDE ADEQUATE WATER SUPPLIES, SANITATION, AND MEDICAL COVERAGE IN JORDAN

A Report Prepared By:
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PREFACE

PREFACE

I would like to thank Dr. Sami Khoury, Jack Thomas, and Dr. David Sharry of the USAID Mission in Amman; Allen Randlov, AID Near East Bureau; and Dr. Leila Erder, the Population Council Middle East Representative, for sharing their ideas and information. My thanks go also to Boyd McCleary, of the Health Planning and Economic Development Program, The University of Michigan, for his help in estimating the costs and coverage of alternatives to medical care delivery.

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EXECUTIVE SUMMARY

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A review was made of the health components of the water sector strategy proposed by the USAID mission in Jordan, of the proposal to initiate a water and sanitation project in Irbid, of opportunities to study the effects of water supplies on health, and of the methods used to extend medical care services.

In evaluating the water sector strategy, the consultant recommended that the mission study the interrelationship of malnutrition, respiratory infections, and diarrheas that afflict infants and children; examine the possible consequences of making quantities of water available without being concerned about water quality; calculate the costs of waste water treatment; and assess the effects on public health of reused waste water.

The problem of rapidly estimating the socioeconomic status of the neighborhoods in Irbid that might benefit from the proposed water and sewerage improvements was examined. The consultant recommended that 1979 Census data be used in calculations, zoning restrictions be enforced, physical sites be inspected, and the population encouraged to adopt hygiene practices.

Recent research on the health status of and water supply in two Jordanian cities was reviewed. Methodological problems and the proposed research linking infant mortality estimates derived from the World Fertility Survey to water and sanitation situations in specific neighborhoods were discussed.

Some alternative approaches to increasing the population covered by primary health care personnel were specified; the approximate costs of extended coverage were calculated and the implications of coverage reviewed.

If it is funded and implemented, the University of Jordan's proposed Health Status Survey will probably yield data useful to the University of Michigan's Health Sector Research Allocation Model. The data could be used to determine the effects on health and estimate the costs of alternative systems.

Research on a threshold-saturation theory of the health benefits of sanitation investments was presented at a seminar for USAID staff and in a lecture at the Department of Community Medicine, University of Jordan.

I. INTRODUCTION AND BACKGROUND

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An adequate water supply is crucial to an arid country such as Jordan. Increased domestic consumption affects and competes with the supply of water available for agricultural use. It has been argued that investments in water supply and sanitation projects can have a significant impact on efforts to maintain the health and well-being of populations in developing countries. When AID funding for health programs was reduced, AID investment in water and sewerage projects became the principal strategy for promoting health in Jordan.

The author of this report and his colleagues at The University of Michigan and Hebrew University in Israel recently proposed a theory on the relationship of sanitation investments to health status. The AID mission in Jordan and the Near East Regional Bureau in Washington were interested in applying the hypothesis to a review of the health components of a proposed water strategy for Jordan. AID staff also wanted to know whether research on the relationships between sanitation investments and health in Jordan could be related to other research to produce useful information.

The consultant's responsibilities were to:

--review the mission's water sector strategy and determine whether a better approach can be taken to implement the health components of water projects;

--review the validity of domestic water use projections, given recent census data and high fertility rates;

--consult or give advice on water-related components of the health education project now being discussed with MOH;

--advise on the need for and design of a mini-KAP on water use habits in Jordan; and,

--review the Irbid water and sewerage proposal.

Following discussions in Amman with the mission director and other AID staff, the consultant's scope of work was modified in accordance with the time available, the progress of mission work, mission priorities, and the consultant's own knowledge of Jordan and of health planning and administration. It was agreed that the consultant would:

--review the health components of the water strategy;

--review the socioeconomic aspects of the Irbid project;

--review proposed research on and opportunities to study the relationship of water supply and sanitation to health status; and,

--examine the contribution that could be made to the Health Planning and Services Project.

The consultant's itinerary was as follows:

22 April	Discussion with Dr. David Sharry of Social Soundness Analysis, Irbid Water and Sewerage Project.
	Review of Research with Dr. Sami Khoury.
23 April	Discussions on costs of alternative health care delivery systems.
	Review of draft concept paper on health education project.
24 April	Field travel.
25 April	Meeting with Dr. Leila Erder, Population Council.
26 April	Presentation on health and water policy analysis.
	Debriefing with Dr. Ed Harrell, Mission Director.
27 April	Field travel, Irbid.
28 April	Lecture, Faculty of Medicine, University of Jordan.

II. PROPOSED STRATEGY FOR TREATMENT OF WASTE WATER

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The proposed waste water treatment strategy described in various documents is an expensive system that may be inappropriate for Jordan. Its implementation may require that both Jordan and its financial supporters fund an unnecessarily costly project.

The costs and health implications of alternative technologies are described in several articles, two of which the consultant left with staff in Amman. These were Michael G. McGary's "Waste Collection in Hot Climates: A Technical and Economic Appraisal"* and D.D. Mara's "Wastewater Treatment in Hot Climates."** The consultant also recommended Mara's Sewage Treatment in Hot Climates, published by Wiley.

The issue of waste water treatment and the general problem of water quality versus water quantity should be taken into account when formulating a water strategy. There is some evidence that problems such as shigella can be better handled through domestic use of larger quantities of water. Too much attention may have been given to water quality.

The simple linking of water supply and fecal disposal to diarrheas in Jordan does not take into account the synergism of malnutrition, lower respiratory infections, and diarrheas. Approximately two-thirds of the infant and childhood deaths reported in several poor countries (e.g., Philippines, Mexico, Indonesia) are caused by this triad. If this is also the case in Jordan, then diarrheas may be the indirect cause of as many as three times the number of deaths implied in the strategy paper. A health strategy to reduce only the incidence of diarrhea may be inadequate, however, given the absence of improved nutritional status, rapid medical attention to respiratory disorders, and rehydration capacity.

Given current knowledge about the relationship of water and sanitation investments to health status, justifying water investments primarily on grounds of health is questionable. Other rationales for increasing domestic amenities should be sought.

Jordan has an adult literacy rate of slightly more than 62 percent. Application of the threshold-saturation theory indicates that its socio-economic development position is such that a high expectation of health benefits from investments in sanitation projects is reasonable.

Questions were raised about the efficacy of reusing waste water. The consultant had no technical knowledge of the subject and recommended contacting the U.S. Environmental Protection Agency, which is funding demonstration

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*See Water, Wastes and Health in Hot Climates, Richard Feachem, et al. (eds.), Wiley, 1977.

**Op. cit.

projects on the health problems of waste water irrigation in Israel. Professor Hillel Shuval is directing these projects. The consultant left Shuval's article, "Public Health Considerations in Wastewaters and Excreta Re-Use for Agrigulcure," with staff.* He also recommended the following literature:

- C.J. Schmidt and D.E. Ross, "Cost Effectiveness Analysis of Municipal Water Reuse," Water Planning Division, Environmental Protection Agency, April 1975 (WPD-4-76-01).

- C.J. Schmidt and E.V. Clement, III, "Demonstrated Technology and Research Needs for Reuse of Municipal Wastewater," National Environmental Research Center, Office of Research and Development, U.S. Environmental Protection Agency, May 1975 (EPA-670/2-75-038).

- H.I. Shuval (ed.), Water Renovation and Reuse, Academic Press, 1977.

- H.I. Shuval, "Health Aspects of Water Recycling Practices," in Hutzinger, O. (ed.), Aquatic-Pollutants: Transformation and Biological Effects, Regamon, 1978.

- E. Katzenelson, et al., "Risk of Communicable Disease Infection Associated with Wastewater Irrigation in Agricultural Settlements," In Science, 26 November 1976.

- A.Y. Sadovski, et al., "Microbial Contamination of Vegetables Irrigated with Sewage Effluent by the Drip Method," In Journal of Food Protection, Vol. 41, No. 5, May 1978.

- Benjamin Tetsch, et al., "Die-away Kinetics of Aerosolized Bacteria from Sprinkler Application of Wastewater," Proceedings, Water Reuse Symposium, Vol. 3, Denver, Colorado: AWWA, 1979.

- H.I. Shuval, "Health Factors in the Re-use of Waste Water for Agricultural, Industrial and Municipal Purposes, In "Problems in Community Wastes Management, Public Health Papers 38, WHO, 1969.

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*See Feachem, op. cit.

III. THE IRBID WATER SUPPLY AND SANITATION PROJECT: SOME OBSERVATIONS AND RECOMMENDATIONS

III. THE IRBID WATER SUPPLY AND SANITATION PROJECT: SOME OBSERVATIONS AND RECOMMENDATIONS

Consultants from Weston International and Stanley prepared a report on the technical and financial feasibility of the Irbid water project. They included in their study a "social soundness analysis." Questions on the authors' methodology--on the small sample size, the lack of random selection of households, and the presence of officials at interviews--were raised.

Many socioeconomic issues could be raised, and references to some of these can be found in the following two articles:

- Jarir S. Dajani, "A Social Soundness Analysis of the Amman Water and Sewerage Systems," Report to USAID, Office of Development Planning, NE/DP, April 17, 1978.
- The World Bank Energy, Water and Telecommunications Department, "Socio-Cultural Aspects of Water Supply and Excreta Disposal," September 1978.

The immediate issue seemed to be the zones of the city to which USAID funding would be allocated. Were these zones the poorer neighborhoods, or other areas of the city? This question had to be reexamined as soon as possible. The consultant suggested that three steps be taken immediately. None could be considered definitive, but if all three pointed in the same direction, the results could be accepted with some confidence.

Household size had to be determined first. It has been argued that the higher the number of people per household, the lower the income level. Data on 303 quarters of Irbid, comprising 16,087 households, were collected during the 1979 Census. The consultant suggested classifying each of the 303 quarters into one of the zones in which a water and sewerage system would be placed and then dividing the number of households in each zone into the population figures to yield a household size more reliable than that calculated in the Weston survey.

The consultant then recommended a study of the existing residential space regulations for the different zones in Irbid. (These regulations may not be regularly enforced.) The study might reveal what the municipality believes are richer and poorer neighborhoods.

As a third step, the consultant recommended that informed observers visually inspect housing and environmental conditions while driving through the city to determine relative poverty levels. This technique has been used in the U.S. in Michigan's Project ECHO. In some societies, structures (e.g., those in Damascus) may be shielded, making it impossible to estimate inhabitants' economic status. This did not appear to be the case in Jordan. Mission staff and Dr. Eiger of the Population Council encouraged the use of this approach. Dr. David Sharry and the consultant visited Irbid, tested the method, and found it feasible. Dr. Sharry then made plans to apply it in Irbid. The consultant asked Professor Demetrius Plessas, who has had experience with the approach, to telephone Dr. Sharry to discuss problems and methods.

IV. REVIEW OF RESEARCH ON ENVIRONMENTAL CONDITIONS AND HEALTH STATUS

IV. REVIEW OF RESEARCH ON ENVIRONMENTAL CONDITIONS AND HEALTH STATUS

Dr. Sami Khoury and the consultant reviewed Khoury's recent research in two cities on the effects that continuous and intermittent water supplies have on health. Observations were made only in clinics (identified as a critical flaw in methodology) and diametrically-opposed conclusions could be drawn after reviewing the data, depending on the variable used as the denominator--cases of diarrhea/total cases or cases of diarrhea/population.

Following these and other discussions on health policy research, the consultant concluded that household surveys of health status, environmental conditions, and service use were essential. Dr. Khoury and the University of Jordan have proposed such surveys, and the basic questionnaires have been designed. No survey has, however, been funded.

Shafiq Al Otum, of the Department of Statistics, University of Jordan, has proposed a study of Jordan using data from the World Fertility Survey. Otum expects to estimate the infant mortality rate and may be able to calculate life-tables. He also proposes to examine the relationships of health status indicators to water connections in various areas. His study, which will be competing for funding in the MEAWARDS, may be very useful in understanding these complex issues.

V. REVIEW OF HEALTH SERVICES DELIVERY PLANNING

V. REVIEW OF HEALTH SERVICES DELIVERY PLANNING

Dr. Khoury noted that the Ministry of Health has been considering a number of alternatives for expanding health service coverage. One approach is to increase the number of physician-directed health centers. Other alternatives are to train and use community health outreach workers from MCH centers and to upgrade the skills of nurse-assistants in village health clinics by training them to perform additional tasks.

The consultant offered to develop cost estimates for these alternatives, using Dr. Khoury's specifications. The community health worker outreach effort, which would cost about 15 percent more than the present system, would more than double coverage. Proposed expansions which replicate the current system would increase coverage by less than 30 percent, but the costs would be at least 20 percent higher than those for the present system. Nurse-assistants in village health clinics could be retrained without increasing substantially current costs, and coverage could expand as much as 10 percent.

The consultant discussed with his colleagues the use in Jordan of the health effectiveness calculations (available in Michigan's Health Sector Resource Allocation Model). Dr. Khoury believes that Jordanian epidemiological data are too weak to support this exercise. Such work has, therefore, been postponed until the results of the health survey become available. The compatibility of model input requirements to the survey was also discussed.

Dr. Michael Bernhart of the Institute of International Business, Georgia State University, was in Amman to help with the AUPHA management review for the Ministry of Health. He and the consultant discussed the various methods used to evaluate health delivery systems. Apart from listing potential indicators of health and services, the consultant suggested he study the application of the "tracer" method, and referred him to Jeanne Stillman's* application of this method in developing countries.

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*Columbia University

Appendix I

COST AND COVERAGE ESTIMATES FOR HEALTH CARE DELIVERY ALTERNATIVES IN JORDAN

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COST AND COVERAGE ESTIMATES FOR HEALTH CARE DELIVERY ALTERNATIVES IN JORDAN

The method used to derive cost and coverage estimates for five alternative health care systems in Jordan is described below. Lack of data was a constraint overcome, at least in part, through use of various assumptions. The results presented below are rough approximations and vary considerably, depending on the set of assumptions used. Certain basic information was available in Jordan. It included:

--personnel salaries;

--drug costs per treatment;

--number of visits to 67 health centers and 245 village health clinics in 1978;

--percentage of visits resulting in treatment;

--number of health centers, maternal and child health centers, and village health clinics;

--approximate number of staff at each type of facility;

--number of health centers planned over the next three years; and,

--effective contact percentage for the health centers and village health clinics.

Five health care delivery alternatives were considered:

1. Addition of 18 health centers over three years.

2. Addition of 18 combined health centers and maternal and child health centers, plus 72 additional village health clinics.

3. Addition of 610 community nurses to the existing maternal and child health centers.

4. Upgrading of the 250 village health clinic nurse assistants.

5. Addition of 610 community nurses to the existing maternal and child health centers, and upgrading of 250 village nurse assistants.*

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*A combination of Alternative 3 and Alternative 4.

The results indicate that the most cost-effective alternatives for increasing the coverage of the population are Alternative 3 and Alternative 5 (the combination alternative, 3+4). Alternative 3 would cost 15 percent more than the present system in a six-year period and would increase coverage by 116 percent. Alternative 5 (3+4) would cost 18 percent more than the present system in a six-year period and would increase coverage by 127 percent. The other three alternatives do not increase coverage by more than 30 percent, and costs for Alternatives 1 and 2, respectively, are 4 percent and 21 percent above the cost of the combination alternative, 3+4.

Tables 1 and 2 and Graphs 1 and 2 present cost and coverage estimates, the general and specific assumptions used, and detailed cost estimates. The assumptions used can be changed as better information becomes available and the estimates can be recomputed.

An analysis of the sensitivity of the results to changes were made. There was no significant change in the relative ranking of the alternatives when the number of M.D.s, R.N.s, and N.A.s at the health centers was changed from 1 to 2, or when the number of visits per effective contact was changed from 1.5 to 4 in Alternatives 3 and 4 and in the combination alternative, 3+4.

A key to abbreviations is provided on page 13.

Table 1

CUMULATIVE COST AND COVERAGE AT YEAR SIX

Alternatives	Million JD			Population Coverage (Thousands)
	Operating Cost	Investment Cost	Total Cost	
PRS - Present system with 63 Health Centers, 61 MCH, 250 Village Health Clinics	17	0	17	590
ALT4 - Present system plus 250 Upgraded VHW	18	0	18	650
ALT1 - Present system plus 18 H.C. over three years	19	2	21	660
ALT2 - Present system plus 18 H.C./MCH and 72 VHC over three years	20	3	24	770
ALT3 - Present system plus 610 Community Nurses attached to MCH	19	1	20	1,300
ALT3+4 - Present system plus 250 Upgraded VHW and 610 Community Nurses attached to MCH	19	1	20	1,340

NOTE: Figures may not be additive due to rounding.

Table 2

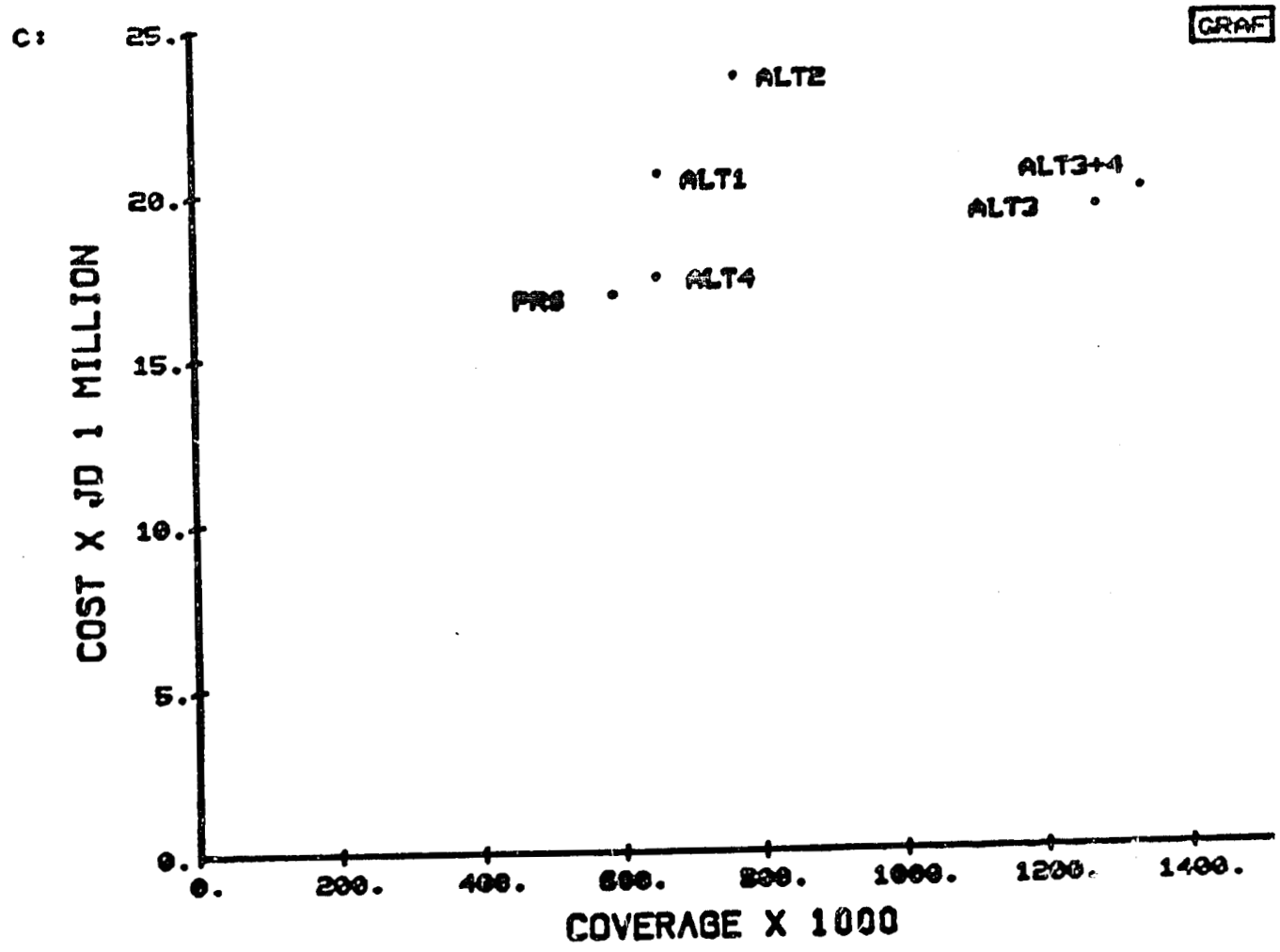
COVERAGE BY ALTERNATIVE AND YEAR (X 1000)

Alternatives	1	2	3	4	5	6	TOTAL
PRS - Present system with 63 Health Centers, 61 MCH, 250 Village Health Clinics	590	590	590	590	590	590	3,500
ALT4 - Present system plus 250 Upgraded VHW	590	653	653	653	653	653	3,900
ALT1 - Present system plus 18 H.C. over three years	590	613	635	657	657	657	3,800
ALT2 - Present system plus 18 H.C./MCH and 72 VHC over three years	590	655	712	769	769	769	4,300
ALT3 - Present system plus 610 Community Nurses attached to MCH	590	590	818	1,048	1,276	1,276	5,600
ALT3+4 - Present system plus 250 Upgraded VHW and 610 Community Nurses attached to MCH	590	653	881	1,110	1,339	1,339	5,900

NOTE: Total figures rounded to two significant digits,

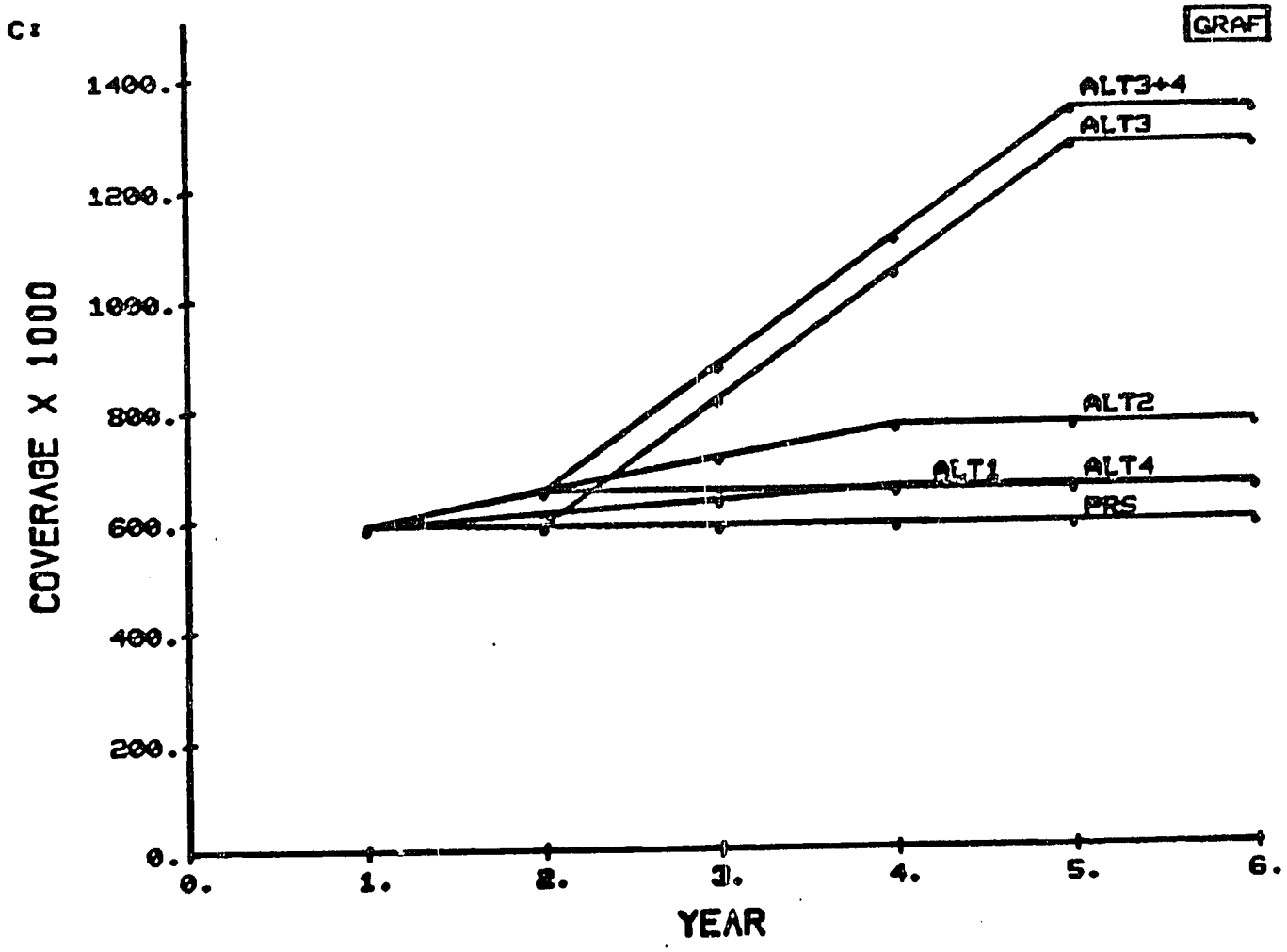
Graph 1

CUMMULATIVE TOTAL COST
AND COVERAGE YEAR 6



Graph 2

COVERAGE BY YEARS



ASSUMPTIONS USED IN THE COMPUTATION OF COST AND COVERAGE ESTIMATES FOR THE ALTERNATIVES*

General Assumptions

1. Personnel Costs

Costs were calculated by multiplying the monthly pay and allowances of each type of personnel by the number of each type in each unit. The number of M.D.s, R.N.s, and N.A.s in the health center (HC) were described as "one or more." We tentatively assumed an average of 1.5 per health center. Each health center was assumed to have one clerk and one assistant pharmacist. The maternal and child health centers were staffed by one midwife, one assistant nurse, and one clerk, with the doctor from the HC coming in two times a week. Each village health clinic was staffed by one nurse assistant, with a health center physician visiting twice a week.

2. Drug Costs

Costs were assumed to be 125 fils per treatment, except in village health clinics, where it was assumed to be one-half of the above treatment cost. This assumed that fewer prescription drugs were being issued at village health clinics. Drug costs for the health centers and maternal and child health centers were derived from the calculated number of visits to 67 health centers and 245 village health clinics in 1978, 2.349 million. Of these visits, 77 percent resulted in treatment. The health centers and maternal and child health centers were visited 1.667 million times; the remainder of the visits were made to village health clinics. Maternal and child health center drug costs were incorporated into health center drug costs because separate data were not available. Drug costs for village health clinics were calculated using data on effective contact--50 percent of the population of the catchment area, 1.5 visits per effective contact. This approximates the remainder of the 2.349 million visits less the health center and maternal and child health centers. Again, 77 percent of the visits resulted in treatment.

3. Facility Costs

It was assumed that the average size of a health center was $500m^2$ and cost $JD80/m^2$. Equipment costs for a new health center were assumed to equal building costs. A new MCH center was assumed to cost the same as a new health center when built separately. When a MCH center was built as part of a new health center, it was assumed to cost an additional 75 percent. This represented some cost-saving due to sharing of space and equipment.

4. Maintenance and Replacement Costs

Building maintenance and replacement costs were assumed to be 10 percent of the construction costs of a new HC or MCH center. Equipment maintenance and replacement costs were assumed to be 20 percent of the equipment costs of a HC or MCH center.

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*See Tables 3-13.

5. Training Costs

Training costs were calculated as JD40/month x the number of months of training for each type of personnel. The cost of training a clerk was assumed to be negligible; the total cost to train a registered nurse was assumed to be JD5,000. Physicians were not included in either the normal training or attrition training costs. Attrition training costs were based on the 10 percent annual attrition rate for all categories of personnel, except medical doctors. In all cases it was assumed that sufficient training facilities and faculty were available. No costs were computed for these factors.

ASSUMPTIONS SPECIFIC TO ALTERNATIVES

Assumptions specific to Alternative 1 (addition of 18 health centers over a three-year period):

NONE.

Assumptions specific to Alternative 2 (addition of 18 combined/health centers and maternal and child health centers and 72 additional village health clinics):

NONE

Assumptions specific to Alternative 3 (addition of 610 community nurses to existing maternal and child health centers):

1. Personnel Costs

Costs were based on 10 community nurses for each maternal and child health center, with each community nurse earning JD720 per year.

2. Drug Costs

Costs were based on a community nurse with an effective contact of 75 percent of the population of the catchment area, with each effective contact yielding 4 visits, and 38.5 percent of the visits resulting in treatment at 125 fils per treatment. The figure of 38.5 percent was used instead of the 77 percent figure derived from 1978 data for health centers and village health clinics because it was assumed that the community nurse would be spending most of her time doing preventive work and would thus be required to treat fewer patients.

3. Training Costs

Costs were based on 24 months of training at JD40 per month.

Assumptions specific to Alternative 4 (upgrading 250 village health workers):

1. Personnel Costs

Costs were based on an upgraded village health worker receiving JD60/month.

2. Drug Costs

Costs were based on an upgraded village health worker with an effective contact of 75 percent of the population of the catchment area, with each effective contact yielding 4 visits and 77 percent of the visits resulting in treatment at 125 fils per treatment. The increase in the percentage of effective contact and in the number of visits per effective contact place an upper limit on drug costs for the upgraded village health worker.

3. Training Costs

Training costs were assumed to be negligible, since village health workers would continue to collect their normal salary (JD50 per month), which represents no increase in costs during the training period. This again assumes that there are sufficient training facilities and faculty available for which no costs were computed.

ASSUMPTIONS ABOUT COVERAGE*

Health Centers

Coverage by health centers was based on the statement that on average, the effective contact of a health center was 25 percent of its catchment area population, which is 15,000, yielding an effective contact per health center of 3,750.

Maternal and Child Health Centers

Coverage by maternal and child health centers was based on the assumption that within a 15,000 population catchment area, these facilities would have an effective contact similar to that for the health center. The figure 3,750 was used. It was also assumed that when health centers and maternal and child centers were taken as a unit, their effective coverage would be additive, yielding an effective contact of 7,500. This assumption probably overestimates the effective contact for the combined health center and maternal and child health center, since these share the same catchment area population.

Village Health Clinic

Coverage by the village health clinics was based on the statement that their effective contact was between 50 percent and 75 percent of the population in their catchment area (1,000). We choose to use the lower figure, 50 percent, which yields an effective contact of 500.

Village Health Clinic with Upgraded Village Health Worker

Coverage by the village health clinics with upgraded village health workers was based on the assumption that effective contact would increase to 75 percent of the catchment area population, yielding a figure of 750.

Community Nurses

Coverage by community nurses was assumed to be 75 percent of the catchment area population. A catchment area population of 1,500 was chosen on the assumption that the community nurse would be involved primarily with a subset of that population, namely, mothers and children. An effective contact of 75 percent of a catchment area population of 1,500 yields a figure of 1,125 per community nurse.

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*Coverage here is defined as effective contact.

KEY

A. Pharm.	=	Assistant Pharmacist
AN	=	Assistant Nurse
CN	=	Community Nurse
EC	=	Effective Contact
HC	=	Health Center
JD	=	Jordanian Dinar
MCH	=	Maternal and Child Health Center
M.D.	=	Medical Doctor
N.A.	=	Nurse Assistant
R.N.	=	Registered Nurse
VHC	=	Village Health Clinic
VHW	=	Village Health Worker

Table 3

ANNUAL OPERATING COSTS OF ONE HC

	Cost in JD
Personnel Salaries	
M.D. = 1.5 x 350/mo. x 12 mo.	6,300
R.N. = 1.5 x 150/mo. x 12 mo.	2,700
N.A. = 1.5 x 75/mo. x 12 mo.	1,350
Clerk = 1.0 x 40/mo. x 12 mo.	480
A. Pharm = 1.0 x 75/mo. x 12 mo.	900
	11,730
Drug Costs	3,111
Maintenance and Replacement Costs	
Building Maintenance and Replacement = 10% cost of building	4,000
Equipment Maintenance and Replacement = 20% cost of equipment	8,000
	12,000
Training Costs (10% Annual Attrition)*	
R.N. training costs assumed to be 5,000 Annual Cost	750
N.A. = 18 mo. x 40/mo. = 720 Annual Cost	108
A. Pharm. = 24 mo. x 40/mo. = 960 Annual Cost	96
	954
TOTAL Operating Costs Per Year	$27,795

*Physicians excluded.

Table 4

INVESTMENT COSTS OF ONE HC

	Cost in JD
Construction Costs	
Building Costs = 80/m^2 x 500m^2	40,000
Equipment Costs = Building Costs	40,000
	80,000
Training Costs	
R.N. = 1.5 x 5000 = 7,500	7,500
N.A. = 1.5 x 720 = 1,080	1,080
A. Pharm. = 1.0 x 960 = 960	960
	9,540
Initial Drug Costs (same as under present system)	3,111
TOTAL Investment Cost per HC	$92,651

Table 5

ANNUAL OPERATING COSTS OF ONE MCH

	Cost in JD
Personnel Salaries	
M.D. (listed under HC costs)	
Midwife = 1 x 125/mo. x 12 mo.	1,500
AN = 1 x 75/mo. x 12 mo.	900
Clerk = 1 x 40/mo. x 12 mo.	480
	2,880
Drug Costs (listed under HC costs)	
Maintenance and Replacement Costs	
Building maintenance and replacement = 10% cost of building	4,000
Equipment maintenance and replacement = 20% cost of equipment	8,000
	12,000
Training Costs (10% Annual Attrition)*	
Midwife = 27 mo. x 40/mo. = 1,080 Annual Cost	108
AN = 18 mo. x 40/mo. = 720 Annual Cost	72
	180
TOTAL Operating Costs Per Year	$15,060

*Physicians excluded.

Table 6

INVESTMENT COST OF MCH BUILT SEPARATELY FROM HC

	Cost in JD
Construction Costs	
Building Costs = $80/m^2 \times 500m^2 = 40{,}000$	40,000
Equipment Costs = Building Costs	40,000
	80,000
Training Costs	
Midwife = 1 x 27 mo. x 40/mo.	1,080
AN = 1 x 18 mo. x 40/mo.	720
	1,800
Initial Drug Costs	3,111
TOTAL Investment Cost (One MCH built separately from HC)	$84,911

Table 7

INVESTMENT COST OF ONE MCH INCORPORATED INTO NEW HC

	Cost in JD
Construction Costs	
75% of cost of new HC when built in coordination (due to more efficient space and equipment use)	69,488
Training Costs (same as for MCH built separately)	1,800
Drug Costs (incorporated into HC; 1 year supply)	0
	71,288
TOTAL Investment Cost of One MCH when Incorporated into New HC	$71,288

Table 8

ADDITIONAL ANNUAL COSTS PER MCH WITH 10 CNs

	Cost in JD
Attrition Training Costs (10% attrition)	
CN = 40/mo. x 24 mo. = 960 Annual Cost	960
Drug Costs	
Based on one-year supply with an EC of 75% of catchment area, @ EC yielding 4 visits, with 38.5% of visits receiving treatment at 125 fils/treatment (0.75 x 1500 x 4 x .385 x 125 fils divided by 1000 fils/JD x 10 CN)	2,165
Salary Costs	
10 CN = 10 x 720 = 7,200	7,200
Additional Annual Costs Per MCH with 10 CNs	$10,325

Table 9

INVESTMENT COST FOR 10 CN

	Cost in JD
Training Costs	
24 mo. x 40/mo. = 960 x 10 CN = 9,600	9,600
Initial Drug Costs	
One-year supply, as above.	2,165
Investment Cost for 10 CN per MCH	$11,765

Table 10

ANNUAL COST PER VHC

	Cost in JD
Salary	
VHW = 1 x 50/mo. x 12 mo. = 600	600
Drug Costs	
Based on one-half of the per treatment cost at the HC No prescription drugs issued by authority of VHW. EC = 0.5 catchment area, @ EC yields 1.5 visits with 77% treated at 63 fils/treatment (0.5 x 1000 x 1.5 x .77 x 63 fils divided by 1000 fils/JD = 36)	36
Attrition Training Costs (10% attrition)	
Cost of training one VHW = 720 Annual Cost = 72	72
Annual Cost per VHC	$708

Table 11

INVESTMENT COST PER VHC

	Cost in JD
Training Costs	
1 x 40/mo. x 18 mo.	720
Initial Drug Costs	
One-year supply based on EC = 50% of the catchment area, @ EC yielding 1.5 visits, with 77% treated at 63 fils/treatment (1000 x 0.5 x 1.5 x 77 x 63 fils divided by 1000 fils/JD)	36
Investment Cost Per VHC	$756

Table 12

ANNUAL OPERATING COST OF ONE UPGRADED VHC

	Cost in JD
Salary	
VHW = 1 x 60/mo. x 12 mo.	720
Drug Costs	
(0.75 x 1000 x 4 x .77 x 125 fils divided by 1000 fils/JD)	288
Attrition Training Costs (10% Attrition)	
Cost of training one upgraded VHW = 800 Annual Cost	80
Annual Operating Cost Per Upgraded VHC	$1,088

Table 13

INVESTMENT COST PER UPGRADED VHC

	Cost in JD
Training Costs	0
Additional Salary Costs	
Variable depending on time of year of training.	0
Drug Costs	
Based on average of 6 months as upgraded VHC due to training time. EC = 75% of catchment area, @ EC yielding 4 visits, with 77% of visits receiving treatment at new rate of 125 fils per treatment (0.75 x 1000 x 4 x .77 x 125 fils divided by 1000 fils/treatment x 0.5).	144
Investment Cost Per Upgraded VHC	$144

Note: Figures used in main body of calculations differ according to time of year training undergone.