Estimating the Market for an Extended MPH Program

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THE PROGRAM OF CONTINUING education in Public Health, a consortium of five schools of public health (Loma Linda University, University of California at Berkeley and at Los Angeles, University of Hawaii, and University of Washington), began a study in February 1972 to explore the feasibility of a new approach to graduate education in public health. According to the proposed program, the five schools would offer a 3- to 4-year course of study leading to a master of public health degree for working health professionals throughout the 13 Western States, largely on an off-campus basis. The program would greatly reduce the time required for full-time course work on campus and thereby allow the student-employees to receive most of their graduate training in a location near their places of work *(1)*.

Our concern in this paper is with one part of the feasibility study *(2)*—the market survey that was conducted in the summer of 1972. The survey included the size and nature of the market for the extended degree program—the geographic distribution, program specialty areas, and academic qualifications of potential applicants, as well as their demographic profile, their motivation, and their probable commitment to the program in terms of time and financial resources.

Since the number of potential students is a crucial part of the rationale for establishing the program, and since it is difficult to assess the market for an unknown program, we preface our report of the survey results with a discussion of methodology in which the development of an operational definition of the market is emphasized.

Survey Methods

We defined the market for an extended MPH program through a series of decisions regarding the survey sampling frame and sampling procedures, an employee questionnaire, the various categorizations of interest and eligibility, and the treatment of nonresponse. A parallel survey of the health organizations employing individual respondents served as a cross-check on employees' perceptions of leave policies and organizational priorities with respect to graduate training in public health. We discuss each of these aspects.

The sampling frame. The sampling frame for the survey included the following types of health organizations in 12 of the 13 Western States (excluding Colorado): State and local health and mental health agencies, regional medical programs, neighborhood health centers, Indian Health Service offices, air and water pollution control districts, Public Health Service regional offices, environmental health, "A" and "B" area comprehensive health planning and major voluntary agencies, and selected departments in all types of hospitals, including mental hospitals. For hospitals, the survey was limited to standard departments—nursing, administration, laboratory, rehabilitation, pharmacy, social services, dietary, and medical records—usually having employees with bachelor's degrees.

Large organizations were subdivided into their component parts. The primary sampling frame for the survey, then, consisted of health units which are either small health organizations or subdivisions of large ones. The health units were stratified by type (agency versus hospital) and geographic region. Within each sampled unit, we took a 100 percent sample of full- and part-time employees with a bachelor's or higher degree.

These groups of health organizations were chosen because they represent a large part of the present market for MPH graduates, and their employees are a pool of potential students on which minimal market estimates could be based. We also assumed that these organizations would be more willing than others to support employees in a public health graduate program; therefore, we expected an employee who indicated interest in the extended MPH program to be more likely to be able to participate.

The selection of hospital departments notably omits physicians associated with hospitals. This omission was not judged to be serious for obtaining market estimates, because these physicians represent diverse specialty areas; also, most physicians who apply to schools of public health are trained in obstetrics and gynecology or pediatrics. Thus, we could expect some applications from physicians in private practice, although they were not a part of the sampling frame. Others who may be interested in and eligible for the program but who work in other settings or are at home are also excluded. As a consequence, the estimated market sizes are biased downward to some degree by our selection of types of organizations for the survey.

Restriction of the sampling frame to employees holding bachelor's degrees insured that all individual respondents would have the minimum educational background for a master's degree program. Employees who already have the MPH or other post-baccalaureate degrees were included because we wanted to find out

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their prevalence in health organizations in the Western States, as well as to assess their interest in individual courses.

The individual questionnaire. We expected a certain amount of misclassification in determining individual interest in the program, since respondents were asked to forecast the outcome of a possible future decision with only partial information about the structure of the decision as it would actually occur in the future. Several observations relating to this problem have been pointed out in the "Report to the President's Task Force on the Extended University" at the University of California *(3)*:

> 1. People are poor predictors of their own future behavior. Even where the service being offered is well known, expressed intentions to buy have proved to be unreliable indicators . . .
> 2. Where the service is presently nonexistent, people have little to go on in estimating its appeal. Decisions will ultimately depend upon alternative variants available from different sources, their relative prices, prestige value, etc. . . .

(We did not attempt to measure the potential effect of a third factor mentioned in the report—the creation of a demand by the introduction of the program.)

The construction of the questionnaire for employees was guided by the need to inform respondents as well as to obtain information from them. The initial part of the instrument focused on basic demographic information followed by a preliminary screening question assessing general interest in an extended MPH program. Those who were not interested in the program were directed to a brief set of questions regarding single courses. For those who responded positively to the initial interest question, the second portion of the questionnaire dealt with more detailed aspects of commitment that would be required of a participant in the program. These questions related to time preferences for course patterns and commitment in terms of time and finances, as well as assessment of prior academic performance. Following this, a final expression of interest was obtained. In this way, the respondent was informed about some of the realities involved in commitment to the program before a second assessment of interest.

Thus, the employee questionnaire represents an interaction between the respondent and the researchers—a process of exchanging information, considering and weighing factors, and then mutually defining a situation from which both parties can predict probable action. The respondent asks, "What is the program? Will it meet my needs? Will it be possible for me to participate? Will I do it?" We wanted to know "Who is this person? Is he or she sufficiently interested? Would he or she be eligible? Will he or she apply?"

Categorizatons of interest and eligibility. The alternate definitions of the market were obtained through selection of what we call "interest-eligibility levels" and through our choice of assumptions about nonresponse.

Seven levels of interest and eligibility for the program were constructed from the variables judged to be of greatest validity and importance—the preliminary expression of interest; the amount of money respondents said they would be willing to pay for off-campus courses; the categories of personal time (weekends, evenings, and annual leave or compensatory time) they would be willing to devote to the program; reported grade point averages for upper-division undergraduate work and for graduate study, if any; and a final statement of intention to apply—if "definitely" or "probably," the year they expect to do so. To be included in any of the response categories, the respondents had to answer "yes" to the first screening question concerning interest in the program. Interest-eligibility level 7 consists of all those who answered affirmatively. All the other levels required at least a "definite" or "probable" response to the final statement of intention to apply.

The seven levels were defined as follows (generally, these levels occur in decreasing stringency, except for levels 4 and 5 which represent alternate ways to omit some requirements for level 3):

LEVEL 1 respondents would *(a)* definitely apply to the program in 1975 or earlier, *(b)* pay $200 or more per year for off-campus courses, *(c)* give compensatory or annual leave time to the program, and *(d)* have an undergraduate grade point average (GPA) of 2.7 or higher and a graduate GPA of 3.0 or higher or no graduate experience and an undergraduate GPA of 3.0 or higher.

LEVEL 2 respondents would *(a)* definitely or probably apply to the program, regardless of when they would apply and *(b)* meet the same time and financial commitments and GPA requirements as level 1 respondents.

LEVEL 3 respondents would *(a)* definitely or probably apply to the program, *(b)* pay $140 or more per year for off-campus courses, *(c)* give weekends, evenings, and compensatory or annual leave time to the program, and *(d)* have an undergraduate GPA of 2.7 or higher or graduate experience and a GPA of 2.8 or higher.

LEVEL 4 respondents would *(a)* definitely or probably apply to the program and *(b)* have an undergraduate GPA of 2.7 or higher or graduate experience and a GPA of 2.8 or higher. (No financial or time criterion.)

LEVEL 5 respondents would *(a)* definitely or probably apply to the program, *(b)* pay $140 or more per year for off-campus courses, and *(c)* give weekends, evenings, and compensatory or annual leave time to the program. (No grade point criterion.)

LEVEL6-1 respondents would definitely apply to the program.

LEVEL6-2 respondents would probably apply to the program.

LEVEL 7 respondents answered affirmatively to the first screening question on interest in the program.

We discuss the various interest-eligibility levels in terms of market size estimates and the level that we selected for the operational definition of the market in the subsequent "Results."

Treatment of nonresponse. In addition to the nonresponse resulting from the limitations of the sampling frame, mentioned earlier, two other types of nonresponse occurred at the individual employee level. The first type occurred with respondents who were employed in health units that responded in the survey; this type is treated as "noninterest" in all of our market estimates.

The second type of nonresponse pertains to persons employed in health units that did not respond in the survey; in this situation, it is likely that there was no opportunity for individual response. There are two possibilities for treatment of this second type of non-

response, and both have been used in making estimates of total market size:

1. Nonresponse assumption A: All nonresponses whether in a responding unit or a nonresponding unit are treated as noninterest. This assumption takes the most conservative possible position.

2. Nonresponse assumption B: Individual nonresponses in responding units are treated as noninterest, but individual nonresponses in nonresponding units are treated as unbiased. With this assumption, we assume that the nonresponding units would have contibuted the same average number of interested persons per unit as responding units.

Results

Alternative definitions of the market. Table 1 presents the estimated total market for the extended MPH program by interest-eligibility level and by method of handling nonresponse together with the standard errors of the estimates.

The wide range of estimated market sizes starting with 1,719 for level 1, assumption A, to 20,335 for level 7, assumption B, points out the importance of the choice of an operational definition of the market.

The impact of relaxing the more conservative nonresponse assumption A in favor of B can be characterized by a fairly uniform percentage increase in the market size, ranging from 37.8 to 51.5 percent. In most cases the percentage increase is about 40 percent.

The impact of the interest-eligibility level definition can be seen in relation to either assumption A or B. The estimates under A show that change from level 1 to level 2 doubles the market size. This increase stems from the inclusion of those who would probably apply, as well as those who would definitely apply. The further increased size of level 3 is again almost double that of level 2. This increase stems from a reduction in the minimum time and financial commitments, as well as a slight lowering of the academic background requirements. The academic criterion of level 3 is consist-t with the usual requirement of the schools of public health in the consortium.

A move from level 3 to 4 eliminates the financial and time commitments while retaining the same academic requirement. This leads to only a relatively small increase, from a market estimate of 7,973 to an estimate of 8,804. Level 5 differs from level 3 in that the academic requirement is removed. The change from 3 to 5, which is 7,973 to 11,626, is substantially larger than the change from 3 to 4. Therefore, low prior academic performance may well stand in the way of many otherwise interested and committed persons. In level 6 both the academic requirement and the time and financial commitments have been eliminated relative to level 3. Thus, the only remaining requirement of level 6 is a definite or probable statement of intention to apply to the program. Level 6 is broken down to show that 33.3 percent in this group responded "definitely," whereas 66.7 percent checked "probably" on that important question regarding intent.

Table 1. Estimated total market and standard errors of estimates, by interest-eligibility level and method of handling nonresponse

Interest-eligibility level	Nonresponse assumption A[1]	Nonresponse assumption B[2]
1	1,719 ± 535	2,601 ± 714
2	4,381 ± 920	6,527 ± 1,345
3	7,973 ± 1,634	11,106 ± 2,198
4	8,804 ± 1,693	12,386 ± 2,281
5	11,626 ± 2,168	15,978 ± 2,949
6	13,154 ± 2,409	18,308 ± 3,324
6-1	4,388 ± 805	6,153 ± 1,086
6-2	8,766 ± 1,809	12,155 ± 2,499
7	14,747 ± 2,637	20,335 ± 3,524

[1] All individual nonresponse is treated as noninterest.
[2] Only individual nonresponse in responding units is treated as noninterest. Nonresponse in units which do not respond is assumed to be unbiased.

Level 7 consists of those who responded "yes" to the initial screening question of interest. A comparison of levels 6 and 7 shows that of the 14,747 who initially expressed interest in the program, 13,154 (89.2 percent) reaffirmed their interest even after answering numerous questions about time, financial commitment, and so on.

The interest-eligibility level 3-A market. To study further the characteristics of those in the market for the extended MPH program, it was necessary to select an operational definition for inclusion in the market. We chose interest-eligibility level 3, nonresponse assumption A, among the 14 possible combinations of interest-eligibility levels and nonresponse assumptions. Respondents in this group recognize the realities of time and financial commitment to the program, and their grade point averages are consistent with the minimal entrance requirements of schools of public health in the West.

The size of the level 3-A market (hereafter, the "market") can also be viewed in relation to the estimates of the total health manpower with a bachelor's or higher degree: The estimated market of 7,973 represents 11.2 percent of an estimated 71,075 in our sampling frame.

Hospital-type units contribute a larger number of potential applicants than agency-type units—5,640 (70.8 percent) versus 2,332 (29.2 percent)—reflecting the substantially larger pool of health workers from which the hospital market is drawn. The hospital market represents 10.7 percent of an estimated 52,910 hospital workers with bachelor's degrees in the sampling frame (and 1.2 percent of an estimated 488,491 employees, regardless of academic degrees). For the types of agencies we sampled, the estimated market of 2,332 represents 4.8 percent of the estimated 48,275 total employees and 12.8 percent of the estimated 18,-165 holding bachelor's degrees.

The market estimates shown in table 2 are distributed by program and region. Corresponding standard errors are typically one-half to two-thirds the

Table 2. Estimated level 3-A market,[1] by program[2] and region

Program	Region							
	Hawaii	Northern California	Oregon	Southern California	"7 State" [3]	Arizona	Washington	Total
Administration	73	824	267	1,167	536	96	158	3,121
Public health administration	22	213	41	562	230	27	44	1,138
Comprehensive health planning	17	348	31	148	230	5	57	836
Hospital administration	30	108	82	309	76	61	50	716
Nursing administration	2	155	82	0	0	3	7	249
Medical care administration	2	0	31	148	0	0	0	181
Maternal-child health	10	345	68	0	401	11	100	935
Health education	18	348	37	174	96	16	7	696
Medical microbiology	3	0	23	456	76	3	0	561
Behavioral science	10	132	175	53	76	3	22	471
Environmental Health	7	95	29	174	115	19	22	461
Mental health	12	142	124	40	58	3	7	386
Immunology	0	108	0	148	0	0	15	271
International health	0	0	6	188	0	0	7	201
Gerontology	6	132	6	0	0	0	0	144
Epidemiology	5	24	6	53	19	0	15	122
Population and family planning	5	47	23	0	0	0	0	75
Nutrition	2	0	25	0	0	0	43	70
Total	151	2,197	789	2,453	1,377	151	396	7,514

[1] Respondents in this category (*a*) would definitely or probably apply for the program, (*b*) would pay $140 or more per year for off-campus courses, (*c*) would give weekends, evenings, and compensatory or annual leave time for the program, and (*d*) reported an undergraduate GPA of 2.7 or higher and a graduate GPA of 2.8 or higher (if they had graduate experience). All individual nonresponse is treated as noninterest.

[2] The following programs had total market estimates of less than 15: biostatistics, occupational health, and parasitology. Respondents who failed to specify a program or whose program was classified as "other" are not included.

[3] Alaska, Idaho, Montana, Nevada, New Mexico, Utah, and Wyoming.

magnitude of the estimates themselves, and therefore these estimates should be interpreted with caution.

A study of the market breakdown by region indicates that substantial market clusters occur in the urban centers of northern and southern California. Oregon and Washington also indicate concentrated points of interest, while the remainder of the market is more sparsely distributed over a wider geographic area.

Additional data show that for 55 percent of the market the nearest of the suggested on- and off-campus centers is one of the five schools of public health. Thirty-eight percent of the market is in the vicinity of the two University of California campuses alone. With the exception of San Diego (11 percent) and Portland (10 percent), the remaining 45 percent of the market is scattered fairly evenly among the off-campus centers, ranging from 1 to 4 percent each. Three-quarters of those in the market in both the campus and off-campus centers are located less than 2 hours' driving time from the nearest center.

Programs are ordered in table 2 from largest to smallest total demand. The administrative category, with 3,121 respondents, is by far the largest single area of program demand—39.1 percent of the total estimated market. Despite the high standard errors, certainly the administration program and very likely health eduation, environmental health, and others in the high-demand range would have adequate clusters of interested persons to support programs in at least several regions.

The market is composed primarily of young men and women who have not worked in the health field. The women outnumber the men by a ratio of 2 to 1, and the ethnic composition of the market is overwhelmingly white (as is the overall bachelor's level manpower pool in the sampling frame). Three-quarters have training in the health or biomedical sciences, generally at the bachelor's level; few are physicians or dentists.

Indications of reasons for desiring the MPH suggest that opportunity for advancement in the organization in which he or she is currently employed and expansion of employment opportunities outside his or her agency or hospital are both important motivating factors for the employee.

The parameters of the market assure that the employees included in it meet the same minimum eligibility standards of the schools of public health and are willing to commit at least minimal time and financial resources to the program. Most of the respondents reported having grade point averages of 3.0 or higher, and the majority indicated that they would give more time and money than the minimum. On questions related to the probable support the employer would give, the responses indicated that the employees could not give definite "yes" or "no" responses. The apparent lack of definite policy on educational leave at the health unit or higher organizational levels is substantiated by the results of the health unit survey.

The relative frequency distribution of school preferences generally follows the geographic distribu-

tion of the market. Thus, the top two schools are the University of California campuses at Berkeley and Los Angeles, with 25 percent each.

Course-scheduling preferences were polled separately for the off-campus and on-campus groups. The most popular choice among the off-campus group was two 1-week sessions spaced 1 month apart; among the on-campus group, it was 1 evening meeting a week for 10-15 weeks. The correspondence and part-time alternatives were notably low in popularity for both groups.

Discussion and Conclusions

In estimating the market size we considered several sources of bias, including those related to limitations of the sampling frame, nonresponse, responses to the questionnaire, and the under- or over-estimation of market size based on the choice of operational definition of the market. By using the conservative nonresponse assumption A, we concluded that the overall impact of nonresponse and noncoverage is a downward bias. As to the direction of bias relative to the operational definition of the market, it is more difficult to make a judgment.

Some persons who were not interested in the program at the time of the survey may become interested before a program begins. It is also likely that some respondents in the level 3-A market would not actually apply despite their expression of time and financial commitment and a definite or probable statement of interest. We could expect the net misclassification to produce some upward bias in the market estimates, but not enough to overpower substantially the opposing downward bias due to nonresponse and noncoverage.

Thus, in our judgment, the choice of the level 3-A market provides a reasonable estimate within the limitations imposed by the measurement problems inherent in any market survey of this type.

In any event, the estimated market size as viewed from the various operational definitions indicates a substantial interest among health workers in becoming public health professionals through an extended degree program. Furthermore, the level 3-A estimates indicate market sizes substantially in excess of program capacity likely to be achieved in the extended degree mode in the near future. Therefore, the data support moving forward with a pilot extended degree program focused on the programs and regions which show the largest estimates of market size.

The initiation of the pilot program in the first few regions will provide some check of the validity of the market size estimates obtained through the market survey. The size of the pool of applications resulting from advertisement of the pilot program will indicate more directly the size of the market; the actual criterion will be applications rather than future projection of interest in the program.

Since the market data that are restricted to a given program and region suffer from substantial sampling variability, more focused followup surveys may be desirable for regions being considered for pilot programs. These surveys should be coordinated with efforts to advertise and promote pilot programs.

The market size estimates resulting from the market survey regardless of academic eligibility of respondents reflect a substantial desire by health workers to increase their level of professional preparation. This expression of interest can also be interpreted as a collective perception of need for more professional training in the health field and also of employment opportunities for those who receive such training. In view of the current trend toward elimination of training grants for in-residence students at schools of public health, an extended degree program may be essential as a mechanism for mid-career development for health workers. Full-time campus training may well be prohibitive in terms of both financial demands and job-release time problems. It is also likely that, as schools of public health assume the role of career development and younger persons move into the health field, additional pressure will be placed on mid-career health workers to upgrade their professional backgrounds.

Four policy questions are suggested by the survey results:

1. Since it will invariably cost more to provide education to persons residing in sparsely populated rural areas than to those in the urban areas near the five schools of public health, will society be better served by training fewers persons in rural areas or by training more persons in urban areas for the same cost?

2. Since the urban areas generally are more attractive to health professionals and therefore have less difficulty in recruiting and retaining such persons, should an effort be made to upgrade the skills of persons who have already made a life decision to remain in the rural areas?

3. Since the market survey clearly shows that minorities with baccalaureate degrees are underrepresented in the rosters of western health agencies, should preference be given to enrolling minorities in the extended degree program? Furthermore, since minorities are not currently employed in any significant numbers, should enrollment, at least for minorities, be opened up to persons not currently employed in health agencies?

4. Finally, what is the optimum ratio of persons trained at the master's level to the total number of employees? Should the ratio be different in rural areas from that of urban areas?

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