

venient locations of health facilities or an inadequate supply of primary care physicians.

For the index to be practical, the requisite data must be available or collectible at reasonable cost. As previously stated, the numerators of the proportions of n_{ij} s need not be positive whole numbers (before adding .5) that must result if the categorical counting system of yes or no is adopted. It should be noted, however, that this counting system requires the minimum amount of information as to whether an individual in 1 of the 20 population groups has received the necessary treatment for his condition if he is in the sick category or made the requisite number of professional visits for preventive care if he is in the well category.

Since Breslow and Somers clearly stated that their LHMP is not a finished product, but rather "an exploratory proposal to be reviewed and refined by health professionals and knowledgeable consumers," it would be premature to field test my index based on this model at this time. The field test will be undertaken when, through further research and consensus of scientific opinion, the preventive packages for the stages are in their final form. Until then, the index is best considered a heuristic tool for a better understanding of the rather complex problem of attempting to assess, in an objective manner, the degree to which human needs are met in the health care sector.

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Designing Primary Health Care Teams for Developing Countries

ARNOLD REISMAN, PhD
LILIA DURAN, PhD

Dr. Reisman is professor of operations research, Weatherhead School of Management, Case Western Reserve University, Cleveland, Ohio 44106. Dr. Duran is a senior researcher, Centro Universitario de Tecnologia Educacional para la Salud, National University of Mexico, Mexico City. The study described is an ongoing one funded by the National University of Mexico and the Mexican National

Council of Science and Technology. Tearsheet requests to Dr. Reisman.

SYNOPSIS

A time-honored industrial engineering technique, job evaluation, which was developed to set rates for manual labor, was used in the design of new teams for delivering primary health care in Latin America. The technique was used both in writing job descriptions for new allied health personnel and in designing the curriculums needed to train the personnel.

COORDINATION BETWEEN THE PROVIDERS of primary health care (PHC) services and the educational institutions that train the personnel delivering these services has been one of the main elements lacking in the PHC delivery systems of Latin American countries (1-8). This deficiency results in ill-defined statements about the quantity, quality, and mix of professionals needing to be trained, and more important, in an excess of health personnel in some areas and an almost total lack of health personnel in others. Thus, the accumulation of tasks at some levels becomes almost overwhelming, whereas at other levels the health workers have too few tasks to perform.

In the study described here, we used the methodological tools of task analysis and job and team design to create a data base for the planners of health services and the staffs of educational institutions training health personnel. With the methodology devised, it is possible to identify the health personnel profiles needed to match the specific conditions that exist in several regions of Mexico.

Objectives and Methods

The main objectives of the ongoing study are (a) to devise a technique by which to determine the numbers and kinds of health personnel that ought to be trained, (b) to provide a communications flow between the units training health personnel and the health care providers, and (c) to find ways to integrate the curriculums for all categories of health personnel so that PHC teams will be staffed with the most cost-effective combinations of workers and so that a proliferation of disorganized efforts to provide health care will be avoided.

As a point of departure, we defined a model of the health systems approach to providing care. It was decided that the model selected would be one in which services would be directed more toward prevention than cure (1, 2, 6, 7), although some cure-oriented services would be included. The focus of the model selected was on the downward delegation of tasks to primary care and preventive medicine personnel in the design of the provider teams' configurations.

Once the model was selected, the level of professional skills required for the various sequences of health care was determined. These sequences start with self-care (encompassing all the tasks that a person does to preserve his own or his family's health) and end with a sequence of tasks requiring

the highest level of professional expertise. Finally, we identified the health problems of Mexico and ranked them as to significance. A matrix was then constructed (table 1) relating the health problems to the sequences of care and the levels of personnel expertise required.

Job and Team Design

Following methods that had been previously applied to the design of new configurations for teams providing anesthesiology services in acute care institutions in the United States (9, 10), we used modifications of job evaluation techniques (11, 12)

Table 1. Functions assigned to various personnel skill levels by the panel on malnutrition

<i>Sequences of care and functions¹</i>	<i>Personnel level required</i>
1st sequence—facilitating self-care: Observe. Detect condition. Give information. Specify nutritious menus.	Nonprofessional could be assigned functions.
2d sequence—monitoring: Provide orientation. Detect condition. Gather data on a population sample.	
3d sequence—1st professional level skills: Organize monitors. Train monitors. Tabulate health data. Implement specific campaigns to orient personnel.	Professional should be assigned functions.
4th sequence—2d professional level skills: Diagnose 1st and 2d degree malnutrition. Treat 1st and 2d degree malnutrition. Record data.	
5th sequence—3d professional level skills: Make clinical and laboratory diagnoses. Treat 3d degree malnutrition. Conduct basic research. Plan and teach in programs. Publish and disseminate information.	

¹ Only a few examples are presented of the functions assigned by the panel to each level of skills and only in relation to the problem of malnutrition. The other panels assigned comparable functions to comparable levels of personnel to deal with Mexico's other urgent health problems—identified as diarrhea (cause not determined), acute respiratory infections, malaria, and tuberculosis.

to write new job descriptions for health personnel. All jobs were classified based on the principle of downward delegation of tasks to the least expensive or the least trained personnel capable of adequately performing the task.

Table 1 shows the functions that each level of personnel perform with respect to each health problem in order to arrive at or maintain a specified health outcome. As was true for the area of anesthesia (9, 10), this approach resulted in the creation of jobs not in existence at the time, and as an

additional benefit, led to a more integrated approach to health care delivery than had been used in the past.

Rather than going into the field where tasks are actually performed, as is called for by traditional job evaluation techniques and as was done in the anesthesia studies, we identified panels of people at each professional skill level who were in practice at various health and educational institutions in Mexico. Each panel had a high degree of expertise in one of the five health problem areas that we had

Table 2. Rating plan for health problems—skills

<i>A</i> Education	<i>B</i> Experience	<i>C</i> Initiative and ingenuity	<i>D</i> Manual dexterity	<i>E</i> International relationships	<i>F</i> Verbal communication	<i>G</i> Written communication	<i>H</i> Management	<i>I</i> Length of specific training
0 None required.	0 None required.	0 Little re- quired (com- plies with specific in- structions).	0 None required.	0 Limited amount required.	0 Moderate amount required.	0 None required.	0 None required.	0 None required.
1 Elementary school.	1 Up to 1 year.	1 Little re- quired (com- plies with complex specific in- structions).	1 Little re- quired (train- ing not needed).	1 Moderate amount re- quired (gen- eral training needed).	1 Large amount required.	1 Moderate amount required.	1 Little required.	1 Less than 6 months (general).
2 High school.	2 More than 1 year.	2 Moderate amount re- quired (plan sequences of operations within set standards).	2 Moderate amount re- quired (gen- eral training needed).	2 Large amount re- quired (needs spe- cial training).		2 Large amount required.	2 Moderate amount required.	2 Up to 1 year (specific) required.
3 Preparatory college.		3 Large amount re- quired (only general methods or no methods available).	3 Large amount re- quired (spe- cial training needed).				3 High (pro- fessional level).	3 Continued education.
4 Technical.								
5 Bachelor's degree.								
6 Specializa- tion degree.								
7 Master's degree.								
8 Doctor's degree.								

NOTE: The numbers above each item indicate the criterion-subcategory described.

Table 3. Rating plan for health problems—responsibility

A Patient	B Equipment and material	C Work of others
0 None.	0 None.	0 None.
1 Delegates responsibility.	1 Low-cost material.	1 Up to 15 people.
2 Has ultimate responsibility.	2 Low-cost general equipment.	2 15 or more people.
	3 High-cost specialized equipment.	

NOTE: The numbers above each item indicate the criterion-sub-category described.

selected. Therefore each panel was asked to specify the functions that ideally each level of personnel should be performing within the next 10 to 15 years in relation to the health problems in the panel's area of interest and expertise. Table 1 shows some of the functions that the panel members selected to deal with malnutrition. The panels were also asked to specify the appropriate mix of personnel categories for primary health care teams to ensure that every team member would be employed at his or her highest skill level and time availability.

The first step in the study was to establish what tasks ought to be performed by the personnel currently employed, irrespective of what they were actually doing in their respective institutions at the time.

With the help of the panels, the tasks that each personnel category should perform were defined and rated according to a number of criteria. Data were then collected as to who was currently performing some of these tasks. In the case of family planning, a questionnaire was administered to obtain the opinions of the panel members about the contribution each task made to achieving the objectives of a particular program and about the frequency with which the task was performed. The tasks that were rated very important and that were performed daily were thus identified and given greater priority.

As in the anesthesia study, the four basic criteria of job evaluation were used in our study, namely, skill, effort, responsibility, and job conditions (11, 12). Each of these factors was in turn broken down into as many levels as was necessary to rate the tasks involved in meeting each of the selected

Table 4. Rating plan for health problems—effort

A Mental	B Physical
0 Requires little concentration (just observes ECG).	C Little.
1 Requires moderate concentration (reading flow-meter indicator).	1 Moderate.
2 Requires intense concentration (administering exact intravenous dosage).	2 High.

NOTE: The numbers above each item indicate the criterion-sub-category level described.

Table 5. Rating plan for health problems—job conditions

A Place	B Resources	C Sanitation	D Health risk	E Risk of physical damage
0 Field: Home. Community.	0 None.	0 None.	0 None.	0 None.
1 Health home.	1 Scarce.	1 Low.	1 High.	1 Risk present.
2 Health center.	2 Moderate.	2 Moderate.		
3 General hospital.	3 High.	3 Good.		

NOTE: The numbers above each item indicate the criterion-sub-category level described.

health problems. The panels helped delineate and refine all factors and subfactors of the rating plan that we arrived at. The results are displayed in tables 2–5. These tables show the levels assigned to each of the subfactors and provide a description of each such level. Thus, "Education" in table 2, which addresses skills, is broken down into nine levels as described in the cells of the first column. These levels range from 0, or none required, to 8, requiring a doctorate degree. On the other hand, table 5, which addresses "Job conditions," shows only two levels of health risk. The panels were able to establish a clear definition for each breakpoint on the scales of tables 2–5.

Table 6 illustrates how the tasks related to the control of malnutrition, a significant health problem

in Mexico, were delineated and rated on each of the various subfactors of skill—"Responsibility," "Effort," and "Job conditions." The subcolumn headings of the table are crossreferenced by capital letters to the subfactors of tables 2-5. Similarly, the numerical entries in the cells of table 6 correspond to the levels described in tables 2-5 for the corresponding criterion subfactors. For example, it takes a person with an elementary school education (level 1 in column A of table 2) to "weigh and measure the child periodically" (first task in table 6).

This technique has proved useful in the assignment of more appropriate functions to the personnel

already employed. Its use in Mexico has already led to a clearer definition of provider functions in the family planning program. The first continuing education workshop in Mexico for health workers was conducted in August 1980 and focused on family planning. It was directed at social workers and auxiliaries, registered nurses and auxiliaries, general practitioners, and gynecologists. All major Mexican health institutions participated, and 150 employees of the Mexican Secretary of Health and Welfare came from all over the country. That workshop has helped to improve the performance of personnel assigned to family planning programs.

Table 6. Analysis of the tasks that need to be performed in dealing with the problem of malnutrition

Tasks	Skill									Responsibility			Effort		Job conditions				
	A	B	C	D	E	F	G	H	I	A	B	C	A	B	A	B	C	D	E
<i>Facilitating self-care</i>																			
Weigh and measure the child periodically.	1	0	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	1	1
Watch over the child in his daily activities and oversee his educational progress.	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1
Assist in well-baby care.	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	1	1	1
Provide the child with a balanced diet, prepared hygienically, within the family's means.	1	1	0	1	1	0	0	0	1	2	0	0	0	0	0	3	3	0	0
Encourage frequent participation by the child in outdoor recreation.	1	0	0	0	0	0	0	0	1	1	1	0	0	1	0	1	2	1	1
<i>Monitoring</i>																			
Transmit information to organized groups.	1	1	1	2	1	1	1	1	1	2	2	1	1	1	1	1	0	0	0
Conduct surveys and distribute information on malnutrition.	1	1	1	2	1	1	1	1	1	2	2	1	1	2	0	1	0	1	1
Provide leadership for detection and prevention programs.	2	1	2	2	1	1	2	1	2	2	2	1	1	2	0	1	0	1	1
Differentiate between various degrees of malnutrition.	4	1	2	2	1	1	2	2	2	1	0	1	0	1	0	1	2	1	1
Refer the child for specialized treatment as necessary.	4	1	2	2	1	1	2	2	2	2	1	0	1	0	1	1	1	0	0
<i>1st professional level</i>																			
Carry out laboratory examinations.	4	1	3	2	0	1	2	2	2	2	3	0	1	1	2	3	3	1	1
Staff the monitoring stations.	4	1	3	2	1	1	2	2	2	2	2	2	1	2	1	1	1	0	0
Supervise the monitors.	4	1	3	2	1	1	2	2	2	2	0	2	1	2	0	1	1	0	0
<i>2d professional level</i>																			
Make clinical diagnosis as to certainty of malnutrition and the degree of it.	5	2	3	2	2	1	2	2	3	2	3	0	2	0	2	2	2	0	0
Indicate and interpret laboratory examinations.	5	2	3	2	2	1	2	2	3	2	3	0	2	1	2	2	2	0	0
Provide specific treatment required for each case.	5	2	3	2	2	1	2	2	3	2	1	0	1	0	2	3	2	0	0
Follow the evolution of acute cases closely.	5	2	3	2	2	1	2	2	3	2	1	0	1	1	0	3	0	1	1
Write in registry detailed description of cases treated.	5	2	3	2	2	1	2	2	3	2	2	1	2	1	3	3	3	0	0
Interpret treatment results.	5	2	3	2	2	1	2	3	3	2	0	0	2	1	3	3	3	0	0
Send subordinates cases for resolution.	6	2	3	2	2	1	2	3	3	2	1	0	1	1	3	3	3	1	1
Exchange experiences related to the case with staffs of health units involved in it.	5	2	4	2	2	1	2	3	3	2	2	1	2	1	4	3	3	0	0
Plan and set up training courses for auxiliary personnel.	7	2	4	3	2	1	2	3	3	2	2	2	2	2	3	3	3	0	0
<i>3d professional level</i>																			
Plan campaigns to detect malnutrition.	7	2	4	3	2	1	2	3	3	2	2	2	2	1	4	3	3	0	0
Diagnose nutrition deficiencies due to specific factors.	6	2	4	3	2	1	2	3	3	2	3	0	2	1	4	3	3	0	0
Prescribe specific treatment for the case.	6	2	4	3	2	1	2	3	3	2	3	0	2	1	4	3	3	0	0
Do research on malnutrition.	6	2	4	3	2	1	2	3	3	2	3	0	2	1	4	3	3	0	0
Publish papers on outcome of research.	6	2	4	3	2	1	2	3	3	2	3	1	2	1	4	3	3	0	0
Disseminate results of research.	6	2	4	3	2	1	2	3	3	2	3	1	2	1	4	3	3	0	0
Elaborate, coordinate, and administer teaching and service plans.	7	2	4	3	2	1	2	3	3	2	3	2	2	1	4	3	3	0	0
Exchange experiences with staffs of other institutions.	6	2	4	3	2	1	2	3	3	2	3	1	2	1	4	3	3	0	0

NOTE: For an explanation of the column headings and the ratings under them, see table 2.

Based on experience gained in the study and from conducting the workshop, we prepared an instructor's manual, a student manual, and an actual practice manual, which are now used in followup family planning courses conducted all around the country to teach "multipliers"—persons who can teach primary health care workers and develop additional instructors.

With the task analysis and job design approach described in this paper, mid-career primary health care workers have been trained for Bolivia, Brazil, Colombia, Ecuador, Honduras, Peru, and other areas of Latin America. The workers trained have included physicians, nurses, and social workers. These procedures currently are being implemented in a number of agencies in family planning, mental health, and other health programs in Colombia, Mexico, and Nicaragua. Finally, the approach outlined here has been used in redesigning the curriculums at several universities in Mexico.

Conclusion

The same basic approach that was developed and used in industrial settings to evaluate manual-job levels and that has been applied in acute care settings in the United States can be used in primary care settings in developing regions of Latin America (13-15). With this approach, new job categories can be formulated that will contribute to more cost-effective health care.

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Characteristics of Recipients in Florida's Long-Term Program of Insulin Distribution

PHIL E. WILLIAMS, MS
JAMES T. HOWELL, MD, MPH
WILLIAM WAYNE McDANIEL, BS
LARRY C. DEEB, MD

The authors are with the Florida Department of Health and Rehabilitative Services. Mr. Williams is coordinator, and

Dr. Deeb is consulting epidemiologist, Diabetes Control Program, Health Program Office. Dr. Howell is deputy secretary of the department. Mr. McDaniel is a health program specialist, Kidney Program, Health Program Office.

Tearsheet requests to Phil E. Williams, Diabetes Control Program, Florida Department of Health and Rehabilitative Services, 1317 Winewood Blvd., Tallahassee, Fla. 32301.

SYNOPSIS

Since 1935 the State health agency has provided insulin to medically indigent diabetics in Florida.