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ASSESSMENT OF TRAINING NEEDS IN ENVIRONMENTAL AND OCCUPATIONAL HEALTH

A SURVEY OF WHO GLOBAL ENVIRONMENTAL EPIDEMIOLOGY NETWORK (GEENET) MEMBERS

WORLD HEALTH ORGANIZATION, GENEVA, 1992

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A Survey of WHO Global Environmental Epidemiology Network (GEENET) Members

BACKGROUND

Environmental epidemiology is a relatively new subdivision of epidemiology. Its increasing prominence is partly a function of two factors, the control of infectious diseases that has been achieved in many parts of the world, and the increasing contamination of the environment leading to the development of environmental health problems. The latter has resulted partly from rapid industrialization and large-scale mechanized agricultural practices without the development or application of methods of contaminant control. In addition, throughout the world there is a growing awareness of the influence of environmental and occupational hazards on public health. Many countries are devoting increasing government and private resources to the control of these hazards. Effective control programs require well-trained staff at different levels.

The World Health Organization (WHO) Global Environmental Epidemiology Network (GEENET) offered an opportunity to obtain information from 966 members in the six WHO geographic regions to assess existing training, local perception of environmental problems, and perceived needs for training in environmental epidemiology. Thus the idea for the Environmental and Occupational Epidemiology Training Needs Survey was born. The purpose of this survey is to assess the training needs in the field of environmental and occupational health as perceived by key professionals already working in the field. The amount and types of training currently available in environmental epidemiology vary widely depending upon the needs of individual countries, the resources available for training, and the prominence of competing needs.

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DATA COLLECTION

Questionnaires were developed in English, translated into French and Spanish, and sent to the 966 members of the GEENET on May 8, 1990 (Appendix 2). Information was sought on the specific area served by the respondent, the existence of a medical school and/or school of public health in the area served, estimates of the severity of problems related to each of 20 environmental and occupational conditions, existing training in the area, ways in which training could be improved, and specifically how WHO could support efforts in the respondent's country. A reminder letter was sent to those who had not answered the survey by June 8, 1990. Although a deadline for acceptance of completed questionnaires had been set at July 31, questionnaires continued to be accepted until coding and key entry of the data had been completed. The last questionnaire was received on November 30.

RESULTS

Respondents

The numbers of questionnaires mailed and the response rates are shown in Table 1 by region, language, and development status. The overall response rate was 49 percent. The highest response rate was from the WHO Africa region with a response of 72 percent, while the other regions showed response rates of about 45-50 percent. There was little difference in the response rates by language. The developed countries had the lowest response rate. Nonrespondents included some individuals whom the postal service could not locate and an unknown number who did not consider themselves appropriate respondents for a training needs questionnaire.

Apart from Table 1, the data presented here are limited to the 433 respondents who indicated, either on the survey questionnaire or on their GEENET application, that they taught although classroom teaching might not have been their primary occupation.

A profile of the respondents is shown in Table 2. The largest group of respondents (42 percent) reported that they served an entire state or province, while the remainder were about equally divided between those who served a larger or smaller area. About 47 percent reported that their present primary position was teaching while an additional 17 percent said they both taught and did administrative work. The remainder were about equally divided between those whose primary job is administration and a variety of other positions.

The largest group of respondents reported their profession to be medicine (45 percent) with an additional 23 percent reporting medical epidemiology or epidemiology. Another 20 percent described themselves as public health professionals. About half the respondents indicated that they received their training within their own country, with an additional 24 percent receiving it at least partly within their country. It should be noted that these tabulations were based on write-in responses. Had the respondent been presented with a check list, the results might have been different.

Academic Level of Training Available

General information about the training available (Table 3) shows that 95 percent of the respondents have a medical school within the area they serve, while 53 percent have a school of public health. The academic level of environmental and occupational health training is also shown, with 82 percent reporting that it occurs at least partly at the university undergraduate level and 74 percent reporting that it occurs at the graduate level. Over half reported that training is

provided by each of the following: technical schools, short-term courses, and seminars or workshops.

Environmental and Occupational Conditions Reported

Environmental and occupational conditions are shown in Table 4 by the degree of seriousness with which the respondent regards each problem. The problem most frequently reported as "very serious" is traffic accidents (42 percent), followed by inadequate sanitation and sewage disposal (26 percent), urban air pollution from motor cars (23 percent), inadequate garbage disposal (22 percent), and air pollution from power plants and industry (21 percent).

Tables 5 and 6 show the percent who reported a condition to be "very serious" by development status and WHO region. It should be kept in mind that the percents for "least developed" countries both here and in later tables are based on only 14 respondents. The least developed countries include Rwanda, Tanzania, Uganda, Ethiopia, Botswana, Togo, and Mali (all in the WHO Africa Region), and Sudan and Yemen (in the Eastern Mediterranean Region) although not all these countries responded to the survey.

As might be expected, the problems considered "very serious" differed depending upon the degree of development of the country (Table 5). Over half the respondents from the least developed countries reported each of the following problems as "very serious": inadequate sanitation and sewage disposal, inadequate garbage disposal, unhealthy or unsafe housing, and food and water contaminated by pathogens. In developed countries traffic accidents were the most frequently reported "very serious" problem (39 percent), followed by air pollution from cars, air pollution from power plants and industry, toxic waste disposal sites, and pollution from toxic waste disposal or spills.

Traffic accidents were considered a problem by a large percent of respondents in all development status categories. In other developing countries 46 percent rated them a "very serious" problem compared to 36 percent in the least developed countries and 39 percent in developed countries. It is interesting that these percents are so close, suggesting that the smaller number of cars in the less developed countries might be offset by a lack of traffic safeguards or safety consciousness.

The percents that reported a problem as very serious show a downward gradient with increasing development in many cases (Figure 1) However, for some problems the percent of respondents reporting a problem to be "very serious" was highest in other developing countries (Figure 2). In addition to traffic accidents these were air pollution from cars, air pollution from power plants and industry, local water pollution from industry, toxic waste disposal or spills, and disasters. Again, this may result from industrial development without the concurrent development of occupational and environmental safeguards. The remaining data from Table 5 are shown in Figure 3.

Environmental or Occupational Crises

A separate open-ended question asked about significant environmental or occupational health crises or emergencies in the area served (Figure 4). The most frequently reported crises concerned toxic waste disposal sites or spills (18 percent). This was followed by natural disasters, including fires (7 percent); contamination of drinking water with chemicals or local water pollution from industry (7 percent); occupational hazards, both chemical and nonchemical (7 percent); air pollution from industry (5 percent); and contamination of drinking water with pathogens (3 percent). Pollution in other categories was reported by 5 percent of the respondents.

Need for Training Improvement

The focus of this report is on the training needs expressed by the respondents. Table 3 shows the academic level at which environmental and occupational health education is offered in the respondent's area. Responses to open-ended questions were sought on ways in which training could be improved in the area served (Table 7). For both university/technical schools and short course/seminars, expanded training time was by far the most frequently reported need expressed (39 percent and 18 percent respectively). This included increasing teaching hours, adding to the number of courses, and increasing the number of teachers. Many responses that fell into other categories implied an increase in training time although it was not explicitly mentioned. For university/technical schools, between 10 percent and 20 percent reported a need for each of the following: more practical emphasis or field training, integrating curricula from different departments or disciplines, developing new degree or diploma programs, and medical student training. For short courses/seminars 14 percent expressed a need for continuing education for professionals. These data are summarized in Figure 5 for categories in which at least 10 percent indicated a need in either schools or short courses.

Space was provided on the questionnaire for additional comments on existing training, but information was not available to separate these into university and/or technical school vs short course training. Although the numbers of responses in any one category were small, they are given here since they do not appear in the tables. The most frequent responses were "expand training time" (8 percent) and provide training materials, texts, or equipment (6 percent). Two to three percent wanted at least one of the following: increased financial resources, increased emphasis on practical or field-training, international cooperation in training and research, or improved training or quality of the faculty. Twelve respondents (3 percent) said that no training exists or there is a complete lack of facilities.

Fields in Which Additional Training is Needed

Overall, the fields most frequently reported as needing additional training (Tables 8 and 9) were occupational health not specified as safety (21 percent), toxicology (17 percent), and epidemiology and/or biostatistics (17 percent). These also ranked among the three most frequently reported fields within the developed and other developing countries. However, solid waste/sewage management (50 percent), water pollution (36 percent), and food contamination (29 percent) ranked high in the least developed countries.

Need for WHO Support of Efforts to Improve Training

Enthusiastic response was obtained to a check list for the question concerning how WHO could best support efforts to improve training in the respondent's own country (Tables 10 and 11). In the least developed countries, 86 percent wanted aid in developing training texts or other materials, and similarly 86 percent felt WHO could facilitate international cooperation in training (Figure 6). The other two choices, providing training for local teachers, and development of training curriculum guidelines, were each checked by over half the respondents. Results are similar for other developing countries. In developed countries fewer respondents voted for any of these options, especially not for training for local teachers.

In response to an open-ended question, about one-third of the respondents reported other ways in which WHO could aid in training, but no single category included more

than 6 percent. The most frequently mentioned were: providing financial assistance, exerting influence and providing WHO recognition to local schools and programs, facilitating the establishment of local programs and schools, helping obtain appropriate materials and technology, and providing professional expertise.

DISCUSSION

Reliability of Data

The reader should be aware that some percents are based on small denominators. These include the category of least developed countries (N=14) and the WHO regions of Eastern Mediterranean (N=19), and southeast Asia (N=24). A difference of one or two respondents in these categories can make a difference of up to 15 percentage points. In addition, responses were received from only about half of the total number of GEENET members, who may or may not represent about half of the teaching members.

Responses to the questions asking for a write-in answer were coded into categories similar to those used for other questions where appropriate. Otherwise they were coded to new categories that represent the most frequent responses or were felt to be particularly relevant to the goals of the survey. Results for these questions might have been different if the respondents had been presented with check lists.

Implications for Training

It is clear from the survey results that many respondents feel the need for improvement in training in environmental and occupational health. The focus they felt this training might take is a function of their perception of local environmental health problems, as well as of their evaluation of specific training needs. Problems and needs differ with respect to the degree of development of a country and other features specific to different geographic areas. WHO's assistance in developing educational programs and in providing financial assistance and technical expertise would clearly be welcome and may provide the only means by which some areas can develop their own expertise specific to their own environmental health problems.

The responses to questions on perceived problems have implications for needed training because they pinpoint areas in which unsolved problems occur. In general, the frequency with which a problem was reported to be "very serious" was related to the developmental status of the countries. Respondents from the more developed countries tended to report problems associated with technology, specifically with contamination or pollution from the automobile and from industry. Indoor air pollution was reported as a problem by a substantial number of respondents in the less developed countries and is also now being recognized as a problem in some developed countries.

The most frequently reported crises involved waste disposal sites or spills. However, no information was obtained on the seriousness of the health threat (mild or serious; resulting in disease, injury, disability, or death) nor on the numbers of people affected. The percent of respondents reporting a particular type of crisis does not necessarily indicate the seriousness of the threat to health nor does it indicate the number of people actually affected.

Traffic accidents are a problem regardless of developmental status. Prevention requires reliable data collected and interpreted within an epidemiological framework to define the types of accidents, their probable causes, and other relevant factors. Improved methods of data interpretation are needed as a basis for formulating a program to reduce the toll on

human lives and welfare. Prevention might include better equipment and periodic inspection of vehicles, improved regulation of both vehicles and drivers, and changes in accepted local customs and norms of behavior through education.

The greatest expressed need for training improvement was more time devoted to training. This might include more teaching time, more teachers, or adding courses to the curriculum. For universities or technical schools, more practical emphasis and field work were mentioned, as well as the need for integrating curricula from separate departments and the development of degree or diploma programs. Continuing education for professionals was the top concern for short courses.

Comparisons presented here have focused on the three development categories used by WHO to characterize countries. Because of the small number of respondents in some of the six WHO regions and the diversity of potential problems within them, no attempt has been made to comment on differences by these regions (Tables 6, 9, and 11). Although not used in this report, the questionnaire responses have also been coded into even smaller geographic areas, some of which represent only a few respondents.

The data file developed from the survey results can be of help in obtaining additional ad hoc tabulations of responses from small geographic areas addressing specific issues relevant to planning WHO supported regional training programs. Tabulations could similarly be developed in response to requests from GEENET members for information concerning their own areas.

APPENDIX 1

Statistical Aspects

In the interests of readability, confidence limits for percents have not been given on the tables. No simple formula is available to help the reader calculate confidence intervals for the categories with relatively small numbers of respondents

For N of 200 or greater (example, other developing countries and developed countries) approximate 95% confidence limits can be obtained as follows:

$$p \pm [1.96(\text{square root}(p[100-p]/N))],$$

where p is the observed percent.

For example, for an observed percent of 25 in the developed group of countries (N=215), one calculates the square root of [(25x75)/215], and multiplies it by 1.96, giving 5.8, and rounding, if one wishes, to 6%. A lower confidence limit of 19% is obtained by subtracting 6 from 25, and an upper limit of 31% is obtained by adding 6 to 25. Similarly, for a percent of 50, the lower confidence limit is 43% and the upper confidence interval is 57%. The range between the upper and lower confidence limits becomes smaller as the sample size increases, and, for a given sample size, becomes smaller when the percent is near zero or 100 compared to percents near 50.

This relatively simple rule is not adequate for small N's, such as the N of 14 for the least developed countries. To give some idea of the much broader confidence limits for percents based on this small number, one can say that the lower confidence limit ranges from zero, for observed percents near zero, to 23% for an observed percent of 50, and to 78% for an observed percent of 100. Corresponding upper confidence limits are 22% for an observed percent of zero, to 79% for an observed percent of 50, and to 100% for percents near 100.

Table 1
Response to survey
(Includes nonteaching members of GEENET)

	Mailed	Questionnaire returned		Questionnaire not returned[1]	
	Number	Number	%	Number	%
TOTAL	966	471	48.8	495	51.2
Region					
Africa	57	41	71.9	16	28.1
Americas	387	183	47.3	204	52.7
Eastern Mediterranean	45	20	44.4	25	55.6
Europe	251	114	45.4	137	54.6
Southeast Asia	61	28	45.9	33	54.1
Western Pacific	165	85	51.5	80	48.5
Language					
English	746	353	47.3	393	52.7
Spanish	160	88	55.0	72	45.0
French	60	30	50.0	30	50.0
Development status					
Least developed	30	16	53.3	14	46.7
Other developing	394	215	54.6	179	45.4
Developed	542	240	44.3	302	55.7

1 Includes 14 known postal delivery problems, and 19 who did not return a questionnaire but sent a note. Probably includes other postal delivery problems and potential respondents who did not feel the questionnaire was appropriate for them.

Table 2
Profile of respondents and areas served
(N=433)

	Number	Percent
Type of area served		
Smaller than state or province	119	27.5
State/province	182	42.0
Larger than state/province, smaller than country	19	4.4
Country	102	23.6
Larger than own country	5	1.2
Missing data	6	1.4
Present position		
Teacher	202	46.7
Administrator	80	18.5
Teacher/administrator	74	17.1
Consultant	10	2.3
Research scientist	27	6.2
Administrator/research scientist	11	2.5
Health officer	13	3.0
Other	6	1.4
Missing data	10	2.3
Profession		
Medicine	193	44.6
Veterinary medicine	8	1.8
Medical toxicology	6	1.4
Medical epidemiology	59	13.6
Toxicology	5	1.2
Epidemiology	42	9.7
Pharmacology	3	0.7
Life science	7	1.6
Physical science	10	2.3
Social science	5	1.2
Public health - other	82	18.9
Other	3	0.7
Missing data	10	2.3
Where respondent was trained		
Within own country	217	50.1
Outside of own country	54	12.5
Both the above	104	24.0
Other	41	9.5
Missing data	17	3.9

Table 3
Current training in environmental and occupational health in own area

	Number	Percent
Does area have a public health school?		
Total	433	100.0
Yes	230	53.1
No	198	45.7
Missing data	5	1.2
Geographic area served by public health school		
Total with school	230	100.0
State/province	63	27.4
Several states/provinces	43	18.7
Whole country	116	50.4
Missing data	8	3.5
Does area have a medical school?		
Total	433	100.0
Yes	411	94.9
No	9	2.1
Missing data	13	3.0
Geographic area served by medical school		
Total with school	411	100.0
State/province	140	34.1
Several states/provinces	105	25.5
Whole country	160	38.9
Missing data	6	1.5
Environmental and occupational health training in area		
University undergraduate	356	82.2
University postgraduate	319	73.7
Technical school	252	58.2
Short-term courses	249	57.5
Seminars/workshops	225	52.0
Other type	40	9.2

Table 4
Percent reporting environmental and occupational conditions by degree of problem
(N=433)

CONDITION	Not a Problem	Somewhat of a Problem	A Problem	Very Serious	Missing Data
Worker exposures to pesticides	9.2	37.0	35.1	16.4	2.3
Worker exposures to other chemicals	1.6	27.3	53.3	15.9	1.8
Air pollution from power plants and industry	7.4	28.6	42.7	20.8	0.5
Urban air pollution from motor cars	5.3	28.4	42.7	22.9	0.7
Pollution from agricultural chemicals and pesticides	7.9	41.6	38.1	10.9	1.6
Pollution from toxic waste disposal or spills	7.4	39.7	36.5	15.2	1.2
Traffic accidents	2.1	20.6	33.7	42.3	1.4
Inadequate sanitation and sewage disposal	18.0	24.9	30.0	25.6	1.4
Inadequate garbage disposal	20.3	24.7	30.5	21.9	2.5
Food contaminated by pesticides and/or chemicals	24.5	43.6	25.2	4.2	2.5
Food contaminated by pathogens	29.8	37.0	20.1	10.9	2.3
Household pesticides and/or other chemical exposures	20.6	52.4	20.3	3.7	3.0
Contamination of drinking water by chemicals or pesticides	28.9	42.3	20.1	6.9	1.8
Contamination of drinking water by pathogens	43.2	27.5	17.1	10.6	1.6
Local water pollution from industry	14.5	37.0	32.8	14.3	1.4
Toxic waste disposal site	17.8	33.5	31.9	14.1	2.8
Indoor air pollution from burning wood, coal, petroleum derivatives, etc.	34.2	36.3	20.6	6.9	2.1
Floods, earthquakes, fires and other disasters	40.6	31.4	17.3	8.3	2.3
Unhealthy and/or unsafe housing	20.3	36.0	25.6	16.6	1.4
Childhood lead exposure	37.4	34.9	18.5	6.2	3.0

Table 5

Percent reporting "Very Serious" environmental and occupational problems by development status of country

CONDITION	Total (N=433)	Least Developed (N=14)	Other Developing (N=204)	Developed (N=215)
Worker exposures to pesticides	16.4	28.6	23.0	9.3
Worker exposures to other chemicals	15.9	21.4	18.6	13.0
Air pollution from power plants and industry	20.8	0.0	27.0	16.3
Urban air pollution from motor cars	22.9	0.0	28.9	18.6
Pollution from agricultural chemicals and pesticides	10.9	7.1	11.8	10.2
Pollution from toxic waste disposal or spills	15.2	7.1	17.2	14.0
Traffic accidents	42.3	35.7	46.1	39.1
Inadequate sanitation and sewage disposal	25.6	78.6	39.7	8.8
Inadequate garbage disposal	21.9	71.4	33.3	7.9
Food contaminated by pesticides and/or chemicals	4.2	7.1	7.8	0.5
Food contaminated by pathogens	10.9	50.0	18.1	1.4
Household pesticides and/orother chemical exposures	3.7	14.3	5.4	1.4
Contamination of drinking water by chemicals or pesticides	6.9	0.0	8.8	5.6
Contamination of drinking water by pathogens	10.6	50.0	17.2	1.9
Local water pollution from industry	14.3	14.3	21.1	7.9
Toxic waste disposal site	14.1	14.3	13.2	14.9
Indoor air pollution from burning wood, coal, petroleum derivatives, etc.	6.9	21.4	11.3	1.9
Floods, earthquakes, fires and other disasters	8.3	7.1	12.7	4.2
Unhealthy and/or unsafe housing	16.6	57.1	28.4	2.8
Childhood lead exposure	6.2	0.0	5.9	7.0

Table 6

Percent reporting "Very Serious" environmental and occupational problems by WHO region

(N=433)

CONDITION	AFR (N=37)	AMR (N=160)	EMR (N=19)	EUR (N=109)	SEAR (N=24)	WPR (N=84)
Worker exposures to pesticides	18.9	26.9	15.8	8.3	12.5	7.1
Worker exposures to other chemicals	18.9	23.1	15.8	11.0	8.3	9.5
Air pollution from power plants and industry	10.8	25.0	15.8	19.3	16.7	21.4
Urban air pollution from motor cars	13.5	34.4	21.1	16.5	25.0	13.1
Pollution from agricultural chemicals and pesticides	8.1	16.2	0.0	11.9	8.3	3.6
Pollution from toxic waste disposal or spills	13.5	24.4	5.3	11.0	20.8	4.8
Traffic accidents	51.4	46.9	57.9	32.1	50.0	36.9
Inadequate sanitation and sewage disposal	62.2	26.9	42.1	13.8	50.0	11.9
Inadequate garbage disposal	54.1	21.9	26.3	9.2	50.0	15.5
Food contaminated by pesticides and/or chemicals	5.4	5.0	5.3	1.8	12.5	2.4
Food contaminated by pathogens	35.1	9.4	26.3	4.6	33.3	1.2
Household pesticides and/or other chemical exposures	8.1	6.9	0.0	1.8	0.0	0.0
Contamination of drinking water by chemicals or pesticides	2.7	9.4	0.0	6.4	12.5	4.8
Contamination of drinking water by pathogens	32.4	10.0	15.8	3.7	29.2	4.8
Local water pollution from industry	21.6	18.1	15.8	8.3	8.3	13.1
Toxic waste disposal site	13.5	20.0	5.3	12.8	12.5	7.1
Indoor air pollution from burning wood, coal, petroleum derivatives, etc.	18.9	6.2	15.8	0.9	4.2	9.5
Floods, earthquakes, fires and other disasters	8.1	14.4	0.0	2.8	4.2	7.1
Unhealthy and/or unsafe housing	45.9	19.4	21.1	3.7	37.5	8.3
Childhood lead exposure	0.0	12.5	0.0	3.7	0.0	3.6

Table 7

Ways in which training could be improved in area served

(N=433)

IMPROVEMENT NEEDED	University/ Technical School	Short Courses/ Seminars
	%	%
Practical or field-training emphasis	18.7	5.5
Environmental health emphasis	8.1	1.8
Epidemiology emphasis	6.0	2.3
Research emphasis	3.2	0.2
Prevention emphasis	2.3	0.2
Expand training time	39.0	18.0
Develop new degree/diploma programs	10.2	0.0
Integrate curricula in various fields	12.9	1.6
Establish school of public health	3.2	0.0
Medical student training	9.7	0.7
Provide or make better use of training materials/texts	8.8	5.1
Provide equipment/improve facilities	4.8	1.2
Increase financial resources	5.5	3.5
Improve quality of faculty	6.9	2.5
Improve quality of curriculum	5.3	2.3
Increase visibility of public health as a field of study	4.2	1.4
Continuing education for professionals	1.6	14.1
Training for inspectors	1.2	2.5
Training for workers	0.2	6.5
Public education	0.2	2.3
Intercountry cooperation	1.6	3.7
Occupational health emphasis	2.8	0.9
Other	25.6	19.4

Table 8

Percent reporting fields in which additional training is necessary (by development status of country)

(N=433)

FIELD	Total (N=433)	Least Developed (N=14)	Other Developing (N=204)	Developed (N=215)
Epidemiology (including biostatistics)	16.6	14.3	20.6	13.0
Risk assessment	5.3	0.0	3.9	7.0
Exposure assessment/monitoring	4.8	7.1	5.4	4.2
Toxicology (including pesticides)	17.3	35.7	20.6	13.0
Occupational safety	7.6	7.1	11.3	4.2
Environmental and occupational injuries	4.8	0.0	5.9	4.2
Environmental and occupational diseases	5.8	0.0	8.3	3.7
Environmental health not otherwise specified	7.4	7.1	8.3	6.5
Occupational health not otherwise specified	21.0	35.7	26.5	14.9
Toxic waste management	3.2	7.1	3.9	2.3
Solid waste/sewage management	5.3	50.0	6.9	0.9
Food contamination (chemicals or pathogens)	6.9	28.6	11.3	1.4
Health education and community services	5.3	0.0	6.9	4.2
Water pollution (including contaminated drinking water)	6.5	35.7	7.4	3.7
Air pollution	9.0	0.0	13.7	5.1
Soil contamination and other pollution not otherwise identified	7.9	14.3	12.7	2.8
Other	29.6	57.1	30.9	26.5

Table 9

Percent reporting fields in which additional training is necessary (by WHO Region)

(N=433)

FIELD	AFR (N=37)	AMR (N=160)	EMR (N=19)	EUR (N=109)	SEAR (N=24)	WPR (N=84)
Epidemiology (including biostatistics)	27.0	16.9	10.5	19.3	8.3	11.9
Risk assessment	0.0	6.9	5.3	3.7	0.0	8.3
Exposure assessment/monitoring	2.7	6.2	5.3	3.7	8.3	3.6
Toxicology (including pesticides)	27.0	17.5	15.8	11.0	25.0	19.0
Occupational safety	2.7	11.2	26.3	0.0	4.2	9.5
Environmental and occupational injuries	10.8	5.0	0.0	5.5	8.3	1.2
Environmental and occupational diseases	2.7	9.4	10.5	2.8	12.5	1.2
Environmental health not otherwise specified	8.1	7.5	15.8	7.3	8.3	4.8
Occupational health not otherwise specified	32.4	25.6	15.8	11.0	29.2	19.0
Toxic waste management	2.7	3.8	5.3	1.8	4.2	3.6
Solid waste/sewage management	21.6	5.6	15.8	0.9	4.2	1.2
Food contamination (chemicals or pathogens)	18.9	8.8	15.8	2.8	8.3	1.2
Health education and community services	8.1	6.2	5.3	3.7	4.2	4.8
Water pollution (including contaminated drinking water)	27.0	5.0	5.3	4.6	12.5	1.2
Air pollution	13.5	9.4	10.5	7.3	16.7	6.0
Soil contamination and other pollution not otherwise identified	2.7	13.1	10.5	4.6	8.3	3.6
Other	27.0	28.8	36.8	25.7	37.5	33.3

Table 10

How could WHO best support efforts to improve training in own country (by development status of country)

(N=433)

METHOD	Total (N=433) %	Least Developed (N=14) %	Other Developing (N=204) %	Developed (N=215) %
Develop training texts/ materials	67.0	85.7	77.0	56.3
Develop training curriculum guidelines	46.9	57.1	51.0	42.3
Provide training for local teachers	50.1	64.3	76.5	24.2
Facilitate cooperation in t raining between countries	68.1	85.7	79.4	56.3

Table 11

How could WHO best support efforts to improve training in own country

(by WHO Region)

(N=433)

FIELD	AFR (N=37) %	AMR (N=160) %	EMR (N=19) %	EUR (N=109) %	SEAR (N=24) %	WPR (N=84) %
Develop training texts/ materials	73.0	65.0	94.7	65.1	66.7	64.3
Develop training curriculum guidelines	54.1	41.9	84.2	45.0	66.7	41.7
Provide training for local teachers	75.7	54.4	78.9	34.9	75.0	36.9
Facilitate cooperation in training between countries	78.4	73.8	89.5	56.0	70.8	63.1

FIGURES

FIGURE 1
PERCENT REPORTING "VERY SERIOUS"
ENVIRONMENTAL AND OCCUPATIONAL PROBLEMS
BY DEVELOPMENT STATUS OF COUNTRY
(HIGHEST % IN LEAST DEVELOPED COUNTRIES)

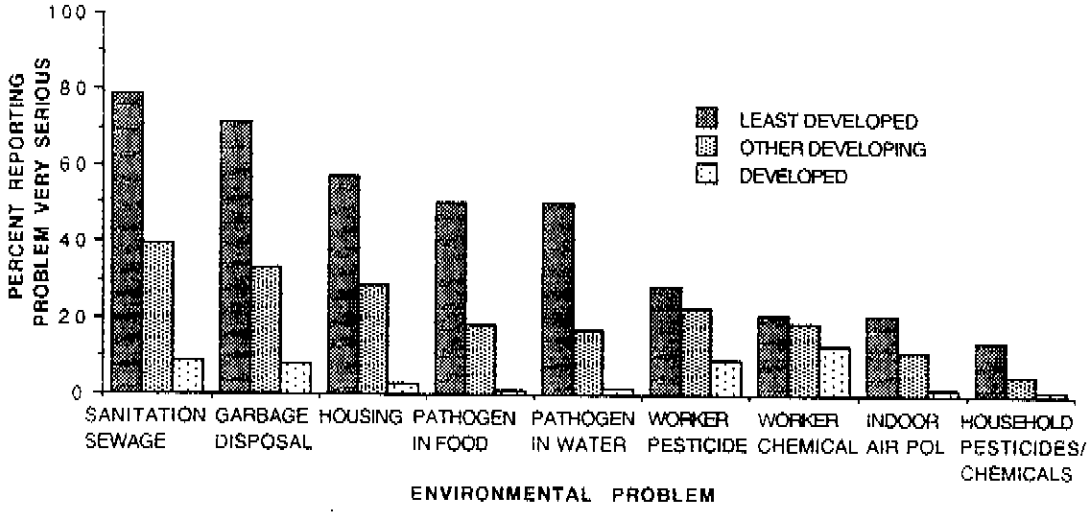


FIGURE 2
PERCENT REPORTING "VERY SERIOUS"
ENVIRONMENTAL AND OCCUPATIONAL PROBLEMS
BY DEVELOPMENT STATUS OF COUNTRY
(HIGHEST % IN OTHER DEVELOPING COUNTRIES)

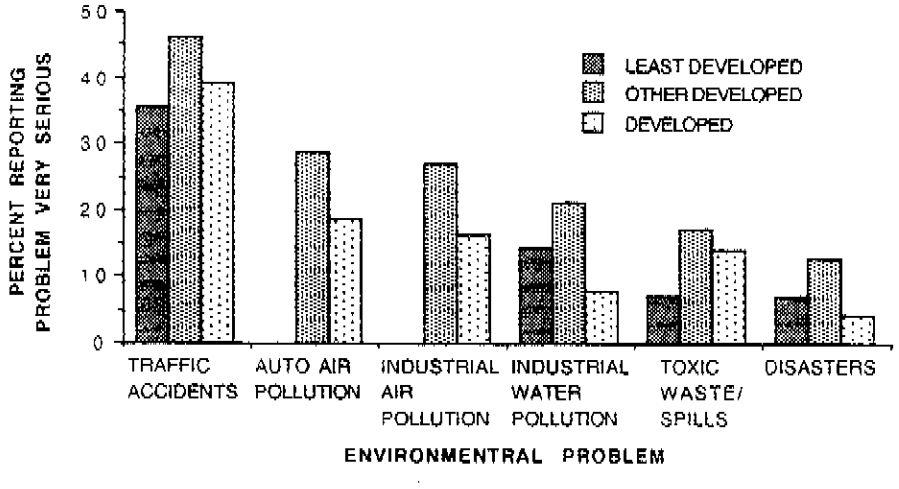


FIGURE 3
PERCENT REPORTING "VERY SERIOUS"
ENVIRONMENTAL AND OCCUPATIONAL PROBLEMS
BY DEVELOPMENT STATUS OF COUNTRY
(OTHER PATTERNS BY DEVELOPMENT STATUS)

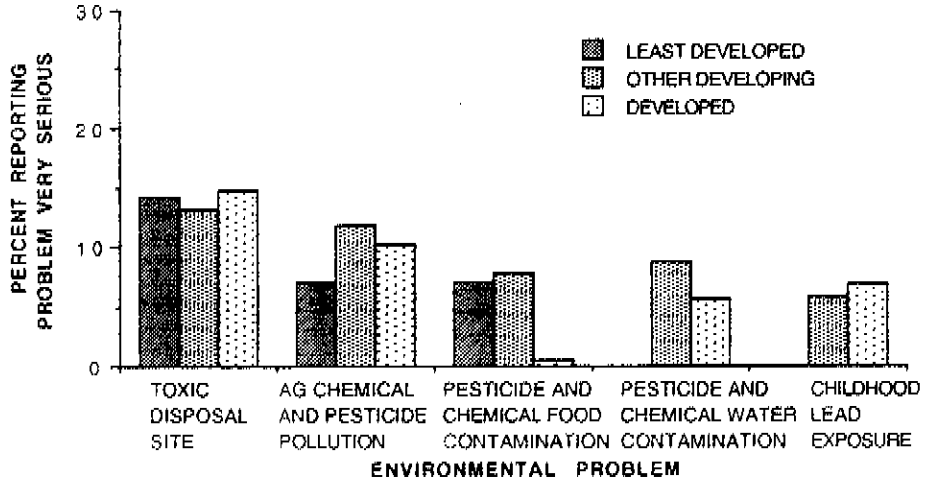


FIGURE 4
PERCENT REPORTING CRISIS OR EMERGENCY
BY DEVELOPMENT STATUS OF COUNTRY

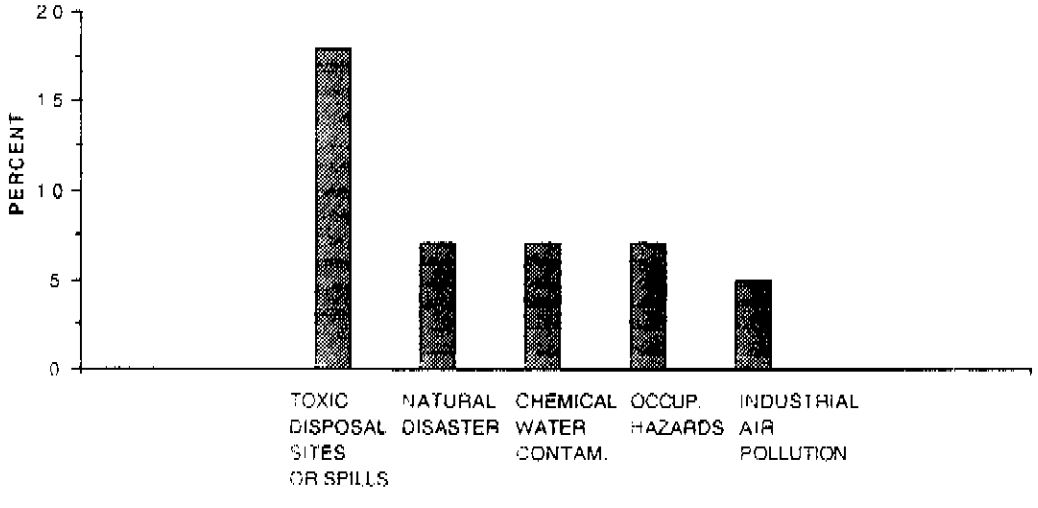


FIGURE 5
WAYS IN WHICH TRAINING COULD BE IMPROVED
UNIVERSITY/TECHNICAL SCHOOL VS SHORT COURSES/SEMINARS
(AT LEAST 10% REPORTING FOR ONE OF THE TWO CATEGORIES)

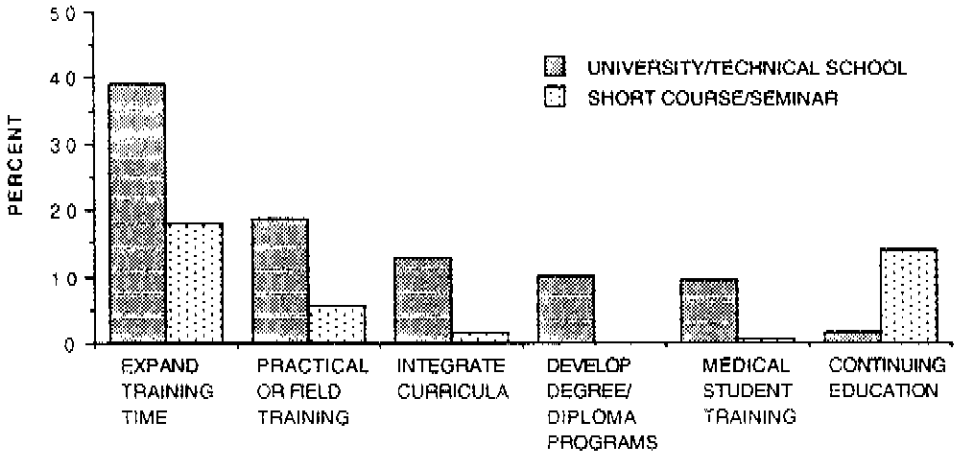
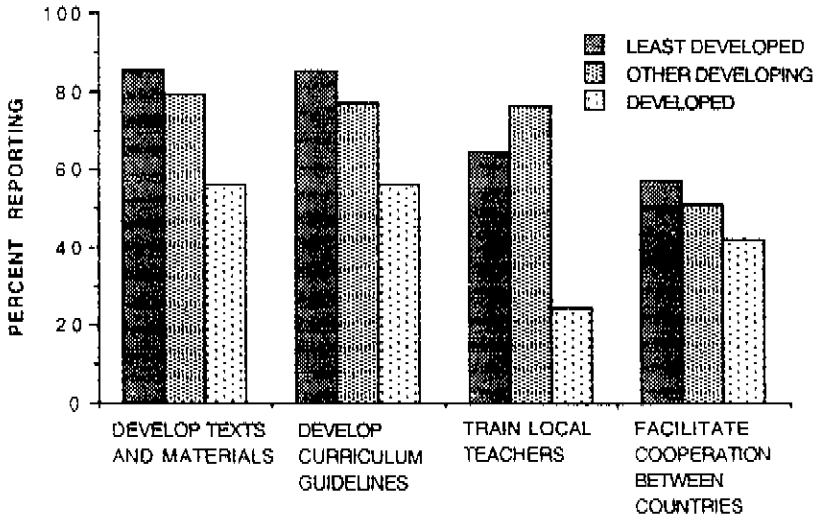


FIGURE 6
PERCENT REPORTING HOW WHO COULD IMPROVE
TRAINING IN OWN COUNTRY
BY DEVELOPMENT STATUS OF COUNTRY



APPENDIX 2

QUESTIONNAIRE USED IN THE SURVEY

The Environmental Epidemiology and Occupational Training Needs Survey

The Environmental and Occupational Epidemiology Training Needs Survey is a collaborative effort of the World Health Organization (WHO) and the California Department of Health Services. The purpose of this survey is to assess the specific environmental problems encountered by public health professionals in developed and developing countries, as well as to assess the needs for further training to deal with these problems. The information you provide us is confidential. The results of the survey will be reported at the second meeting of the International Society for Environmental Epidemiology (ISEE) at Berkeley, California from August 13-15, 1990. All respondents will received a copy of the report by mail. WHO and ISEE will use the results to plan future training activities.

Thank you in advance for your participation in this important international environmental survey.

1a. What is the name of the geographic area (province or country) you serve ?

Name _____

_____

1b. How many people live in the area you serve?

# of people _____

1c. Is there a school of public health in the area you serve?

1 ❑ YES 2 ❑ NO

→ Answer question 1d

1d. How many students attend the public health school?

# of students _____

1e. What geographical area does the public health school serve?

1 ❑ The Province/State

2 ❑ Several Provinces/States

3 ❑ The Whole Country

1f. Is there a medical school in the area you serve?

1 ❑ YES 2 ❑ NO

↳ Answer question 1g.

1g. How many students attend the medical school?

# of students _____

1h. What geographical area does the medical school serve?

1 ❑ The Province/State

2 ❑ Several Provinces/States

3 ❑ The whole Country

Please estimate the importance of specific environmental and occupational conditions in the area you serve: **Answer with a X in the appropriate box.**

Environmental and Occupational Conditions	0 Not a problem	1 Somewhat of a problem	2 A problem	3 Very serious problem
2. Worker exposures to pesticides				
3. Worker exposures to other chemicals				
4. Urban air pollution from power plants and industry				
5. Urban air pollution from motor cars				
6. Pollution from agricultural chemicals and pesticides				
7. Pollution from toxic waste disposal or spills				
8. Traffic accidents				
9. Inadequate sanitation and sewage disposal				
10. Inadequate garbage disposal				
11. Food contaminated by pesticides and/or chemicals				
12. Food contaminated by pathogens				
13. Household pesticides and/or other chemical exposure				
14. Contamination of drinking water by chemicals or pesticides				
15. Contamination of drinking water by pathogens				

Environmental and Occupational Conditions	0 Not a problem	1 Somewhat of a problem	2 A problem	3 Very serious problem
16. Local water pollution from industry				
17. Local air pollution from industry				
18. Toxic waste disposal site				
19. Indoor air pollution from burning wood, coal, petroleum derivatives, etc.				
20. Floods, earthquakes, fires and other disasters				
21. Unhealthy and/or unsafe housing				
22. Childhood lead exposure				

23. Are there other important environmental health problems in the area you serve that were not mentioned above?

1 ❑ YES 2 ❑ NO

↳ Answer question 24

24. What are these environmental health problems?

_____

_____

_____

25. Are there other important occupational health problems in the area you serve that were not mentioned above?

1 ❑ YES 2 ❑ NO

↳ Answer question 26

26. What are these occupational health problems?

27. Are there other important injury related problems that were not mentioned above?

1 ❑ YES 2 ❑ NO

→ Answer question 28

28. What are those injury related problems?

29. Over the past two years, has there been a significant environmental or occupational health crisis or emergency in the area you serve?

1 ❑ YES 2 ❑ NO

→ Answer question 30

30. Please describe the crisis or emergency.

31 How is environmental and occupational health training conducted in area you serve? (Please check all the categories that apply)

Type of Training	Target Groups	Number of Courses	Number of Students
a- University undergraduate	1 ❑ Medical students 2 ❑ Engineering students 3 ❑ Science students 4 ❑ Other (Specify)_____	1 _____ 2 _____ 3 _____ 4 _____	1 _____ 2 _____ 3 _____ 4 _____
b- University postgraduate	1 ❑ Master in Science 2 ❑ Master in Public Health 3 ❑ Ph.D./Dr.P.H. 4 ❑ Sc.D. (Doctor of Science) 5 ❑ Diploma 6 ❑ Other (Specify)_____	1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____	1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____
c- Technical college/school	1 ❑ Nursing students 2 ❑ Public Health inspectors 3 ❑ Factory inspectors 4 ❑ Environmental health Officers/ workers/promoters 5 ❑ Other (Specify)_____	1 _____ 2 _____ 3 _____ 4 _____ 5 _____	1 _____ 2 _____ 3 _____ 4 _____ 5 _____

Type of Training	Target Group	Number of Courses	Number of Students
d- Short-term courses	1 ❑ Health professionals 2 ❑ Environmental health Officers/ workers/promoters 3 ❑ Other (Specify)_____	1 _____ 2 _____ 3 _____	1 _____ 2 _____ 3 _____
e- Seminars/workshops	1 ❑ Health professionals 2 ❑ Public Health inspectors 3 ❑ Professionals in industry i.e. chemists, engineers, etc. 4 ❑ Factory inspectors 5 ❑ Environmental health promoters 6 ❑ Other (Specify)_____	1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____	1 _____ 2 _____ 3 _____ 4 _____ 5 _____ 6 _____
d- Other type of training (specify) _____	1 ❑ _____ 2 ❑ _____ 3 ❑ _____ 4 ❑ _____ 5 ❑ _____	1 _____ 2 _____ 3 _____ 4 _____ 5 _____	1 _____ 2 _____ 3 _____ 4 _____ 5 _____

32. Is the training conducted in the area you serve satisfactory?

1 ❑ YES 2 ❑ NO

33. Please list the possible ways in which the training taking place in the area you serve could be improved?

a. University undergraduate: _____

_____

_____

b. University postgraduate: _____

_____

_____

c. Technical college/school: _____

_____

_____

d. Short-term courses: _____

_____

_____

e. Seminars/workshops: _____

_____

_____

d. Other (specify): _____

_____

_____

34. Additional comments on existing training: _____

_____

_____

35. Given the nature and extent of environmental and/or occupational health conditions in the area you serve, in which fields is **additional training necessary? (Please list the topics)**

_____

_____

_____

36. How could WHO best support the efforts to improve environmental and occupational health training in your country?

1 ❑ Developing training texts/materials
2 ❑ Developing training curriculum guidelines
3 ❑ Providing training for local teachers
4 ❑ Facilitating cooperation in training between different countries
5 ❑ Other methods (specify): _____

_____

37. What is your present position?_____

38. What is your profession?_____

39. Where did you get your training?_____

Once again thank you for your participation. Your contribution will be very helpful in identifying the need for training of personnel in the fields of environmental epidemiology and occupational health. Please mail the questionnaire in the enclosed envelope to:

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