Access to continuing professional education among health workers in Ghana

ガーナにおける保健医療従事者の継続専門教育へのアクセス

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ACRONYMS

CEAI	Continuing professional Education Access Indicator
CPE	Continuing Professional Education
DHS	Demographic & Health Survey
DPT	Diphtheria-Pertussis-Tetanus vaccine
FASID	Foundation for Advanced Studies on International Development
FGD	Focus Group Discussion
GOG	Government of Ghana
GSS	Ghana Statistical Service
GTZ	Gesellschaft für Technische Zusammenarbeit (German Technical Development Corporation)
GWU	George Washington University
HDI	Human Development Indicator
IMR	Infant Mortality Rate
ISTP	In-Service Training Policy
OJT	On-the-Job-Training
SARS	Severe Acute Respiratory Syndrome
SAS	Statistic Analysis Software
SD	Standard Deviation
SPSS	Statistical Package for Social Sciences
JICA	Japan International Cooperation Agency
MII	Macro International Incorporation
MOH	Ministry of Health
WHO	World Health Organization
WPI	Water Poverty Index

ABSTRACT

1. Introduction and background

Continuing Professional Education (CPE) is generally accepted as a recognized channel for disseminating enhanced knowledge and skills to health workers (HWs). In developing countries, the majority of CPE programs have been implemented, as one of the intervention modes necessary to improve health status among local population, with financial and technical support from development agencies. However, those CPE programs supported by development agencies tend to be short-noticed, ad-hoc based, and poorly coordinated, and sometimes provide participants with extraordinary amount of allowance. For this reason, some CPE programs create confusion within the Ministry of Health (MOH) of the country. Despite these current issues specific to developing countries, very few studies have been conducted in terms of distribution of CPE opportunities among HWs. WHO pointed out that one of the reasons for little concerning comprehensive CPE situation is the lack of recognition of healthcare human resources as an authentic area of research despite its importance in contrast with, for example biomedical research.

Numbers of physicians and nurses per population have been internationally recognized as the indicators that measure quantitative status of human resources. However, indicators that measure qualitative status of human resources are critically lacking. To improve the quality and efficiency of health services, both quantitative and qualitative status of healthcare human resources are necessary.

This study is aimed at demonstrating the distribution of CPE opportunities and estimating the determinants of it. This study also attempts to construct an index of access to CPE, as a qualitative indicator of human resources, and further examines the validity of the index.

2. Methods

A survey on quantities and distribution of CPE opportunities was conducted in Ghana. Due to lack of the data concerning the past CPE programs in the country, a statistically representative sample size was unable to be calculated. Therefore, the survey was designed in the form of census, targeting all the MOH HWs in three (Volta, Western, and Brong-Ahafo regions) of 10 regions of Ghana. The survey was conducted between June and July 1998, by visiting every MOH-operated health facilities located in the three regions and using a self-administered questionnaire that asked the questions regarding the results of CPE during a two-year-and-five-month period from 1 January 1996 to 31 May 1998.

Based on earlier studies and the pretest for this study, eight background variables of frequencies of CPE opportunities were employed: (1) gender; (2) professional working experience in the form of number of years spent as a MOH employee; (3) age; (4) type of occupational group; (5) distance from the district capital of the duty station to the regional capital; (6) rank of post in the MOH personnel system; (7) type of duty station; and (8) number of staff working at the duty station. The same data were uniformly applied to those who work in the same health facility in terms of the three (distance to the regional capital; type of duty station; and number of staff) of the eight variables. Thus, these three variables formed clusters. Therefore, Poisson mixed model was applied as a multivariate analysis by employing frequencies of CPE opportunities as the dependent variable and the eight background variables as the independent variables. A Focus Group Discussion (FGD) was organized among HWs in each of the three regions. In each FGD, open-ended questions concerning selection of participants in CPE programs were asked.

3. Results

The survey covered 6696 HWs (nominal coverage: 87.1%) and 444 health facilities (nominal coverage: 89.3%).

3.1 Quantities and distribution of CPE opportunities

Mean of overall CPE opportunities offered per HW per three years was 1.38 CPE, which is greater than the target figure adopted by the MOH (1.00 CPE opportunities per three years). Mean of self-perceived CPE demand of CPE opportunities per HW per three years was 2.77 CPE (Table 1). The variance of supply of CPE opportunities (sd=1.25) was greater than that of demand (sd=0.13).

In the Ghanaian MOH personnel system, there are 72 occupational groups. To enable data to be appropriately analyzed, first, all the 72 occupational groups were categorized into four groups: i.e. (i) health technical staff; (ii) administrative staff; (iii) non-health technical staff; and (iv) support staff. Second, health technical staff were further categorized into 17 sub-groups (Table 1). Oversupply of CPE opportunities was detected among several health technical staff such as medical doctors and medical assistants. However, undersupply of CPE opportunities was detected among the majority of other occupational groups. In terms of rank of post, directors enjoyed 6.57 CPE opportunities per three years while their self-perceived needs are 2.95 CPE opportunities per three years. Thus, oversupply was identified among directors.

The value of one-time participation in a CPE program varies according to occupational group. Therefore, frequencies of CPE opportunities were standardized in terms of occupational group. Standardized frequencies of CPE opportunities among health technical staff (γ =0.68 [1]) were more equally distributed than those among administrative staff (γ =0.54). The least frequently trained 50.7% of the total HWs had no CPE opportunity during 2.42 years. The most frequently trained 10% accounted for 43.6% of share of total CPE opportunities. Thus, it was revealed that CPE opportunities were unequally distributed. As a result of Poisson mixed model, four (gender; type of occupational group; rank of post; and type of duty station) of eight independent variables produced the significant estimates of regression coefficient ($p < 0.01$).

The results of FGDs revealed that selection of participants in CPE programs was dependent primarily on duty station managers' decisions. While participants were selected on a rotational basis at some duty stations, specific HWs were repeatedly selected at other duty stations. It was confirmed that better-performing HWs tended to be selected as participants in CPE programs.

3.2 Construction and application of an index

The CEAI (Continuing professional Education Access Index) composed of six component indicators was constructed: availability of CPE (X_1); distribution of CPE(X_2); informational access to CPE (X_3); geographical access to CPE (X_4); economic access to CPE (X_5); and preparedness to release the staff (X_6). UNDP's technique used for construction of Human Development Indicator was applied as follows:

$$CEAI = \left(\frac{\sum_{i=1}^{6} w_i X_i}{\sum_{i=1}^{6} w_i} \right)$$

$$= \frac{1}{21.6}\left(5.4X_1 + 2.6X_2 + 3.0X_3 + 2.8X_4 + 4.2X_5 + 3.6X_6\right)$$

Where, w_i: variable weights to be calculated based on points of importance level ranking

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[1] Gini coefficient γ is the indicator that compares the levels of equal distributions. The value of γ is between 0 (perfect equal distribution) and 1 (perfect unequal distribution).

Table 1 Frequencies of CPE opportunities of health workers (HWs)

	Number of respondents *		Supply of CPE opportunities		Demand of CPE opportunities	Standardization coefficient
			2.42 years †	3.00 years‡	3.00 years	
	N	%	*Mean*	Mean	Mean	α_i
Gender						
Male	2405	37.3%	0.97	1.20	2.62	-
Female	4404	62.7%	1.21	1.50	2.86	-
Professional working experience as a MOH employee (yr)						
< 10	1440	21.8%	1.29	1.60	2.78	-
10-19	2847	43.1%	0.94	1.17	2.79	-
20-29	1936	29.3%	1.14	1.41	2.74	-
30 ≦	389	5.9%	1.69	2.10	2.70	-
Age (yr)						
< 20	2	0.0003%	1.00	1.23	2.77	-
20-29	379	5.7%	1.11	1.38	3.00	-
30-39	2516	38.1%	1.09	1.35	2.85	-
40-49	2649	40.1%	1.11	1.38	2.79	-
50 ≦	1056	16.0%	1.21	1.50	2.53	-
Type of occupational group						
Health technical staff	3341	50.1%	1.83	2.27	2.90	0.956
Medical doctor	143	2.1%	2.94	3.64	2.73	1.014
Medical assistant	132	2.0%	3.78	4.69	2.91	0.951
Nurse	1175	17.6%	1.43	1.77	2.93	0.944
Midwife	580	8.7%	1.78	2.21	2.93	0.940
Public health nurse	666	10.0%	2.30	2.85	2.95	0.940
Pharmacist	33	0.5%	1.03	1.28	2.61	1.061
Laboratory technician	66	1.0%	0.94	1.17	2.80	0.989
Radiographer	27	0.4%	0.15	0.19	2.55	1.085
Nutritionist	47	0.7%	2.53	3.14	2.93	0.945
Physiotherapist	11	0.2%	0.45	0.56	2.72	1.017
Mortuary officer	17	0.3%	0.24	0.30	2.47	1.122
Health educators	12	0.2%	2.33	2.89	3.00	0.924
Malaria control officer	31	0.5%	1.16	1.44	2.62	1.058
Leprosy control officer	96	1.4%	2.85	3.53	2.82	0.980
Environmental health officer	64	1.0%	1.05	1.30	2.81	0.985
Bio-statistician	86	1.3%	0.97	1.20	2.87	0.963
Other health technical staff	155	2.3%	1.43	1.77	2.74	1.101
Administrative staff §	1335	20.0%	0.59	0.73	2.78	0.996
Non-health technical staff‖	146	2.2%	0.27	0.33	2.56	1.081
Support staff ¶	1850	27.7%	0.27	0.33	2.55	1.087
Distance from duty station to regional capital (km) **						
< 100	4250	63.5%	1.10	1.36	2.76	-
100-199	1798	26.9%	1.01	1.25	2.80	-
200-299	282	4.2%	1.99	2.47	2.76	-
300 ≦	366	5.5%	1.06	1.31	2.73	-
Rank of post in MOH personnel system						
Director	33	0.5%	5.30	6.57	2.95	-
Senior staff	815	12.2%	2.12	2.63	2.80	-
Junior staff	5827	87.3%	0.95	1.18	2.76	-
Type of duty station						
Hospital	3064	45.8%	0.82	1.02	2.78	-
Health center	1898	28.3%	1.32	1.64	2.80	-
Clinic	654	9.8%	1.73	2.14	2.83	-
Maternity home	23	0.3%	0.78	0.97	2.72	-
Health administration office	837	12.5%	1.40	1.74	2.68	-
Training / research institute	220	3.3%	0.43	0.53	2.58	-
Number of staff working at duty station						
1-9	1164	17.4%	1.66	2.06	2.83	-
10-49	2154	32.2%	1.33	1.65	2.76	-
50-149	1915	28.6%	0.68	0.84	2.68	-
150 ≦	1463	21.8%	0.92	1.14	2.85	-
Total	6696	100.0%	1.11	1.38	2.77	1.000

Note
* Totals may not sum to n = 6696 owing to missing observations.
† CPE participation during the period from 1 January 1996 to 31 May 1998.
‡ Converted 2.42-yaer-scale data into 3-year-scale.
§ Administrative staff include: administrator, accountant, secretary, and supply & store officer.
‖ Non-health technical staff include: engineer, laundry superintendent, and hospital maintenance technician.
¶ Support staff include: orderly, driver, and security guard.
** The distance from district capital where duty stations are located to regional capital was employed, referring distances of major road (Directorate of Road, Ministry of Public Works, 2001).

The values of all the six component indicators (X_1 , X_2,$\cdots X_6$) are between zero as minimum (lowest access to CPE) and one as maximum (highest access to CPE). While regional comparison of CEAI values demonstrated smaller differences, Brong-Ahafo region produced the highest CEAI value (=0.573) that indicates the best access to CPE of all the regions. The CEAI values vary more widely according to type of duty station. Clinic produced the highest CEAI value (=0.609) that indicates the best access to CPE of all the types of duty stations. A simple regression between the CEAI values and the standardized frequencies of CPE opportunities per health worker per annum produced a significant linear relationship ($p < 0.01$) and an extremely high level of conformity in the model (R^2 =0.96).

4. Discussion

4.1 Quantities and distribution of CPE opportunities

Mean of overall CPE opportunities offered per HW (1.38 CPE per three years) was greater than the target figure adopted by the MOH (1.00 CPE per three years), but was not comparable to mean of self-perceived CPE demand of CPE opportunities per HW (2.77 CPE per three years). Even after standardization of CPE opportunities according to type of occupational group, significant estimates of regression were detected in type of occupational group. This indicates that type of occupational group is a strong predictor of CPE opportunities. One of the missions of health services in public sector is to deliver homogeneously appropriate quality of services to local populations. In the light of this, CPE opportunities should be more equally distributed in a systematic manner.

The HWs with substantial responsibilities and duties have difficulties in sparing time participating in CPE programs. However, FGDs revealed that, the heavier HWs' workloads were, the more frequent CPE opportunities they needed for coping with their substantial and complicated duties. This may imply that the small variation in α_i is attributable to a psychological conflict between willingness to have more CPE opportunities and to refrain from being out of duty stations owning to responsibilities for workloads.

Duty station managers tend to nominate better-performing staff as participants in CPE programs. This implies further unequal distribution of CPE opportunities and CPE as an incentive. Since development agencies often provide participants in CPE programs with extraordinarily amount of allowance, CPE has been perceived as an extra-income tool. The MOH and development agencies should reconsider the original philosophy of CPE that is to improve the quality of health services through updating HWs' skills and knowledge.

4.2 Construction and application of an index

The CEAI value for those working at hospitals was the lowest (0.333) though their informational access to CPE was relatively high. This is because hospitals had the greatest number of staff (mean = 90.5) and their probability of being nominated, as a participant, was extremely low. To cope with this situation, what has been learned through CPE should be disseminated within duty stations through in-house On-the-Job-Training.

A simple linear regression between CEAI values and the standardized numbers of CPE opportunities produced a significant linear relationship ($p < 0.01$) and an extremely high level of conformity in the model (R^2=0.96). This indicates that the validity of the CEAI model is ensured to the large extent. However, further examination of the CEAI model is necessary to improve the quality of the index because only three earlier studies in the United States were used to calculate weights of component indicators. It should be ardently suggested that CPE be further studied and be recognized as an area of public health research.

1. INTRODUCTION AND BACKGROUND

1.1 NEEDS FOR RESEARCH ON CPE

Emerging and re-emerging diseases, the outbreak of epidemics and endemics, and rapid development of new clinical technologies drive health workers in every part of the world to equip themselves with knowledge and skills to cope with those issues.[1-4] In particular, urgent training needs have been recently brought about with regard to today's risks and threats of terrorism[5,6] and severe acute respiratory syndrome (SARS).[7] Moreover, implementation of health sector reforms on-going in a number of developing and transitional countries requires health workers at managerial and administrative posts to be more trained.[8] Given the increasing training needs among healthcare human resources, the importance of continuing professional education (CPE) should be further emphasized.

CPE, frequently being replaced by the term in-service training, among health workers is generally accepted as a recognized channel for disseminating enhanced knowledge and skills to health workers and ensuring professional competence,[9,10] and improving moral and work attitudes.[11-14] The CPE approach features two major comparative advantages.[15] First, the amount of additional investment in health workers in service as human capital can be minimized because they have already been assigned to the specific service duty stations with basic knowledge, skills, technologies, and professional working experiences. CPE is more cost-effective, in terms of financing and time, than pre-service training where a variety of knowledge and skills from basic to the advanced must be thoroughly provided. Second, what has been learned in CPE programs can be immediately practiced and tested, with little time lag, by health workers at their duty stations such as hospitals and health centers. This will contribute to earlier improvement in quality of both curative and preventive health services.

As a part of health care systems, it is natural that CPE should be carefully analyzed and rationalized as an important step toward better use of existing resources. It is necessary to reasonably determine, within the health policy framework, the level of commitment to CPE. To do this, both quality and quantity of CPE programs should be thoroughly examined. However, comprehensive CPE situation, such as quantities and distribution of CPE opportunities, has been rarely addressed and analyzed,[16] while a number of studies in respective clinical areas have been conducted to examine the linkage of CPE intervention to the level of application of learning and performance change among health workers.[17-40] One of the reasons for little research concerning human resources such as comprehensive CPE situation is the lack of recognition and understanding of healthcare human resources as an authentic area of research despite its importance in contrast with, for example biomedical research.[11,15,41], and the difficulty in rationally analyzing CPE issues compared with clinical research. [42]

1.2 Effectiveness and Impact of CPE

Implementation of CPE does not necessarily ensure an immediate improvement of quality in health care services and health status of local populations. There are several steps to be cleared in order for achieving the improvement of health status: (i) health workers are provided with CPE opportunities; (ii) they practice and maintain the skills and knowledge learned; (iii) the quality of services improves; and (iv) then health status of local populations improves.

Of these, to practice and maintain the skills and knowledge learned is the critical step. For instance, Keah *et al.* confirmed the significant increase of awareness and knowledge of disinfection and sterilization in the health facilities through CPE in their study in Malaysia.[26] On the other hand, Kanlisi reported CPE on strengthening district health systems in Ghana brought about no significant or

sustained in the performance of district health management teams.[43] Thus, the variation in the levels of practicing and maintaining the skills and knowledge learned has been confirmed. This is largely attributable to the extent to which CPE contents meet training needs among the target health workers.

1.3 INDICATOR FOR EVALUATING ACCESS TO CPE

The indicators on quantitative aspects of healthcare human resources such as population ratios (e.g., populations per physician and nurse) have been commonly recognized.[44] However, it was reported that those population ratios have disadvantages as the health indicators.[45] The indicators representing qualitative aspects of healthcare human resources have been lacking. Subsequently, qualitative aspects of staff development have been relatively neglected and human resource development has excessively focused on quantitative aspect such as the production of personnel.[46,47] Note that it is a serious shortcoming that there is an incomplete set of indicators for addressing and measuring healthcare human resources[48] though 60-80% of total health expenditure is spent on them.[49-51] Hence, this study also attempts to construct an index that enables us to measure and evaluate the access to CPE.

Currently there are several indicators for measuring '*access*' that are internationally recognized: e.g. access to safe water; access to sanitation; and access to health services.[52] Those indicators for '*access*' are generally defined in terms of distance or time. However, some weaknesses, such as ambiguity and limitations of the definitions, have been pointed out.[53] For instance, access to safe water, the most common indicator for '*access*' of the above three, is defined as '*In urban areas such a source may be a public fountain or standpipe located not more than 200 meters away and in rural areas access implies that members of the household do not have to spend a disproportionate part of the day fetching water*'.[54] However, a number of governments apply this definition to their countries by modifying it with their

own original ideas and criteria. Subsequently, three factors (distance, time spent, and water quantity per capita) are optionally integrated to formulate these country-specific definitions.[55] Moreover, several important aspects such as physical availability of water and people's capacity to use water are missing.[56] For this reason, a British interdisciplinary researcher group has recently developed the Water Poverty Index (WPI) to address access to safe water in more comprehensive manner.[57,58] Thus, taking access to safe water as an example, the concept of '*access*' as an indicator has not been clearly and sufficiently defined but suffers from complexity.

To quantify access to CPE among health workers in the form of an index, it is essential to compose it with several factors that possibly determine or characterize the access in comprehensive and interdisciplinary manner, in the light of the lessons learned from the limitations of 'access to safe water' as an indicator.

1.4 HEALTHCARE HUMAN RESOURCES IN GHANA

In Sub-Saharan African countries, the development of healthcare human resources has been a top priority and substantial efforts have been made to provide a generation of trained personnel of all categories.[59] The Government of Ghana (GOG) has been placing increasing emphasis on producing adequately prepared healthcare human resources utilizing three medical schools. More than 100 physicians are produced per annum, including those who are externally trained in Europe or Cuba. Nevertheless, the numbers of physicians (currently estimated at approximately 1600) and other health workers in Ghana are limited. Populations per physician and nurse in Ghana are 22970 and 3704 respectively (Figure 1).[54,60] These figures are worse in other Sub Saharan African countries and are largely attributed to the brain drain to the United Kingdom and the United States.[61]

To cope with these issues, from a long-term perspective, efforts should be made to continuously produce health workers on a sustainable basis. However, from a short-term perspective, strengthening CPE for health workers currently in service should, simultaneously with pre-service training, be implemented since CPE contributes to earlier improvement in the population's health status.[15] CPE could also be one of several effective tools for reducing brain drain and retaining health workers.[38] Moreover, to monitor changes in health workers' application of learning to the daily services delivery, quality assurance has been emphasized in Ghana[62,63]

2. RESEARCH QUESTIONS AND OBJECTIVES

Given the importance of CPE and the likelihood of undesirably distributed CPE opportunities, the Ghanaian Ministry of Health (MOH) adopted, in 1997, the In-Service Training Policy (ISTP) that calls for at least one CPE program every three years for every health worker for the purpose of equalizing CPE opportunities.[64,65] However, how CPE opportunities are distributed among health workers has not been studied and documented. Are CPE opportunities distributed undesirably or unequally? If so, what health workers and what type of health facilities are the least benefited from CPE opportunities? To answer these questions, the following specific objectives were established in this study:

1. To examine the quantities and distribution of CPE opportunities and assess the level of inequality of the distribution. Furthermore, to identify major determinants of frequencies of CPE opportunities.

2. To construct an index as a possible useful tool that enables the level of access to CPE to be measured and evaluated. Furthermore, to assess the validity of the index by applying it to the case in Ghana.

This study is aimed at analyzing the holistic quantities and distribution of CPE opportunities because they have been rarely addressed not only in Ghana but in other countries despite its importance. By focusing on holistic quantities and distribution of CPE opportunities that have been nearly forgotten, this study attempts to enhance the awareness of the urgent tasks of strategic policy of healthcare human resource development.

3. METHODS

3.1 SURVEY DESIGN

To analyze the quantities and distribution of CPE opportunities among health workers, a survey was conducted. Because of lack of available information concerning past CPE programs, a statistically appropriate sample size that would ensure the level of data representativity was unable to be estimated. For this reason, the survey was designed in the form of census, targeting all MOH health workers in three of 10 regions (Volta Region, Western Region, and Brong Ahafo Region) of Ghana.[i] These three regions are average in terms of major health indicators such as infant mortality rate and vaccination coverage (Figure 2).[66] In this study, the MOH's definition of governmental health workers was employed: i.e. all types of occupational group working as either permanent or contracted full-time employees of the MOH.

The survey was conducted between June and July 1998, by visiting every MOH-operated health facility located in the three regions and using a self-administered questionnaire. Two types of questionnaire forms, each consisting of a structured question sequence, were prepared. 'Form A' was administered to health workers and 'Form B' to duty station managers. Verbal agreement to take part in the study was obtained from health workers. Both forms were filled out by individuals after they received instructions in local languages.[ii] The forms were field-checked and locally collected during the survey team's visit. Those who were on short leave or otherwise temporarily absent were requested to fill out the form and

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i In these three regions, a Japan International Cooperation Agency (JICA)-supported project has been implemented. This survey was conducted as a part of the project.

ii Ewe, Akan, and Ga, region-specific languages,[67] were used when giving the instruction on self-administered questionnaire respectively in Volta Region, Western Region, and Brong-Ahafo Regions.

to send it back to the survey team.

Prior to conducting the full-scale survey, a pre-test was conducted at Dodowa Health Center and Prampram Health Center in the Dangme West District of Greater Accra Region on 10-15 May 1998. The number of health workers participating in the pretest was 38 with no refusal case to participate.

It is particularly important in this study to ensure the level of reliability and validity of data on participation in the past CPE programs. A study in the United States reported data representativity of a 10-year period on past CPE programs had limited reliability and validity.[68] Another study in Eritrea assumed that health workers' memories of episodes of participation in CPE programs during the past two years were sufficiently reliable.[69] The results of the pretest for the survey supported this trend. Therefore, in this study, the number of times respondents participated in CPE programs during a two-year-and-five-month period (2 + 5/12 = 2.42 yr) from 1 January 1996 to 31 May 1998, expressed as $C_{2.42}$, was adopted for measuring the frequencies of CPE opportunities.

Six thousand six hundred ninety six health workers and 444 health facilities took part in the study (Table 1). According to the salary payroll database of the MOH, the number of currently working health workers under MOH was 7691 in the three regions.[70] However, this figure included those on long leave, such as maternity leave and overseas fellowship leave, and those who already retired but were still registered in the database probably due to technical errors. Therefore, the precise number of health workers currently on duty was not specified. According to the list of health facilities, the number of currently functioning MOH-operated health facilities was 497.[71] However, since it included those already closed down or no longer functioning, the precise number of health facilities was not specified. Therefore, only nominal participation rates were calculated: 87.1 % (=6696/7691) of health workers and 89.3% (=444/497) of health facilities.

3.2 Background variables for CPE opportunities

To identify key determinants of frequencies of CPE opportunities among health workers, background variables were employed. The results of the pretest indicated that more CPE opportunities seem to have been offered to: (i) female health workers; (ii) those with longer professional working experience; and (iii) those categorized into the higher age groups. Moreover, a past study in Eritrea indicated that: (i) specific occupational groups were provided with more CPE opportunities; and (ii) locations of health workers' duty stations were an important determinant of CPE opportunities.[69] Given this situation, eight background variables were employed: i.e. (1) gender; (2) professional working experience in the form of number of years spent as a MOH employee; (3) age; (4) type of occupational group; (5) distance in national and regional road network from the district capital of the duty station to the regional capital; (6) rank of the post in the MOH personnel system; (7) type of duty station; and (8) number of staff working at the duty station.

3.3 Focus group discussions

Focus group discussions (FGDs) are one of the most useful tools to gather qualitative data and provides many important indications and suggestions which researchers would tend to otherwise miss,[72] particularly in studies on CPE.[73] Therefore, to enrich and deepen the description of the CPE situation, a FGD was organized among health workers in each of the three target regions. In these FGDs, the open-ended questions were asked (Annex 3). Between seven and nine health workers participated in each FGD (total 23: they included medical assistants, nurses, pharmacists, laboratory technicians, administrative staff, biostatisticians, and support staff). Of 23, 17 (73.9%) were females.

Through the FGDs, willingness to participate in CPE programs, the CPE participant selection process,

and the other background information regarding CPE, were addressed. All the sessions of FGDs were managed in region-specific local languages by skilled local moderators. The contents of FGDs were tape-recorded with participants' verbal agreement, transcribed, and analyzed through coding of consistent themes and key words or phrases.

3.4 DATA ANALYSIS

Data obtained through the survey were analyzed using SPSS for Windows (version 11.0). There are 72 occupational groups in the Ghanaian MOH personnel system.[74] To enable data to be appropriately analyzed, first all the 72 occupational groups were categorized into four groups: (1) health technical staff; (2) administrative staff; (3) non-health technical staff; and (4) support staff. Second, health technical staff were further categorized into 17 sub-groups for the purpose of analyzing variation of CPE opportunities among medical and paramedical groups (Table 2).

To identify the significant determinants of frequencies of CPE opportunities, Poisson mixed model was applied as a multivariate analysis by employing $C_{2.42}$ as the dependent variable and eight background variables as the independent variables. This is because a mixed model is more appropriate than simple multiple regression when the independent variables form clusters of health workers.[75,76] With regard to the health workers working at a specific health facility, the same data were applied to the distance to regional capital, type of duty station, and the number of staff at the duty station, regardless of individual-specific data such as gender, professional working experience, age, type of occupational group, and rank of post. Therefore, these three background variables (distance to regional capital, type of duty station, and number of staff at the duty station) play a role as clusters. For Poisson mixed model analysis, SAS (version 8.5) was used.

3.5 CONSTRUCTION AND APPLICATION OF AN INDEX

Since it is anticipated that a number of factors regulate access to CPE, an index should be comprised of several component indicators. To identify appropriate component indicators and to determine the variable weights for each indicator, earlier studies were reviewed. Then, a formula for the index was modeled and constructed.

The number of past studies on access to CPE is extremely limited and the majority of them were those in developed countries such as the United States and Japan. Therefore, a part of the data, which were colleted through a survey and FGDs in Ghana conducted for this study, was included in data sources for identifying component indicators and weighing them. To test the validity of the proposed index, this study also furthermore attempts to apply the model to the situation in Ghana.

4. LIMITATIONS OF THE STUDY

First, there should be limitations in the validity and generalizability of the results of the study because only three of 10 regions were selected by convenience sampling. Though census was employed as a sampling method in the selected regions, the different findings might have been identified if the survey had been conducted nationwide.

Second, the results of the FGDs may contain some bias, because medical doctors and directors who play a core role in health service delivery were not included in participants in them. In this study, the contents of FGDs were dependent on the perceptions of paramedical, administrative, and support staff. Directors and medical doctors might have presented different views.

Third, this study has limitations in ensuring reliability of information gathered through both questionnaire forms. The participating health workers were given the options on whether they would fill their staff identification numbers in 'Form A'.[iii] The duty station managers were required to give the names of the health facilities in 'Form B'. This approach may have deterred health workers from presenting real information and frank views.

[iii] The Ghanaian MOH expressed their strong interest in identifying the health workers in 'Form A' for the purpose of possible registration of the past CPE participation results in the MOH human resource database. The participating health workers were adequately informed that the MOH agreed not to use the information from 'Form A' for staff performance assessment process.

5. RESULTS

5.1 QUANTITIES AND DISTRIBUTION OF CPE OPPORTUNITIES

The characteristics of individual respondents in the survey are presented in Table 2. Female health workers accounted for 62.7%. Professional working experience in the MOH measured as the number of years of servicing was nearly in normal distribution, and 43.1% of respondents had 10-19 years professional working experience. Only 12.7% were either directors or senior officers. Half of respondents were health technical staff and 20% were administrative staff. Nurses accounted for the largest proportion in health technical staff, equivalent to 17.6% of the total. The duty stations of 63.5% of the respondents were located in the districts within 100 km of the regional capital, where the majority of CPE programs were held.

5.1.1 Demand-supply relation in CPE opportunities

Figure 3 shows the demand-supply relation in CPE opportunities. In this study, CPE demand was defined as self-assessed frequencies of CPE opportunities perceived as necessary to maintain and improve quality of services, but which do not cause significant shortcomings in the functions of the duty station. CPE supply was defined as the number of times respondents participated in CPE programs (C). To enable the results to be compared with the target adopted in the ISTP, the mean values of both demand and supply collected in the survey were plotted after converting them into a three-year-interval scale (e.g. C_3 as CPE supply), as to each occupational group, rank of post in MOH personnel system, and type of duty station.

Regardless of types of occupational group, rank, and duty station, health workers expressed their willingness to have CPE opportunities nearly three times in three years (i.e. once every year) with a low deviation (mean = 2.77, SD = 0.13) (Figure 3). Conversely, the supply of CPE opportunities (mean = 1.75) was under-delivered compared to demand and was more widely distributed (SD = 1.38). In contrast, directors had 6.57 times as many of CPE opportunities in three years, while they were willing to be trained 2.95 times. A similar oversupply of CPE opportunities was detected in several health technical occupational groups: i.e. medical assistant, medical doctor, leprosy control officer, and nutritionist (Figure 3). The larger mean of CPE opportunities is in accordance with types of occupational group, rank, and duty station, the larger standard deviation of them becomes (Figure 4). This is because a larger value of mean is attributable to more widely varied data compared with those with smaller mean values.

Note that aggregated supply of CPE opportunities among total health workers (1.38 times in three-years) was slightly higher than the target figure in the ISTP (1.00 times in three-years), although it did not reach the demand level (2.77 times in three-years). In other words, 9233 person-CPE-opportunities were available for 6696 health workers in the three-year-interval scale. This indicates that the total quantities of CPE opportunities MOH delivered were equivalent to 138% of those necessary for achieving the target in the ISTP.

5.1.2 Distribution of CPE opportunities

Since the needs for CPE opportunities in different occupational groups vary, the value of one-time participation in a CPE program should also vary. Thus, it is inappropriate to discuss the distribution of CPE opportunities among a variety of occupational groups crudely without adjustment. Generally,

health workers are aware of how frequently they need CPE and to what degree they can spare time for it in their responsibilities.[77] Therefore, the values of $C_{2.42}$ were standardized in terms of occupational group in the following manner. First, occupational-group-specific necessary frequencies of CPE opportunities (f_i: occupational group= i) were calculated based on health workers' self-assessment. Second, dividing the aggregated necessary frequencies of CPE opportunities (the numerator in the following equation) by f_i, a standardization coefficient α_i was calculated for each occupational group:

$$\alpha_i = \frac{\sum_{i=1}^{20} f_i \cdot N_i \Big/ \sum_{i=1}^{20} N_i}{f_i} \quad \text{(where, } N_i \text{: number of health workers of occupational group } i \text{)} \tag{1.1}$$

Finally, the standardized number of times of participation in CPE programs during 2.42 years period $\hat{C}_{2.42}$ was calculated for each case, multiplying its crude value $C_{2.42}$ by α_i.[iv]

Figure 5 shows the extent to which the CPE opportunities were equally distributed after standardization, applying the Lorenz curve. When the curve is close to the 45° line, the distribution of CPE opportunities is more equal. The least frequently trained 50.7% of the total health workers, described as the intersection of the horizontal axis, accounted for 0% of share of total CPE opportunities. In other words, 49.3% of health workers monopolized all the CPE opportunities offered to health workers. In particular, the share of the most frequently trained 10% is comparable to 43.6% of total CPE opportunities and mean of $\hat{C}_{2.42}$ was 5.13. Note that, as the extreme cases, five health workers had more than 14 standardized CPE opportunities during the period, at pace equivalent to once per two months. The Lorenz curve for health technical staff is closer to the 45° line of perfect equality, indicating that the level of inequality of CPE opportunity distribution is milder than the total health workers. Lorenz curves provide a clean and visual image of the overall distribution. However, when

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[iv] For example, the value of one time of CPE participation by health technical staff ($\alpha = 0.956$) is equivalent to that of 0.956 times of all health workers (Table 1).

two Lorenz curves cross, it is difficult to compare which of the two indicates more equal distribution.[78] On such an occasion, Gini coefficient γ is useful to compare the levels of equal distributions.[v] The value of γ is between zero (perfectly equal) and one (perfectly unequal). Gini coefficients were calculated for each Lorenz curve. Since the Gini coefficient for administrative staff (γ =0.68) was higher than that for the total health workers (γ =0.66), CPE opportunities were more unequally distributed among administrative staff. A survey in Eritrea follows a similar trend.[69]

The results of the survey revealed that 42.4% of hospitals appointed their staff as training coordinators who is responsible for coordinating in-house on-the-job-training (OJT) within health facilities. However, other types of duty station with less number of staff rarely such have training coordinators (8.3% of health centers; 6.5% of clinic; 6.0% of maternity home).

5.1.3 Determinants of CPE opportunities

Poisson mixed model was applied, as the multivariate analysis, by employing $\widehat{C}_{2.42}$ as the dependent variable and the eight background variables as the independent variables. Dummy variables were created for the categorical variables: i.e. gender; type of occupational group; rank of post in MOH personnel system; and type of duty station.

The results of Poisson mixed model are presented in Table 3. Of all the independent variables, significant estimates of regression coefficient ($p < 0.01$) were identified for gender, type of occupational group, rank of post, type of duty station. All the other independent variables did not

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[v] Gini coefficient (γ) is defined as: $\gamma = \frac{1}{\mu N(N-1)} \sum_{i>j} \sum_{j} |x_i - x_j|$ (where, μ : mean, N: number of individuals, x: measured value of each individual). A value of Gini coefficient (γ) is equivalent to double the area between the Lorenz curve and the 45° line of perfect equality (see Figure 4).

produce significant estimates of regression coefficient.

Male health workers produced a significantly ($p < 0.0001$) but slightly positive estimate of regression coefficient, implying males enjoyed slightly (1.13 times) more CPE opportunities than females. Type of occupational group may be a strong predictor of CPE opportunities because 15 of 19 dummy variables for it resulted in significant estimates of regression coefficient ($p < 0.0001$) compared with support staff. For instance, the categories of medical assistant and medical doctor, in particular, enjoyed extremely more frequent CPE opportunities (respectively 7.83 times and 6.28 times more). Type of rank of post also may be a strong predictor because it produced significantly positive estimates of regression coefficients ($p <0.0001$) for both director and senior staff. Of five dummy variables for type of duty station, only one (health center) produced a significant estimate of regression coefficient ($p <0.0001$). This implies that whether a duty station is health center could be the only type-of-duty-station-specific determinant.

5.1.4 Focus group discussions

In all the FGDs, the participants stated that they were willing to have more CPE opportunities to improve the quality of services they were currently practicing. Some stated that they had uncertainties in coping with cases due to lack of opportunities to confirm whether they were practicing in the right way.

Participant: '*Since I started working as a medical assistant six years ago, I never had even single training opportunity... I sometimes feel unconfident about what I do for my patients. I am the only medical assistant at my health center...so, in reality, I have no colleague with whom I exchange views about whether I am doing right things...*'

The participants with more responsibilities and duties stated that they needed more CPE opportunities to more efficiently cope with substantial daily workloads.

Participant: '*In my clinic, a post for junior pharmacist has been vacant for years, so I have to take over that responsibility too. But I am not pharmacist but nurse! So, my training needs are serious and tremendous to cope with dual assignments.*'

According to the participants, they were concerned about creating difficulties in keeping duty stations functioning when they were absent and about inconveniences to colleagues and local populations in the catchment areas when participating in CPE programs. The perception sometimes made them hesitant to participate in CPE programs. Some participants agreed to proactively shared what was learned with their colleagues at the duty stations as soon as they participated in a CPE program.

Participant 1: '*When I participated in training last year, two colleagues of mine a little reluctantly took over my responsibility during my absent. I did not do anything wrong. I just participated in training in Ho* (Volta regional capital)....*but felt guilty a bit. The relationship with them has not been very good since that time. My husband supported me by doing household duties when I was away for training but...*'

Participant 2: *'In our health center, we always try to share what we learned, with the colleagues who did not participate in training programs. I believe that helps us not only disseminate what was learned but also maintain good human relationship in the workplace by reducing colleagues' jealousy.* '

Participant 3: *'Once, I had to temporarily close the clinic for a few days when I participated in training. This was because I was the only health worker there at that time. Some villagers blamed me for closing the clinic for the purpose of participating in training. It was a bitter experience I would never forget.*'

The participants agreed that the notification of CPE participant recruitment did not require the specific gender qualification of CPE participants. The majority of participants in each FGD stated that the way of selecting participants in CPE programs was largely dependent on the decisions made by duty station managers. They shared the common impression that staff members with better performance tended to be nominated as CPE participants. It was agreed among the participants that information concerning forthcoming CPE program should be delivered to their duty station every month or every two months.

Participant 1: *'Our manager keeps us informed that he selects the better-performing staff as participants in training programs. As a result, the specific staff have repeatedly participated in training as far as I observe.'*

Participant 2: *'In my health center, better-performing staff are selected in principle as well... but, once in a while, the manager selects participants on a rotational basis or from voluntary applicants who have seen the notification letter of CPE programs on the bulletin board.'*

Participant 3: *'In my previous workplace, the manager used to nominate participants in training on a more impromptu basis and sometimes repeatedly assigned the same staff members. So,I was a little surprised to hear that I was nominated in my current workpalce as a participant in training due to good daily performance.'*

5.2 CONSTRUCTION AND APPLICATION OF AN INDEX

Today, a great number of indicators are widely used.[79-81] Indices are a statistical concept, an indirect way of measuring a given quantity or state, effectively providing a measure which allows for comparison over time. Key issues which have to be addressed in the construction of any indices

include selection of components and formula.[58] Construction of an index of access to CPE among health workers were undertaken by selecting six component indicators through the literature review as follows.

5.2.1 Conceptual Framework

The continuing professional education access index (CEAI) is proposed by following the technique used for construction of the Human Development Indicator (HDI)[60] and the Water Poverty Index (WPI).[56] An index is defined as a generalized mean $X(\alpha)$ (≥ 0) with the weights of w_i (> 0) for N components i ($= 1,2,3,\cdots,N$):

$$(2.1) \qquad X(\alpha)=\left(\frac{\sum_{i=1}^{N} w_i X_i^{\alpha}}{\sum_{i=1}^{N} w_i}\right)^{1/\alpha} = \left(\frac{w_1 X_1^{\alpha} + w_2 X_2^{\alpha} + \cdots + w_N X_N^{\alpha}}{w_1 + w_2 + \cdots + w_N}\right)^{1/\alpha}$$

In the CEAI, six components were employed ($N = 6$): (i) X_1: availability; (ii) X_2: distribution; (iii) X_3: informational access; (iv) X_4: geographical access; (v) X_5: economic access; (vi) X_6: preparedness to release staff. These components were selected from those which represent the policies and environment that ensure and influence CPE opportunities based on the results of literature review. The mean of order 1 ($\alpha = 1$) is the simple weighted arithmetic mean from X_1 through to X_6. The weights of w_i were determined using rank-based-points according to the levels of importance of each components. Three studies in the United States compared the major factors including those employed as component for the CEAI (Table 4). Six points were assigned to the component reported as the most important one of the six in the results of the respective studies. Accordingly, one point was given to the component reported as the least important one of the six. Then, the mean values of the points were calculated for

each component as variable weights: $w_1 = 5.4$; $w_2 = 2.6$; $w_3 = 3.0$; $w_4 = 2.8$; $w_5 = 4.2$; $w_1 = 3.6$ (Table 4).

Therefore, Eq. (2.1) will be:

$$(2.2) \qquad CEAI = \left(\frac{\sum_{i=1}^{6} w_i X_i}{\sum_{i=1}^{6} w_i} \right)$$

$$= \left(\frac{w_1 X_1 + w_2 X_2 + w_3 X_3 + w_4 X_4 + w_5 X_5 + w_6 X_6}{w_1 + w_2 + w_3 + w_4 + w_5 + w_6} \right)$$

$$= \left(\frac{5.4 X_1 + 2.6 X_2 + 3.0 X_3 + 2.8 X_4 + 4.2 X_5 + 3.6 X_6}{5.4 + 2.6 + 3.0 + 2.8 + 4.2 + 3.6} \right)$$

$$= \frac{1}{21.6} \left(5.4 X_1 + 2.6 X_2 + 3.0 X_3 + 2.8 X_4 + 4.2 X_5 + 3.6 X_6 \right)$$

The respective component indicators ($X_1, X_2, X_3, \cdots, X_6$) are defined as follows:

5.2.2 Availability of CPE

Availability of CPE is an essential precondition for access to CPE among health workers. The earlier studies in Japan reported that CPE opportunities were insufficient due to lack of available programs.[82,83] A study among nurses in the United States revealed that '*readily available programs*' were the most facilitating factor in accessing and gaining CPE.[84] Since the budget for CPE is generally vulnerable to being cut,[15] scarce and unstable budgeting for CPE[85,86] affects sustainable availability of CPE. Thus, the level of availability and sustainability of CPE is one of the components that characterize access to CPE. The most precise way of measuring availability is the proportion of total number of person-days covered by CPE per year to total number of health workers. However, the number of days for a CPE program varies by type or program subject. Therefore, total number of person-CPE-opportunities is more appropriate:

$$(3.1) \qquad A = \frac{\text{Total number of person - CPE - opportunities available per year}}{\text{Total number of health workers}}$$

The technique used for construction of the HDI[60] and the WPI[56] was adopted to produce relative availability of CPE ($0 \leq X_1 \leq 1$) as follows:

$$(3.2) \qquad X_1 = \frac{A - A_{\min}}{A_{\max} - A_{\min}} \qquad (0 \leq X_1 \leq 1) \qquad \begin{cases} X_1 = 1: \text{ Most sufficiently available} \\ X_1 = 0: \text{ Least sufficiently available} \end{cases}$$

A study in South Africa employed, as a cutoff point, health workers' participation in CPE programs in 12 months.[87] Also, the results of the survey for this study revealed that the majority (87%) of health workers need a CPE opportunity per year and all the others expressed less frequent CPE needs. Mean of frequencies of CPE opportunity needs among the health workers was 0.92 CPE opportunities per year (SD = 0.22). Therefore, a CPE opportunity per annum was employed as the maximum value for A ($A_{\max} = 1$). Since 206 health workers (3.1%) participating in the survey for this study did not recognized CPE needs, zero time CPE opportunity per annum was employed as the minimum value ($A_{\min} = 0$):

$$(3.3) \qquad X_1 = \frac{A - A_{\min}}{A_{\max} - A_{\min}} = \frac{A - 0}{1 - 0} = A$$

5.2.3 Distribution of CPE

How CPE opportunities are distributed among health workers depends on employers' or CPE providers' policy including arbitrary selection of participants. Under the employer-driven CPE scheme, specific groups sometimes need to be given more CPE opportunities (e.g. managerial staff under the health reform) than the others. A study in Eritrea and the survey for this study in Ghana illustrated how

CPE opportunities were unequally distributed (Figure 5).[69] Thus, the way in which CPE opportunities are distributed importantly regulates access to CPE among health workers. Being defined as follows, Gini coefficient (γ), a well-known indicator originally developed for assessing the distribution of household incomes,[78] was applied to measure the level of equality in CPE opportunity distribution:

$$(4.1) \qquad \gamma = \frac{1}{\mu N(N-1)} \sum_{i>j} \sum_{j} |x_i - x_j| \qquad 0 \le \gamma \le 1 \qquad \begin{cases} \gamma = 1 : \text{Perfect unequal distribution} \\ \gamma = 0 : \text{Perfect equal distribution} \end{cases}$$

Where, μ : mean, N: number of cases, x: measured value of each case

A greater value of Gini coefficient stands for more unequal distribution. Therefore, applying Gini coefficient, distribution of CPE (X_2) was defined as:

$$(4.2) \qquad X_2 = 1 - \gamma = 1 - \frac{1}{\mu N(N-1)} \sum_{i>j} \sum_{j} |x_i - x_j|$$

$$(0 \le X_2 \le 1) \qquad \begin{cases} X_2 = 1 : \textit{Perfect equal CPE distribution} \\ X_2 = 0 : \textit{Perfect unequal CPE distribution} \end{cases}$$

5.2.4 Informational access to CPE

Unless the information concerning scheduled CPE programs is delivered to health facilities or health workers in appropriate timing, they are physically unable to be aware of the programs and to apply for them. In developed countries, physicians and dentists generally can be easily reached with updated mailing lists by CPE providers compared with other occupational groups.[88] On the other hand, nurses, for example in the United States, considered the lack of information concerning CPE programs to be a deterring factor in accessing and gaining CPE.[84] To transmit the message to the appropriate target

groups, CPE providers should use a series of well-defined marketing strategies to promote and communicate the value of the program being planned.[88] When being funded as staff development by the governments, target groups can be identified through internal administrative channels such as personnel database. The information necessary to be disseminated should include: topic; date; location; qualification for participation; and tuition fee. There are a number of ways in which the information is delivered to health workers, e.g. internet, e-mail, post mail, journal advertisement, bulletin board at duty stations, and suggestion from supervisors and employers. In many developed countries, information concerning programs being planned within the countries is available through internet,[89] while it is not in most developing countries. The most critical step of information delivery that can be applied commonly to both developing and developed countries is whether information has been transmitted to health workers' duty stations. Therefore, following the technique for relative availability of CPE, informational access to CPE (X_3) is defined as:

$$(5.1) \qquad X_3 = \frac{I - I_{\min}}{I_{\max} - I_{\min}} \qquad (0 \le X_3 \le 1) \qquad \begin{cases} X_3 = 1 : \textit{The most frequently informed} \\ X_3 = 0 : \textit{The least frequently informed} \end{cases}$$

Where, I: *Number of times that health facilities are informed of forthcoming CPE programs for their staff in a year*

The results of the FGDs revealed that delivering information concerning forthcoming CPE program to their duty station every month or every two months is frequent enough to draw the health workers' attention. Therefore, 12 and zero times of information delivery in right timing per annum were employed respectively as the maximum ($I_{\max} = 12$) and minimum ($I_{\min} = 0$) values for I:

$$(5.2) \qquad X_3 = \frac{I - I_{\min}}{I_{\max} - I_{\min}} = \frac{I - 0}{12 - 0} = \frac{I}{12}$$

5.2.5 Geographical access to CPE

The nearer the location of the venue of a CPE program is, the fewer difficulties in participating in it health workers have. Geographical access to CPE is an important factor that characterizes costing time and money on traveling to the venue.[88,90] For this reason, location of duty station was one of the determinants of CPE opportunities in the study in Eritrea[69] and in the United State.[84,91] Some studies reported that the effects of distance-CPE-programs using broadcast or internet are comparable to those of traditional classroom-based CPE.[92,93] However, those CPE modes are available predominantly for health workers practicing in rural areas of developed countries and their effects are not thoroughly discussed but include several questionable aspects.[94] Therefore, the distance between duty stations and the major cities, where most CPE programs take place, is an appropriate way of measuring geographical access. However, the precise distance on the road network is not available in some countries. In such an occasion, distance from the nearest village, town or city to one major city, where CPE programs are often implemented (e.g. provincial capital or national capital), should be replaced. Given that longer distance to venues of CPE programs reduces access, geographical access to CPE (X_4) is calculated as follows by using a relative distance based on the technique for availability of CPE:

$$(6.1) \qquad X_4 = 1 - \frac{D - D_{\min}}{D_{\max} - D_{\min}} \quad (0 \le X_4 \le 1) \qquad \begin{cases} X_4 = 1: \text{The most geographically accessible} \\ X_4 = 0: \text{The least geographically accessible} \end{cases}$$

Where, D: *Distance from duty stations to a major city where CPE programs are implemented* (≅ *Distance in national and regional road network from the district capitals of the duty stations to the regional capitals*)

Adelson reported that the location of CPE programs preferably should be within '*driving distance*' in the United States.[88] However, the use of private vehicles as transport means is not uniformly applicable to other countries. In the United States, where private vehicles are one of the major transport means for commutation, business, and leisure, the number of vehicles per 1000 people is the greatest (= 765) in the

world (world average = 122). On the other hand, that in Ghana (= 8) is lower than Sub-Sahara Africa average (= 23), and even low-income countries (= 12).[95] Moreover, only 3.0% of households in Ghana, most probably the better off, possess private vehicle(s).[66] The level of punctuality and reliability of public transport in Ghana is not comparable to those in developed countries. Given these situations, a unified maximum distance (D_{max}) applicable globally was unable to be determined. Therefore, 368 km, which was the maximum value in the survey for this study, was provisionally employed, a maximum value detected in the survey for this study, as a value of D_{max}:

$$(6.2) \qquad X_4 = 1 - \frac{D - D_{min}}{D_{max} - D_{min}} = 1 - \frac{D - 0}{368 - 0} = 1 - \frac{D}{368}$$

5.2.6 Economic access to CPE

Who will pay for or share costs for participation in a CPE program importantly regulates access to CPE among health workers. Even though a program is scheduled in convenient location and time, it would not be accessible if the tuition is either extremely high or non-reimbursable. For instance, a study in the United States found that the amount of tuition the third most important factors for deciding to apply for programs among physicians and nurses in 1980.[88,96] Another recent study in the country in 1999 reported that tuition cost was the most deterring factor and that tuition reimbursement was the forth most facilitating factor in CPE.[84] This implies that who covers the tuition cost remains critical at least for two decades in the United States. A study in Japan targeting public health nurses reported that the tuition cost for CPE programs attended by only 57.8% of participants in the past five years were covered by their employers. The ways of sharing tuition cost varies from full reimbursement and partial reimbursement (primarily by employers) to full payment by participants.[97]

In developing countries where private commercial sector seldom provides CPE programs, the participants are generally paid per diem and accommodation costs, primarily by the governments. When being funded by development agencies, the amount of payment becomes extraordinarily substantial. In Mozambique, one development agency paid the equivalent of 18 months' salary to health professionals participating in a three-week provincial workshop. In Togo, four development agencies gave the participants in CPE program payment for subsistence support.[98] In those countries, there is an emerging risk that CPE is considered to be a tool for extra income opportunity.[15] Thus, the variation of economic access is significant. For enabling us to make even international comparison in the future, economic access to CPE (X_5) is defined as the mean of reimbursement ratio of total tuition cost:

$$(7.1) \qquad X_5 = \frac{1}{100N}\sum_{i=1}^{N} R_i \quad (0 \le X_5 \le 1) \quad \begin{cases} X_5 = 1: \textit{ Fully reimbursed or paid by employers} \\ X_5 = 0: \textit{ Fully paid by participant} \end{cases}$$

Where, R_i: *Percentage of the amount reimbursed or paid by the employer out of total tuition of a program in which a health worker participated (%)*
N: Number of health workers who participated in program(s)

5.2.7 Preparedness to release the staff

Health workers' participation in CPE is not necessarily recognized as a part of their duties by their employers. A study in the United States reported that 48% of nurses believed that to release them to participation without taking vacation is a facilitating factor to access to CPE.[84] Also, Bowman and O'Donnell reported that participation in CPE in working hours was one of the major influencing factors to decision on CPE participation among health workers.[91] Thus, the extent to which employers release their staff for the purpose of sending them to a CPE program is an essential component that determines the level of access to CPE. Therefore, the level of preparedness of release the staff at health facilities was defined as follows:

$$(8.1)\quad P = \frac{\text{Maximum number of staff who are released at a time to CPE with a health facility functioning}}{\text{Total number of health workers in a health facility}}$$

$$(8.2)\quad X_6 = \frac{P - P_{\min}}{P_{\max} - P_{\min}} \qquad (0 \le X_6 \le 1) \qquad \begin{cases} X_6 = 1: \textit{Most prepared to release staff} \\ X_6 = 0: \textit{Least prepared to release staff} \end{cases}$$

When P = 1, a health facility will not be functioning during the CPE period because all the staff participate in CPE and there will be no staff. At a glance, this extreme situation does not seem to be observed in reality. However, at an small-scale health facility with only one staff such as a clinic in rural areas of developing countries, for him or her to participate in CPE, health facility need either to have tentatively replaced health worker from the nearest health facility or to be temporarily closed and request local populations of the catchment areas to refer to the other nearer health facilities. Under these conditions, P = 1 possibly occurs. Therefore, one and zero were respectively employed as the maximum ($P_{\max} = 1$) and minimum ($P_{\min} = 0$) values for P:

$$(8.3)\quad X_3 = \frac{P - P_{\min}}{P_{\max} - P_{\min}} = \frac{P - 0}{1 - 0} = P$$

5.2.8 Application of the CEAI to the Ghana case

First, the respective component indicators defined above were calculated. Second, the CEAI values were calculated by applying Eq (3.2). It was anticipated that, in three of six component indicators (informational access (X_1), geographical access (X_2), preparedness to release staff to CPE (X_6)), the same values are applied to all health workers working at the same duty station. Therefore, the CEAI was calculated according to region and type of duty station (Table 5). Figure 6 and Figure 7 illustrated the crude values of component indicators prior weighing in hexagram. In Ghana, health workers in public sector are paid tuition, per diem, and the cost for transport and accommodation when

participating in any type of CPE program. Therefore, the values for economic access to CPE (X_5) were 1.0.

The shapes of hexagrams were varied according to type of duty station. Also, the values of the CEAI vary from 0.447 in training/research institute to 0.609 in clinic. On the other hand, regional comparison demonstrated that the shapes of the hexagrams of three regions were similar in hexagrams. However, Brong-Ahafo region produced higher value of CEAI (= 0.573) than the other two region by presenting the highest values in four of six component indicators: (i) availability (X_1); (ii) distribution (X_2); (iii) geographical access (X_4); and preparedness to release staff (X_6).

Figure 8 demonstrates the relationship between the CEAI values as the environmental factor and the standardized number of CPE opportunities as the resultant status. A simple linear regression between the CEAI values and the standardized number of CPE opportunities per health worker per annum $\widehat{C}_1$ produced a significant linear relationship ($y = 2.893x - 1.107$, $df = 9$) and an extremely high level of conformity in the model ($R^2 = 0.960$).

6. DISCUSSION

6.1 QUANTITIES AND DISTRIBUTION OF CPE OPPORTUNITIES

6.1.1 Distribution of CPE opportunities and the feasibility of the MOH's target

It was confirmed that the overall quantities of CPE opportunities are enough to ensure the feasibility of the MOH target: one CPE opportunity every three years for each health worker.[64,65] However, drastic change is necessary in the way that opportunities are distributed. Even after standardization according to type of occupational group, considerable inequality was confirmed in the distribution of CPE opportunities.

Moreover, a Poisson mixed model demonstrated that type of occupational group was still a strong predictor even though standardization was undertaken according to type of occupational group. These findings imply that CPE opportunities have an excessively unequal distribution as to type of occupational group. This supports the results of the study in Eritrea. However, the types of occupational group with more CPE opportunities are different between that study and ours. The study in Eritrea demonstrated that radiographers and pharmacists were higher in terms of the proportion of respondents who participated in CPE,[69] while those occupational groups were provided with less frequent CPE opportunities compared with the total health workers in this study (Table 2). This might be attributable to the possible difference between Eritrea and Ghana in MOH's human resources development policy and/or development agencies' interests. One of the missions of health services in public sector is to deliver homogeneously appropriate quality of services to local populations.[48] From this viewpoint, it is indispensable to ensure a more equal distribution of CPE opportunities to comprehensively upgrade health workers' knowledge and skills.

One way to achieve a more equal distribution is for one CPE opportunity to be uniformly offered every three years to each health worker as the MOH suggested in the ISTP. This could be the standard policy and almost a slogan because the simple criterion will enable health workers to remember and provide an encouragement to participate in CPE programs in more proactive manner. It would also simplify the process of monitoring the progress of CPE coverage in the MOH. Another alternative is that specific occupational groups might be prioritized for CPE opportunities. The most reasonable way to do this would be according to occupational group. Because the frequency of CPE opportunities necessary for daily practice naturally varies among occupational groups due to differences in the frequency and pace of development of new technologies, knowledge, and skills specific to those groups. The variation among the values of standardization coefficients α_i is relatively small: the rate of the highest (1.122 for mortuary officer) against the lowest (0.924 for health educator) is only 1.214 (=1.122/0.9424). Nevertheless, the values of α_i in this study are worth considering as a tool for weighing when prioritizing specific occupational groups.

In addition to the frequency of CPE opportunities, the workload that allows health workers to participate in CPE programs differs according to occupational group.[45] As the results of the FGDs indicate, the heavier health workers' workloads are, the more frequent CPE opportunities they probably need for coping with their substantial and complicated duties. This may imply that the small variation in α_i is attributable to a psychological conflict between willingness to have more CPE opportunities and to refrain from being out of duty stations owing to responsibilities for workloads. This supports the finding that health educators with the lowest α_i and mortuary officers with the highest α_i present very high and very low means in the number of times of participating in CPE programs, respectively (Table 2). Also, it coincides with the finding that directors with more responsibilities and dense workloads expressed their willingness to have less CPE opportunities than currently provided (Figure 3). The discrepancy between demand and supply among directors may suggest that the oversupply of CPE

opportunities is hindering their daily duties and the functions of their duty stations due to frequent absences while participating in CPE programs.

6.1.2 Measurement of CPE needs

Methods for assessing CPE needs involve complicated issues.[99] In this study, frequencies of CPE opportunities were measured using a self-administered questionnaire since this approach is a cornerstone for assessing CPE needs of health workers.[77,88,100,101] This is based on the assumption that health workers are, as professionals, aware of what they need to do their job through encountering difficulties and uncertainties in their daily practices. They know how frequently and how long they can be absent from their duty stations in the light of daily workloads. However, health workers tend to believe that they are close to the standard in performance. Yet, between where they are and where they ought to be, there could be a large disparity.[102] Therefore, the experienced third-party experts, who are neither health workers themselves nor their supervisors, could be the appropriate CPE needs assessors because they can objectively evaluate health workers' performance and identify weakness that the workers themselves may otherwise miss.[103,104] However, it should be carefully noted that CPE needs assessment by third party experts are expensive and time-consuming.

Also, specific CPE programs should be minimum requirements based not on health workers' spontaneous needs but on employers' political will. Examples include CPE programs concerning clinical countermeasures for emerging diseases and outbreaks of specific diseases, health system reform, and introduction of new health-related laws. However, resources such as budget and time for a CPE needs assessment are generally very limited, probably because participation in CPE programs carries no assurance that desired change in competence or performance will occur.[96,105] An earlier study reported the similar undesirable case in Ghana.[43]

6.1.3 Selection of CPE participants

Once the type of target occupational group is specified, the nomination of participants in CPE programs is largely dependent on duty station managers' decision. In the light of the level of inequality in distribution of CPE opportunities (Figure 5), there seems be some bias in the selection process and inappropriate assignments of participants. Some duty station managers made efforts to increase transparency by presenting notification letters of CPE programs on bulletin boards and encouraging internal competition for participation. However, that may accelerate the inequality in the distribution in CPE opportunities because only staff members with better performance records tend to be selected. Ad-hoc selection also might possibly exacerbate less equal distribution and would also reduce the level of transparency.

There is a risk that CPE could, in some cases, be considered an incentive, or reward for good performance. It would increase the discrepancy in level of knowledge and skills among health workers. Consequently, quality of services to be provided could vary from one health worker to another, thereby making it difficult to assure the quality of services of health facilities. It is reported that development agencies, major sources of CPE programs, tend to pay substantial per diems to participants.[106] In Mozambique, for example, one development agency paid the equivalent of 18 months' salary to health professionals participating in a three-week provincial workshop. In Togo, four development agencies gave the participants payment for subsistence support.[98] This study has limitations in confirming a similar situation in Ghana. However, that situation should be carefully prevented through reminding both health workers and development agencies of the original philosophy and concept of CPE. It is ironic that CPE with improvement of moral and work attitude as one of its objectives may create moral degradation among health workers.[15]

6.1.4 Access to CPE

Mean of frequencies of CPE opportunities among female health workers (1.21) was greater than that among male colleagues (0.97). Conversely, the estimate of regression coefficient for males (0.1254) was significantly and slightly positive ($p = 0.0011 < 0.01$), implying males enjoyed 1.13 times more CPE opportunities than females. This reverse results between univariate descriptive analysis and Poisson mixed model is probably attributable to greater standard deviation of frequencies of CPE opportunities among males (1.793) than that among females (1.724). Nevertheless, a gender disparity in frequencies of CPE opportunities is very subtle. Also, gender bias in CPE participant selection process was not detected in FGDs. Thus, gender is not necessarily a barrier for participating in CPE programs despite male dominance in the country.[107-111] Since the majority of health workers (91.7% in males, and 76.5% in females) were married, understanding and consideration of the female health workers' spouses and other household members indirectly contributed to gender-balanced distribution of CPE opportunities.

When undertaking Poisson mixed model, support staff with the fewest CEP opportunities (Table 3) and the largest sample size ($N = 1850$) was employed as a reference for dummy variables for occupational groups because it is generally recommended to choose a category with the largest sample.[112] For this reason, except for two occupational groups (radiographer and mortuary officer), all the other occupational groups presented positive estimates of regression coefficient compared to the reference. Of them, 15 dummy variables of occupational group produced significant estimates of regression coefficient. This indicates that type of occupational group is one of the key determinants of access to CPE. Many CPE programs specify the type(s) of occupational group as target trainees. However, World Health Organization (WHO) insisted that the advantages of training health workers from different occupational groups in a team, rather than in separate professional categories, be

considered.[113] Therefore, CPE planners must take into account what occupational groups are highlighted and could be integrated into a CPE target group. In this way, it would be possible for CPE planners to control access to CPE and to decrease the discrepancies of CPE opportunities based on type of occupational group.

Distance from duty station to regional capitals, where most CPE programs took place, did not produce a significant estimate of regression coefficient with frequency of CPE opportunities. Particularly in developing countries where communication and transport are generally less established, distance often hampers access to information on CPE and traveling to the venue of CPE programs. The proportion of paved of total roads in Ghana (30%) is higher than in Eritrea (22%) and Sub-Saharan Africa (22%). Similarly, the number of telephone mainlines per 1000 people in Ghana is greater than in Eritrea (7%) and comparable to in Sub-Saharan Africa (14%).[114] This supports the results that distance was not a significant determinant of access to CPE in Ghana but it was in Eritrea. Furthermore, the results might also imply that the information delivery system in the MOH functions well.

As discussed earlier, directors expressed willingness to have fewer CPE opportunities than actually offered (Figure 3). One of the reasons for this is probably a heavier workload than they used to have and than other ranks currently have. In Ghana, health sector reforms have been on-going since 1993. The key components of the reforms include the reorganization of the MOH and the decentralization of responsibilities and resources to the district level.[115,116] For this reason, the needs for management training for directors have been importantly recognized.[117] Subsequently, a number of training programs and seminars (as parts of CPE programs) have targeted managerial staff for years.[8] This situation probably made directors participate in a greater number of CPE programs.

A negative estimate of regression coefficient for number of staff was detected though it was not significant ($p = 0.0547$). This implies that CPE opportunities have been insufficiently offered to health

workers with greater numbers of colleagues even though those duty stations (e.g. hospitals) can afford to release more staff in a time without compromising their service functions. However, this study revealed that what has been learned are possibly further shared and disseminated within duty stations through in-house OJT in health facilities with the greater number of staff such as hospitals, having been promoted by training coordinators. This situation has been recognized as one of the positive impacts of CPE. [118-120] At health centers, clinics, and maternity homes frequently without training coordinators, staff are also assumed to share what have been learned in more informal and flexible way on daily basis because number of staff are less (mean of staff of number: 95.0 for hospital; 9.2 for health center; 4.7 for clinic; and 2.9 for maternity home). Yet, that is the activities on a voluntary basis but fully dependent on relationship among and good will of the staff at each duty station. Some health workers would not be willing to share what they learned to maintain it exclusively as their privileged knowledge and skills.

The results of this study imply that participation in a CPE program both directly and indirectly influences the quality of health services. Although the temporary absence of health workers could have a short-term impact on services, CPE benefits service users through the application of enhanced knowledge and skills. The level of availability of and access to CPE, thus, presents a potential improvement in the quality of services as well as the career development of health workers.

6.2 CONSTRUCTION AND APPLICATION OF AN INDEX

6.2.1 Translation of the CEAI values

Clinics produced the highest value of the CEAI of all the types of duty stations, primarily due to higher values of availability (X_1), distribution (X_2), and preparedness to release staff (X_6). In particular, availability factor (X_1), which produced the largest value for clinics, is emphasized compared with other

component indicators. This is because the largest weight, accounting for 25.0% ($=5.4/21.6\times100$), was assigned to availability (X_1) at the designing stage of the CEAI formula due to its highest level of importance in comparison with others based on the past studies (Eq 3.2). In preparedness to release staff (X_6), a higher value tends to be produced for duty stations with a fewer number of staff due to its definition such as clinics (Eq 9.3).

Note that hospitals with the highest informational access (X_2) produced the second lowest CEAI value, followed by training/research institutes. The health workers at hospitals were offered relatively less CPE opportunities in effect (0.333 times per health worker per annum) than health workers at other types of duty stations: e.g. 0.686 times per health worker per annum at clinics (Figure 8). This is primarily because hospitals have the greatest number of staff (mean = 90.5) of all types of duty stations. These findings also suggest the crucial needs for a systematic dissemination of what have been learned, within hospital through internally arranged CPE or in-house OJT, to those who did not participate in CPE.

6.2.2 Validation of the CEAI

This study demonstrated significantly high level of fittings of the CEAI values as the environmental factor into the number of actually offered CPE opportunities as its resultant status. Even though selecting and weighing of component indicators were undertaken based mainly on the limited number of the studies only in the United States, the application of the CEAI model to the case of Ghana resulted in production of the very high value of R^2 (=0.960) with statistical significance ($p = < 0.001$) in their simple linear regression. This may indicate that the validity of the CEAI model is ensured to the large extent. However, further examination of the CEAI model is necessary to assess the validity in more detail and improve the quality of the index by applying the cases of other countries to the model.

7. CONCLUSION AND RECCOMMENDATIONS

It was confirmed that CPE opportunities are of sufficient quantities in comparison with the MOH's target figure. Due to the possible regional variation, however, there are limitations in generalizing to the CPE situation nationwide. The MOH should be advised to undertake micro-planning for re-adjusting and achieving the MOH's target figure. Offering 1.00 CPE opportunity per three years equally to every health worker regardless of type of occupational group is likely to be less convincing. At least, the values of the standardization coefficient α_i proposed in this study should be considered when distributing CPE opportunities to respective occupational groups.

It is recommend that CPE opportunities be more equally distributed in a systematic manner in order to increase effectiveness and efficiency of limited resources available for CPE. WHO has recognized the importance of ensuring CPE opportunities among all the categories of health workers throughout their careers.[85] The budget allocated to the Human Resource Development Division responsible for CPE in Ghana, accounted for only 9.0% of MOH headquarters budget and 1.1% of the total MOH budget.[121] In developing countries like Ghana, the CPE budget is more vulnerable and dependent on external support such as from development agencies. Budget allocations are, therefore, fluid and out of beneficiary governments' control even though the CPE system enables governments to provide health workers (at least in the public sector) with CPE opportunities on a sustainable basis. Yet, the majority of the current CPE programs supported by donor agencies are short-noticed, supply-driven, ad-hoc based and poorly coordinated. That situation is creating heavier administrative burden and confusion in the Ghanaian MOH.[122] Therefore, it is essential to thoroughly review the roles and limitations of donor agencies as a development partner.

A simple linear regression between the CEAI and standardized number of CPE opportunities produced an extremely high conformity in the models. This indicates the proposed CEAI model is the valid to the large extent. This study demonstrated one attempt to quantify the access to CPE among health workers from various viewpoints. However, more efforts should be made in terms of construction and application of human resource-related indictors to improve or reconsider the CEAI.

Needless to say, CPE should not be the tool for generating extra income for health workers, but for improving the quality of health services. The health policy makers might have to be warned in terms of the possible risk of incentive-oriented reasons for participating in CPE (found in the other Sub-Sahara African countries).[15] Further study is necessary to deepen the discussion on health workers' perceptions and intentions with regard to CPE because the reasons for participation in CPE programs can influence the level of performance.[123]

Some health care executives admit that they do not believed that CPE is a primary strategic factor for improving organizational performance.[42,105] For this reason, there may be few CPE systems except those devoted primarily to renewing specialist licenses in developed countries.[124-131] Without more research, it will be difficult to judge to what extent further investment is necessary in CPE and to design CPE system. It should be, therefore, ardently suggested that CPE be further studied and be recognized more as an area of public health research.

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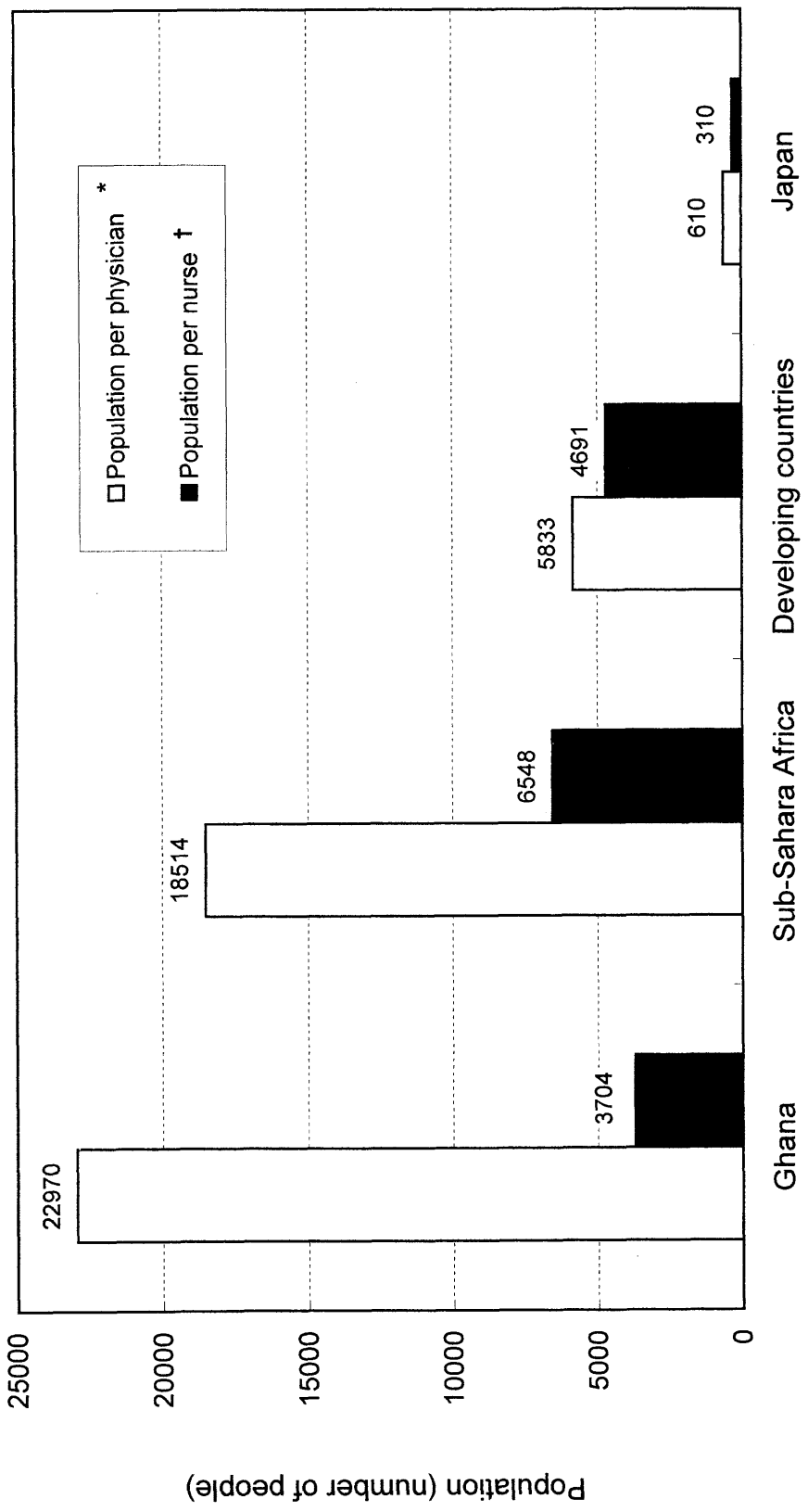


Figure 1 Population per physician and nurse in Ghana

Source * World Bank. *World Development Report 1997*. New York: Oxford University Press; 1997.[54]
† United Nations Development Programme (UNDP). *Human Development Report 1997*. New York: Oxford University Press; 1997.[60]

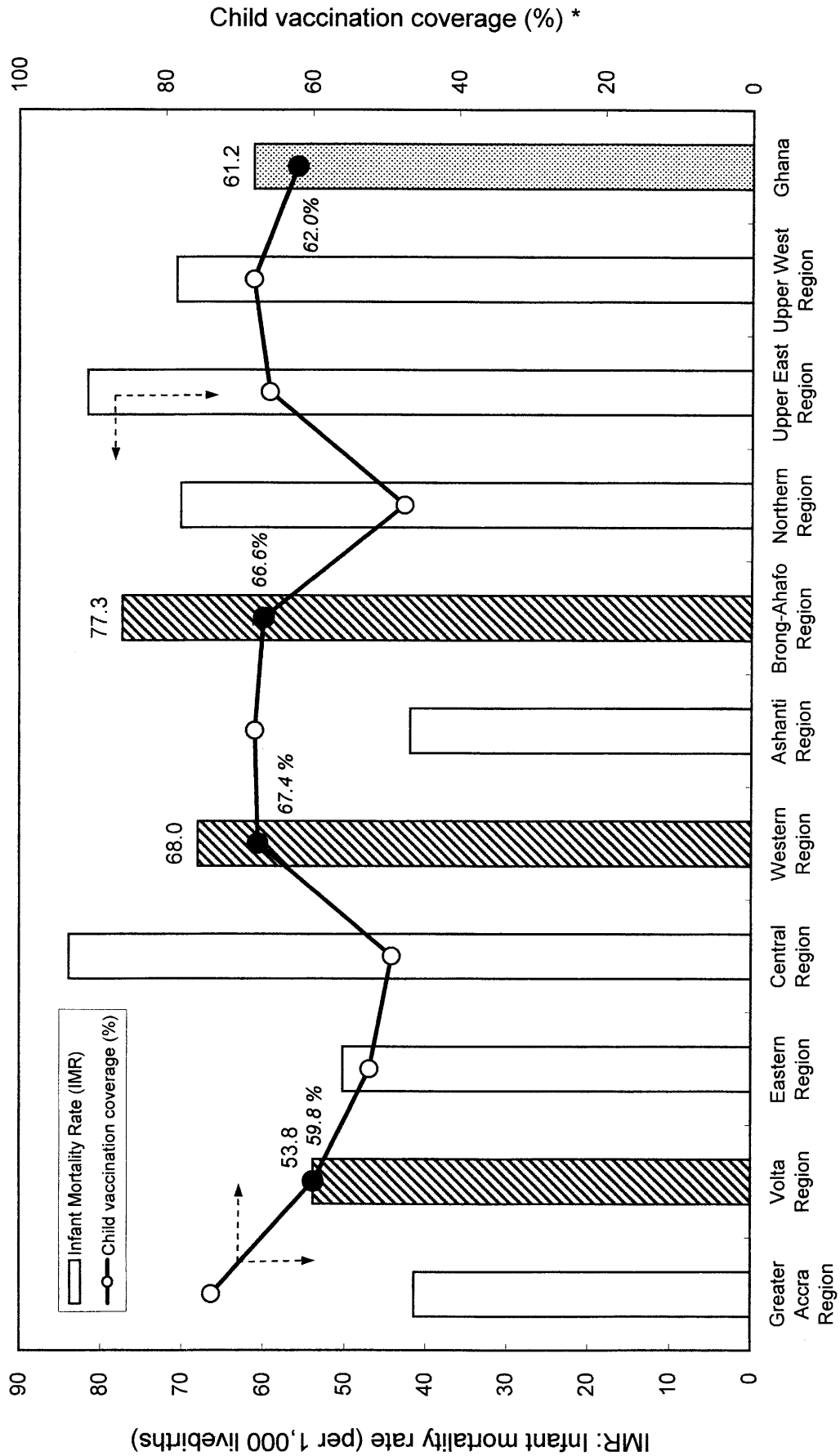
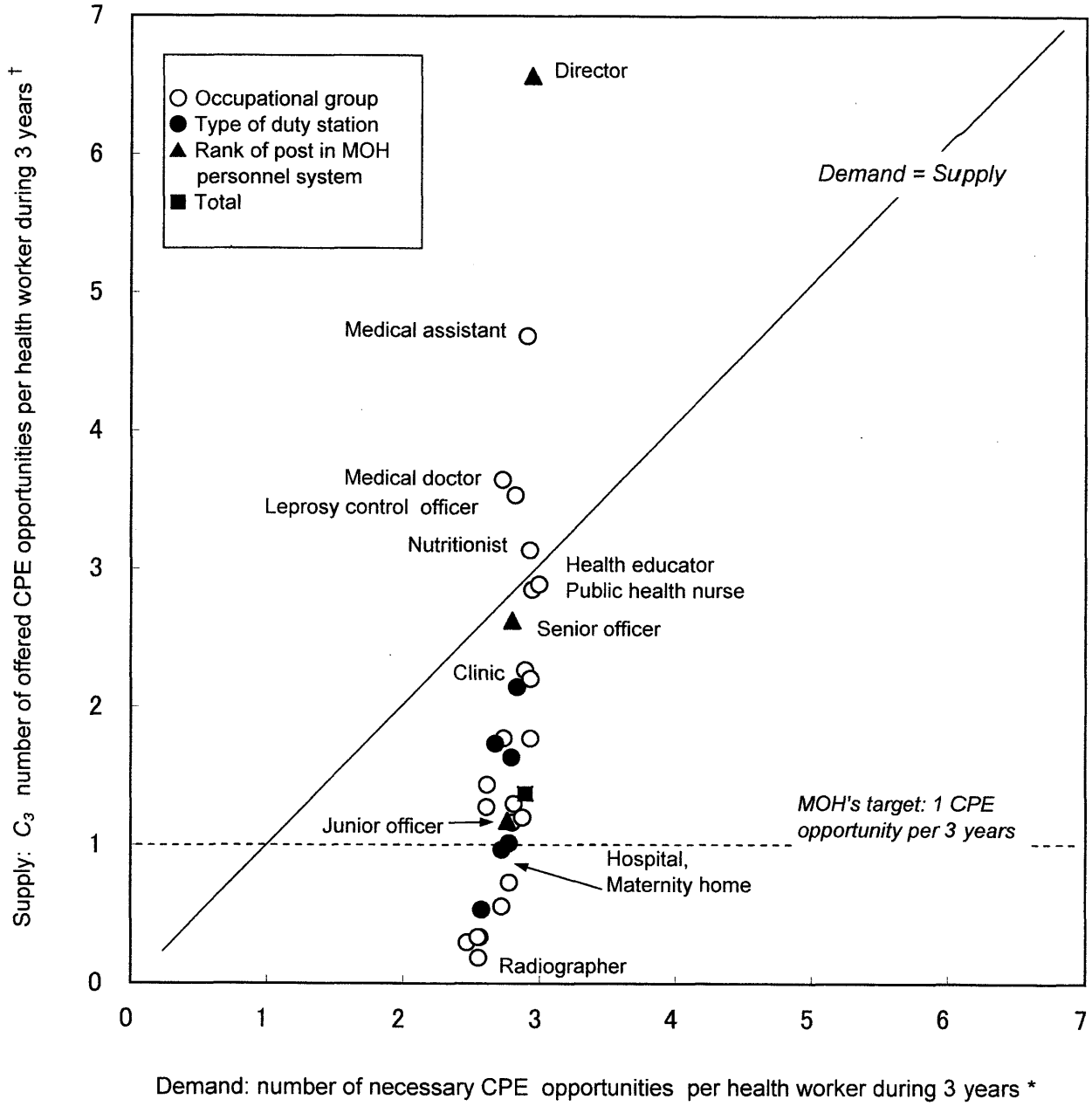


Figure 2 Infant mortality rate and child vaccination coverage in Ghana

Source Ghana Statistical Services (GSS), Macro International Inc. (MII). *Ghana Demographic and Health Survey 1998*. Calverton: MII; 1999. 85-104.[66]
Note * Children fully vaccinated (I.e., those who have received BCG, measles, three doses of DPT, and polio)



* Self-assessed number of times of CPE opportunities are converted into 3-year-interval scale.

† Offered CPE opportunities during 2.42 years ($C_{2.42}$) are converted into 3-year-interval scale (C_3).

Figure 3 Demand and supply of CPE opportunities

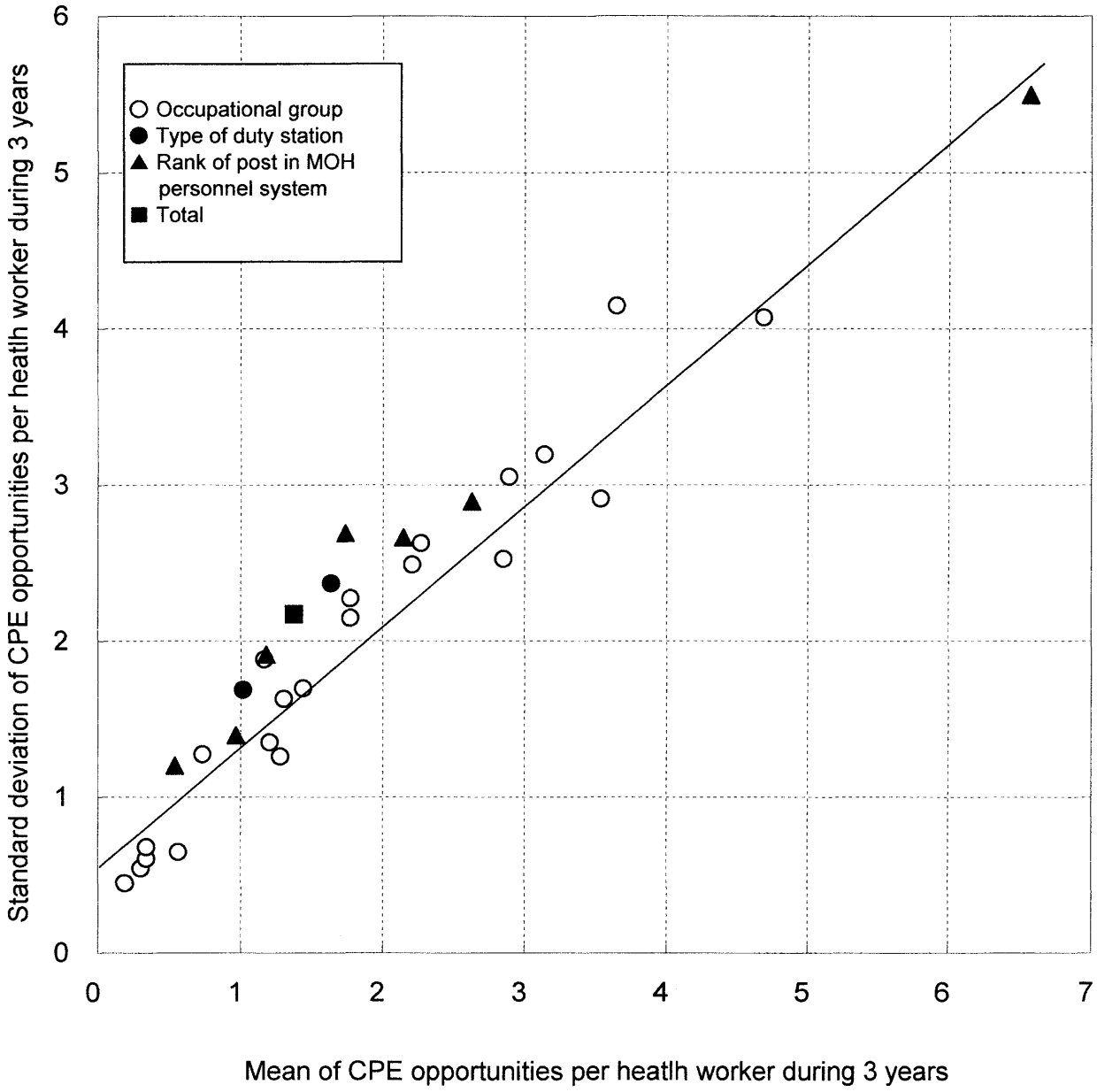
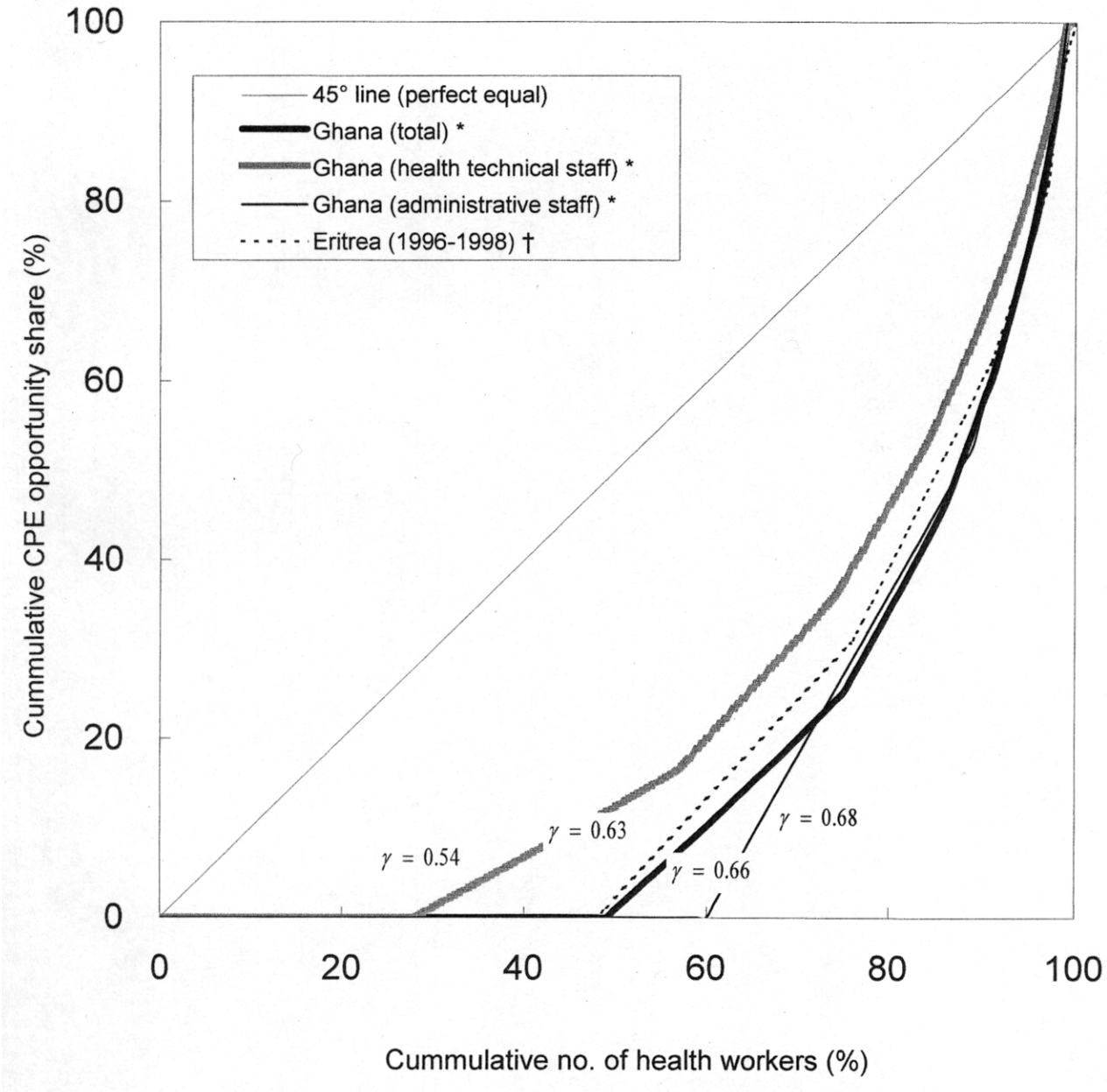


Figure 4 Relationship between mean and standard deviation of CPE opportunities per health worker during 3 years



* Standardized no. of times of participation in CPE programs

† Ahmed A.M., Hagos B. Continuing medical education in Eritrea: Need for a system. *Human Resource for Health Development Journal*. 1993; 3 (2): 132-138.[69]

‡ γ : Gini coefficient

Figure 5 Lorenz curves of CPE opportunties

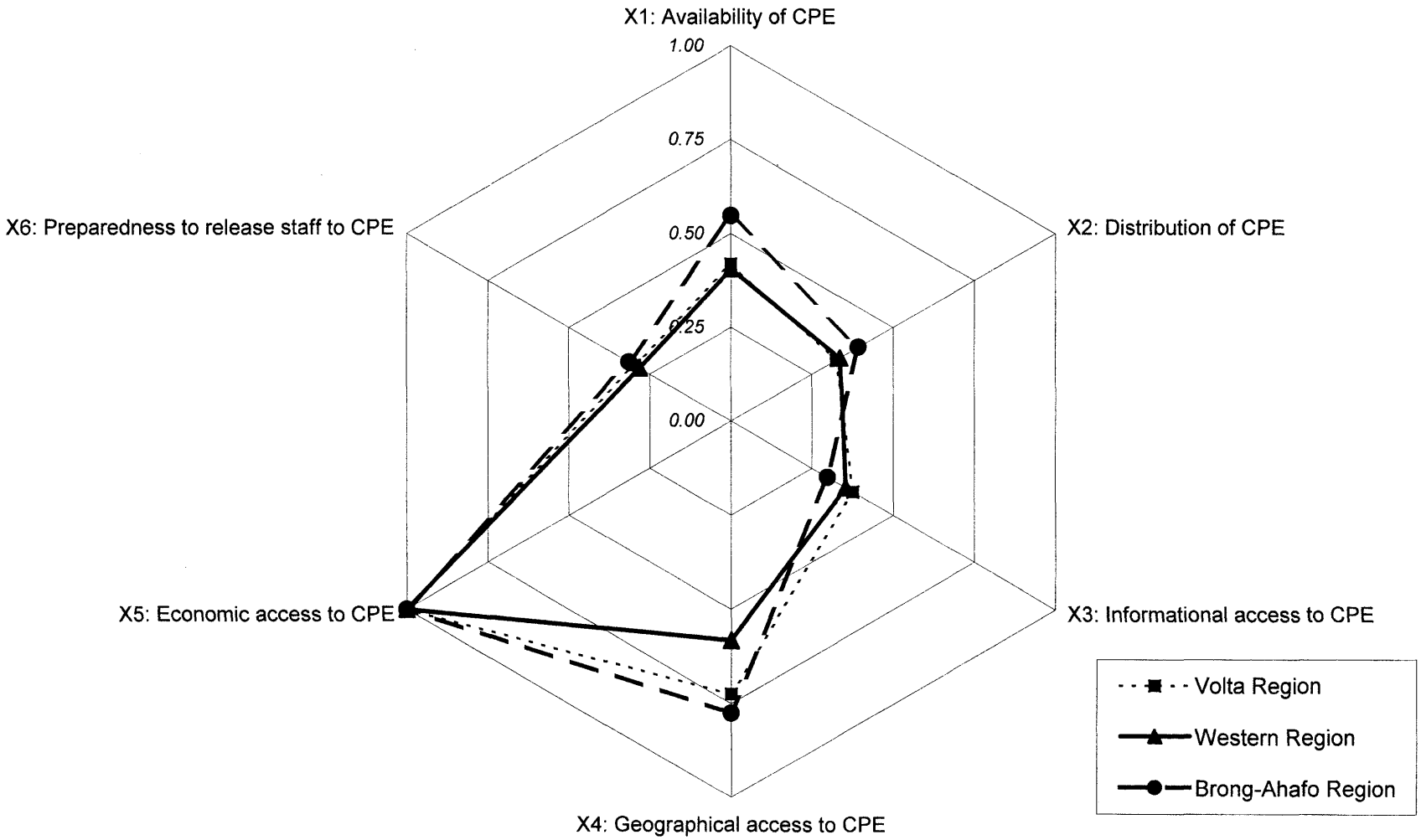


Figure 6 CEAI hexagram for comparison by region

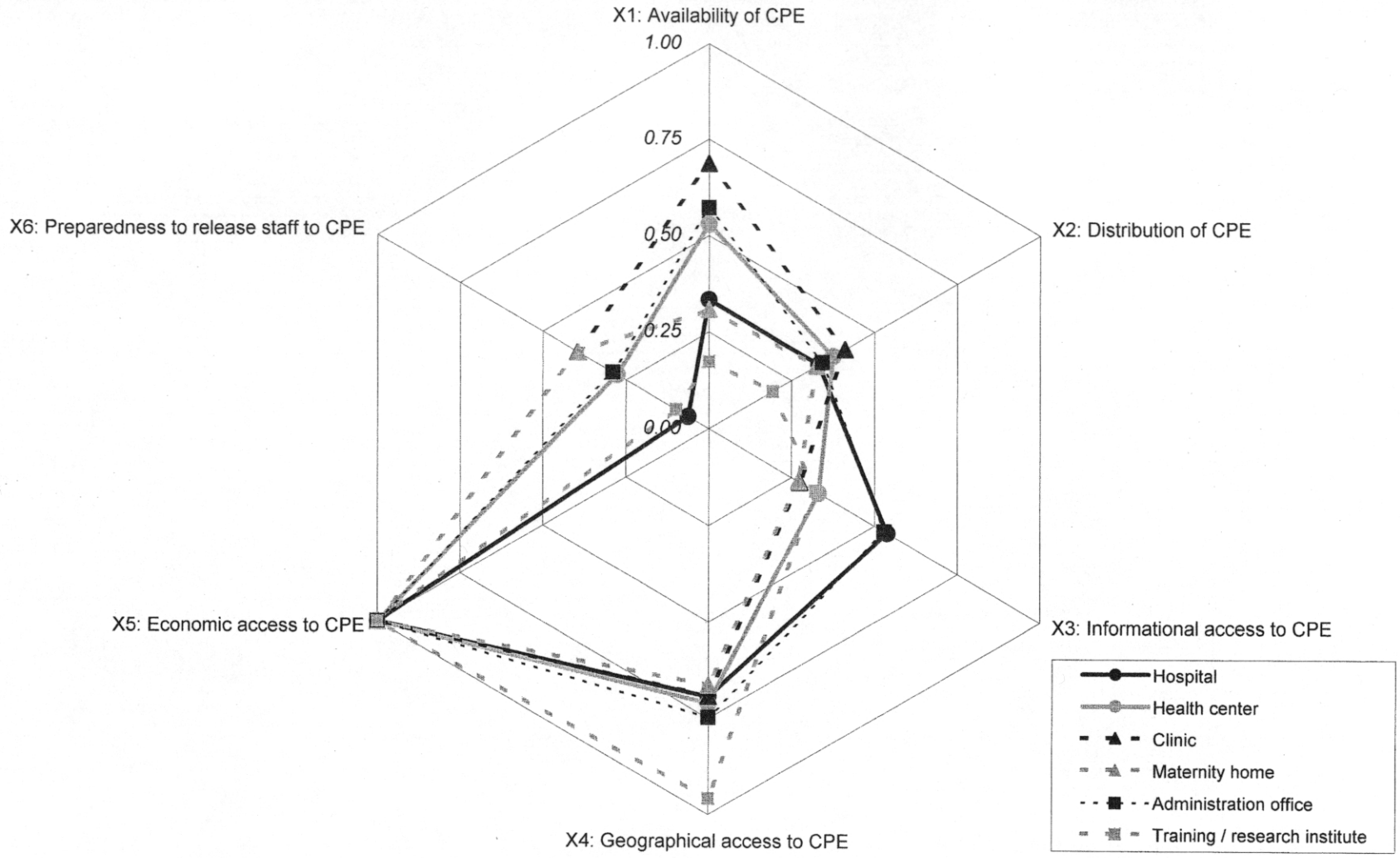


Figure 7 CEAI hexagram for comparion by type of duty station

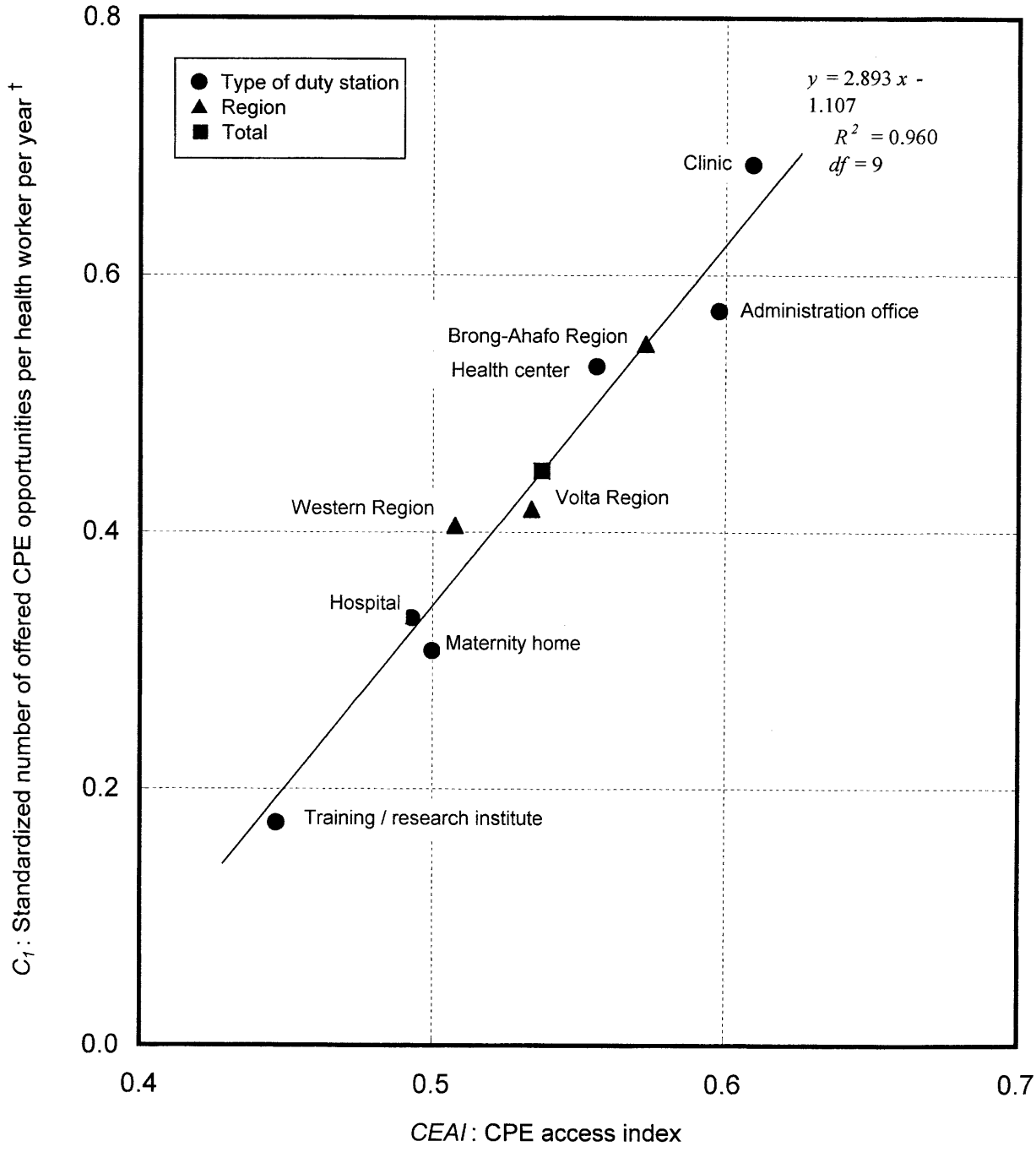


Figure 8 Relationship beween the CEAI and the standardized number of times of CPE opportunities among health workers

Table 1 Number of samples in the three target regions

	Region			Total
	Volta Region	Western Region	Brong-Ahafo Region	
"Form A" for health workers				
Total number of health workers *	3,364	2,400	1,927	7,691
Number of health workers submitting "Form A"	2,675	2,212	1,809	6,696
Nominal coverage (%)	79.5%	92.2%	93.9%	87.1%
"Form B" for health facilities				
Total number of health facilities†	248	99	150	497
Number of health facilities submitting "Form B"	217	89	138	444
Nominal coverage (%)	87.5%	89.9%	92.0%	89.3%

Source * The numbers include health workers on long leave (e.g. maternity leave and fellowship).
Ministry of Health (MOH). *Integrated Personnel Payroll Database*. Accra: MOH (unpublished); 1997.[69]
† Ministry of Health (MOH). *List of health facilities*. Accra: MOH; 1995.[70]

Table 2 Characteristics of samples and frequencies of offered CPE opportunities

	No. of respondents		$C_{2,42}$: No. of times participating in CPE program(s) †					Standardization coefficient
	N	%	*Min.*	*Max.*	*Median*	*Mean*	*s.d.*	α_i
Gender								
Male	2405	37.3%	0	17	0.0	0.97	1.793	-
Female	4404	62.7%	0	16	1.0	1.21	1.724	-
Professional working experience as a MOH employee (yr)								
< 10	1440	21.8%	0	14	1.0	1.29	1.923	-
10-19	2847	43.1%	0	17	0.0	0.94	1.583	-
20-29	1936	29.3%	0	13	1.0	1.14	1.760	-
30 ≤	389	5.9%	0	14	1.0	1.69	2.034	-
Age (yr)								
< 20	2	0.0003%	0	2	1.0	1.00	1.414	-
20-29	379	5.7%	0	12	1.0	1.11	1.627	-
30-39	2516	38.1%	0	17	1.0	1.09	1.789	-
40-49	2649	40.1%	0	13	1.0	1.11	1.639	-
50 ≤	1056	16.0%	0	16	0.0	1.21	1.971	-
Type of occupational group								
Health technical staff	3341	50.1%	0	17	1.0	1.83	2.119	0.956
Medical doctor	143	2.1%	0	16	2.0	2.94	3.345	1.014
Medical assistant	132	2.0%	0	17	4.0	3.78	3.286	0.951
Nurse	1175	17.6%	0	12	1.0	1.43	1.733	0.944
Midwife	580	8.7%	0	14	1.0	1.78	2.008	0.940
Public health nurse	666	10.0%	0	12	2.0	2.30	2.037	0.940
Pharmacist	33	0.5%	0	3	1.0	1.03	1.015	1.061
Laboratory technician	66	1.0%	0	9	1.0	0.94	1.518	0.989
Radiographer	27	0.4%	0	1	0.0	0.15	0.362	1.085
Nutritionist	47	0.7%	0	16	2.0	2.53	2.578	0.945
Physiotherapist	11	0.2%	0	1	0.0	0.45	0.522	1.017
Mortuary officer	17	0.3%	0	1	0.0	0.24	0.437	1.122
Health educator	12	0.2%	0	7	1.5	2.33	2.462	0.924
Malaria control officer	31	0.5%	0	5	1.0	1.16	1.369	1.058
Leprosy control officer	96	1.4%	0	13	2.5	2.85	2.348	0.980
Environmental health officer	64	1.0%	0	6	1.0	1.05	1.315	0.985
Biostatistician	86	1.3%	0	5	1.0	0.97	1.089	0.963
Other health technical staff	155	2.3%	0	13	1.0	1.43	1.834	1.101
Administrative staff §	1335	20.0%	0	13	0.0	0.59	1.027	0.996
Non-health technical staff ǀ	146	2.2%	0	3	0.0	0.27	0.488	1.081
Support staff ¶	1850	27.7%	0	5	0.0	0.27	0.547	1.087
Distance from duty station to regional capital (km) **								
< 100	4250	63.5%	0	16	1.0	1.10	1.671	-
100-199	1798	26.9%	0	14	0.0	1.01	1.703	-
200-299	282	4.2%	0	17	1.0	1.99	2.779	-
300 ≤	366	5.5%	0	9	0.0	1.06	1.663	-
Rank of post in MOH personnel system								
Director	33	0.5%	0	17	4.0	5.30	4.433	-
Senior officer	815	12.2%	0	16	1.0	2.12	2.335	-
Junior officer	5827	87.3%	0	16	0.0	0.95	1.542	-
Type of duty station								
Hospital	3064	45.8%	0	16	0.0	0.82	1.361	-
Health center	1898	28.3%	0	14	1.0	1.32	1.912	-
Clinic	654	9.8%	0	12	1.0	1.73	2.148	-
Maternity home	23	0.3%	0	3	0.0	0.78	1.126	-
Health administration office	837	12.5%	0	17	1.0	1.40	2.170	-
Training/research institute	220	3.3%	0	8	0.0	0.43	0.969	-
Number of staff working at duty station								
1-9	1164	17.4%	0	16	1.0	1.66	2.109	-
10-49	2154	32.2%	0	17	1.0	1.33	2.012	-
50-149	1915	28.6%	0	13	0.0	0.68	1.363	-
150 ≤	1463	21.8%	0	16	1.0	0.92	1.223	-
Total	6696	100.0%	0	17	1.0	1.11	1.750	1.000

Note * Totals may not sum to n = 6696 owing to missing observations.

† The distance from district capital where duty stations are located to regional capital was adopted, referring distances of major road (Directorate of Road, 2001).

‡ CPE participation during the period from January 1, 1996 to May 31, 1998.

§ Administrative staff include: administrator, accountant, secretary, and supply & store officer.

ǀ Non-health technical staff include: engineer, laundry superintendent, and hospital maintenance technician.

¶ Support staff include: orderly, driver, and security guard.

Table 3 Poisson mixed model of standardized number of times of participation in CPE programs on background variables

	Estimate of regression coefficient	*Standard error*	*95% Confidence interval*	*t-value*	*Significance*	*Relative risk*
Gender						
Female (*reference*)	0.0000	-	-	-	-	1.00
Male	0.1254	0.03806	(0.051, 0.200)	3.30	0.0011**	1.13
Professional working experience as a MOH employee (yr)	0.001959	0.002259	(-0.002, 0.006)	0.87	0.3862	1.00
Age (yr)	0.000909	0.002544	(-0.004, 0.006)	0.36	0.7209	1.00
Type of occupational group						
Support staff (*reference = 0*)	0.0000	-	-	-	-	1.00
Medical doctor	1.8369	0.08850	(1.663, 2.011)	20.76	<.0001**	6.28
Medical assistant	2.0583	0.07632	(1.908, 2.208)	26.97	<.0001**	7.83
Nurse	1.6607	0.05510	(1.552, 1.769)	30.14	<.0001**	5.26
Midwife	1.7531	0.06041	(1.634, 1.872)	29.02	<.0001**	5.77
Public health nurse	1.7597	0.05895	(1.644, 1.876)	29.85	<.0001**	5.81
Pharmacist	1.0341	0.1869	(0.667, 1.401)	5.53	<.0001**	2.81
Laboratory technician	1.1458	0.1403	(0.870, 1.422)	8.16	<.0001**	3.14
Radiographer	-0.5305	0.4726	(-1.459, 0.398)	-1.12	0.2622	0.59
Nutritionist	1.6892	0.1141	(1.465, 1.913)	14.80	<.0001**	5.42
Physiotherapist	0.2494	0.5111	(-0.755, 1.254)	0.49	0.6258	1.28
Mortuary officer	-1.0193	0.9677	(-2.921, 0.882)	-1.05	0.2928	0.36
Health educator	1.7004	0.2148	(1.278, 2.123)	7.92	<.0001**	5.48
Malaria control officer	1.1802	0.1781	(0.830, 1.530)	6.63	<.0001**	3.26
Leprosy control officer	1.7895	0.08582	(1.621, 1.958)	20.85	<.0001**	5.99
Environmental health officer	1.1396	0.1792	(0.788, 1.492)	6.36	<.0001**	3.13
Biostatistician	1.0184	0.1290	(0.765, 1.272)	7.89	<.0001**	2.77
Other heatlh technical staff	1.4247	0.08457	(1.259, 1.591)	16.85	<.0001**	4.16
Administrative staff	0.6933	0.05949	(0.576, 0.810)	11.65	<.0001**	2.00
Non-health technical staff	0.1958	0.1677	(-0.134, 0.525)	1.17	0.2435	1.22
Distance from district capital of duty station to regional capital (km)	0.000633	0.000360	(0.000, 0.001)	1.76	0.0796	1.00
Rank of post in MOH personnel system						
Junior officer (*reference = 0*)	0.0000	-	-	-	-	1.00
Director	0.8049	0.1135	(0.582, 1.028)	7.09	<.0001**	2.24
Senior officer	0.4209	0.04000	(0.342, 0.500)	10.52	<.0001**	1.52
Type of duty station						
Hospital (*reference = 0*)	0.0000	-	-	-	-	1.00
Health center	0.3956	0.1521	(0.097, 0.694)	2.60	0.0096**	1.49
Clinic	0.4063	0.1588	(0.094, 0.719)	2.56	0.0108*	1.50
Maternity home	-0.2032	0.3858	(-0.961, 0.555)	-0.53	0.5985	0.82
Health administration office	0.4320	0.1672	(0.103, 0.761)	2.58	0.0101*	1.54
Training/research institute	-0.6569	0.2655	(-1.179, -0.135)	-2.47	0.0137*	0.52
Number of staff working at duty station (person)	-0.00182	0.000947	(-0.004, 0.000)	-1.93	0.0547	1.00
Variance(σ^2)	0.2952	0.02967	(0.237, 0.354)	9.95	<.0001**	

Note * $p < 0.05$
** $p < 0.01$

Table 4 Weights estimation of the component indicators

	Rank-based-points* and descriptions of related items in the past studies					Variable weights (Mean)
	Vaughan, 1980 †			Bowan & O'Donnell, 1985 ‡	Glass & Todd-Atkinson, 1985 §	
	Physician	Dentist	Nurse	Nurse	Nurse	
X_1 Availability of CPE	6	6	4	6	5	$w_1 = 5.4$
	Course objectives (in available CPE programs)			*Job relatedness (of available CPE programs)*	*Redily available programs*	
X_2 Distribution of CPE	2	2	2	1	6	$w_2 = 2.6$
		(not addressed)		*(not addressed)*	*Employer's encouragement (on CPE opportunity)*	
X_3 Informational access to CPE	2	2	2	5	4	$w_3 = 3.0$
		(not addressed)		*Advanced planning (based on CPE information)*	*Information about programs*	
X_4 Geographical access to CPE	3	3	5	2	1	$w_4 = 2.8$
	Travel distance (to the venue of CPE programs)			*Location (of the venue of a CPE program)*	*(not addressed)*	
X_5 Economic access to CPE	5	4	6	4	2	$w_5 = 4.2$
	Tuition (amount of CPE programs)			*Paid fees (for CPE programs)*	*Tuition and travel expense reimbursed*	
X_6 Preparedness to release staff to CPE	4	5	3	3	3	$w_6 = 3.6$
	Length of CPE programs (that may affect duty station's function)			*Attendance on work time*	*Release work time with pay*	

Source * Ranking-based-point system: 1st rank (the most important) = 6 pt; 2nd rank = 5 pt; 3rd rank = 4 pt; 4th rank = 3 pt; 5th rank = 2 pt; and 6th rank (the least important) = 1 pt

† Adelson R., Watkins F.S., Caplan R.M. *Continuing education for the health professional: Education and administration methods*. Rockville, An Aspen Publication; 1985. 146-147 [88]

‡ Bowan B., O'Donnell D. Needs assessment: an information processing model. *Journal of Continuing Education in Nursing*. 1985; **16** (6): 200-204 [91]

§ Glass J.C., Todd-Atkinson S. Continuing education needs of nurses employed in nursing facilities. *Journal of Continuing Education in Nursing*. 1999; **30** (5): 219-228 [84]

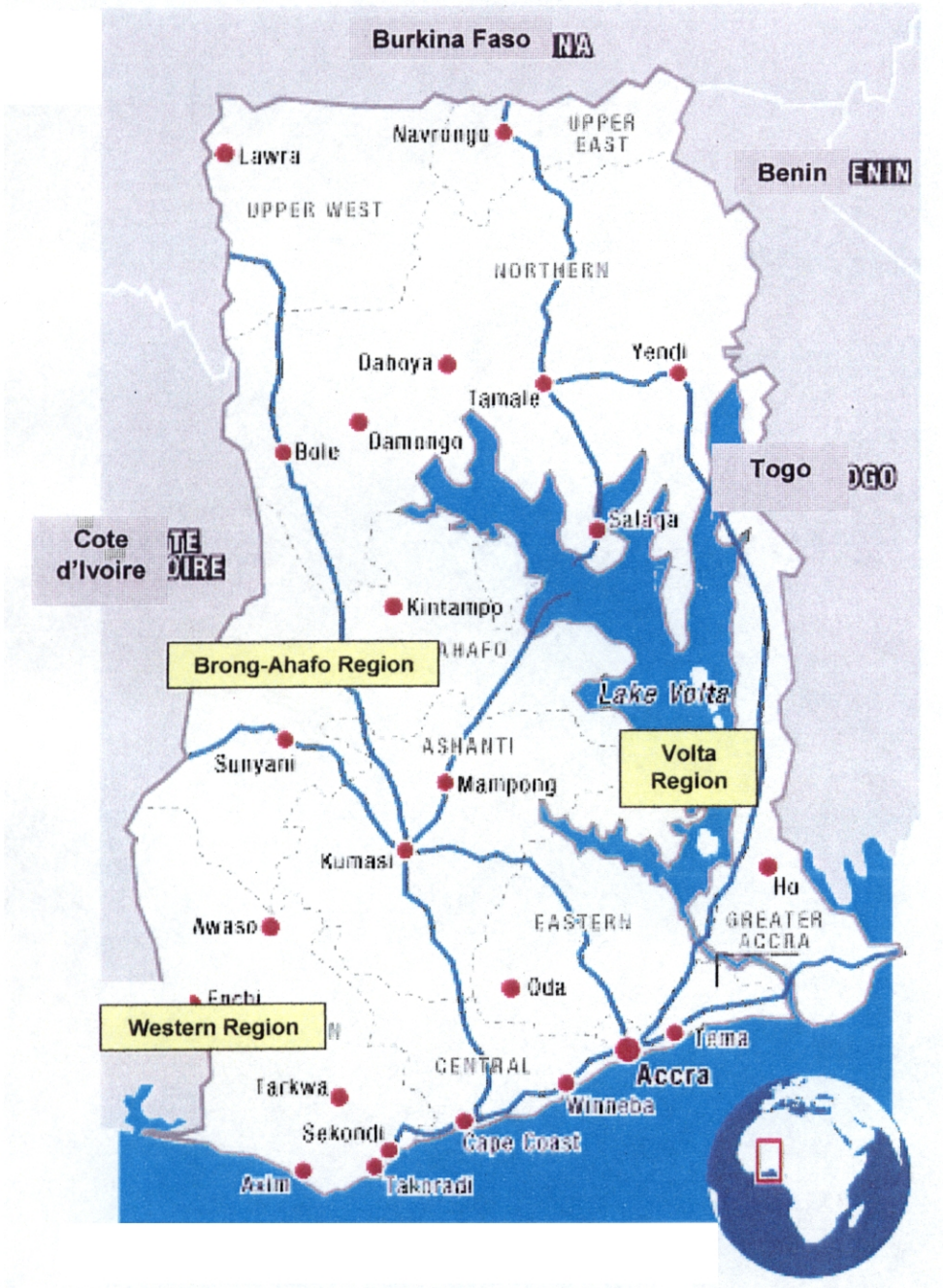
Table 5 Application of the CEAI to the three regions of Ghana

	Region				Type of heatlh facilities					
	Ghana	Volta Region	Western Region	Brong-Ahafo Region	Hospital	Health center	Clinic	Maternity home	Administration office	Training / research institute
X_1: Availability of CPE	0.448	0.418	0.405	0.547	0.333	0.529	0.686	0.308	0.572	0.174
X_2: Distribution of CPE	0.338	0.325	0.336	0.393	0.332	0.375	0.411	0.326	0.343	0.193
X_3: Informational access to CPE	0.345	0.376	0.353	0.298	0.538	0.332	0.275	0.271	0.531	0.321
X_4: Geographical access to CPE	0.711	0.725	0.582	0.775	0.694	0.711	0.692	0.664	0.748	0.958
X_5: Economic access to CPE	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
X_6: Preparedness to release staff to CPE	0.299	0.297	0.282	0.314	0.063	0.276	0.394	0.394	0.289	0.099
CPE Access Index (CEAI)	0.537	0.534	0.508	0.573	0.493	0.556	0.609	0.500	0.598	0.447

ANNEX

ANNEX 1

MAP OF STUDY AREA



Republic of Ghana

ANNEX 2

QUESTIONNAIRE "FORM A"
(For health workers)

FORM A
(for Health Workers)

QUESTIONNAIRE OF NEEDS AND BASELINE SURVEY FOR IN-SERVICE TRAINING

Purpose	The purpose of this questionnaire is to assess the training needs of personnel in the health facilities to help the MOH plan relevant In-Service Training (IST) for the MOH staff. Your answers to each question raised here will be reflected on an IST system for all the MOH staff in Ghana. Your cooperation is very much appreciated.
How to fill out	You are requested to fill out this questionnaire form either by selecting the most suitable option(s) ☑, or by writing the answer(s).

PART A: DEMOGRAHIC INFORMATION

A1) Sex: ☐(1) male, ☐(2) female

A2) Staff ID number: G | O | V | | | | | | | | | |

A3-A5) Date of birth: day ...../ month ...../ year 19.....

A6) Marital status: ☐(1) single, ☐(2) married, ☐(3) widowed, ☐(4) divorced, ☐(5) separated

PART B: EDUCATIONAL BACKGROUND AND DUTIES

B1) Highest educational qualification (*select only one from the following*):
☐(1) Ph.D., ☐(2) master, ☐(3) post graduate diploma, ☐(4) bachelor, ☐(5) diploma, ☐(6) GCE "A" Level, ☐(7) GCE "O" Level, ☐(8) SSS, ☐(9) technical, ☐(10) JSS, ☐(11) MSLC ☐(12) primary, ☐(13) none, ☐(14) other (*specify* .....)

B2) Occupational classification in the Ministry of Health (*select only one from the followings*):
☐(1) medical doctor, ☐(2) dentist, ☐(3) general nurse, ☐(4) public health nurse, ☐(5) community health nurse, ☐(6) enrolled nurse, ☐(7) midwife (except the latest four options (3)-(6), (5) and (6)) ☐(8) medical assistant, ☐(9) anesthetist, ☐(10) pharmacist, ☐(11) radiographer, ☐(12) health service administrator, ☐(13) engineering technician, ☐(14) engineer, ☐(15) medical lab., ☐(16) services technical officer (CDC), ☐(17) technical officer (biost.), ☐(18) technical officer (art. illust.), ☐(19) technical officer (x-ray), ☐(20) technical officer (ortho.), ☐(21) technical officer (lab.), ☐(22) technical officer (nut.), ☐(23) technical officer (malaria), ☐(24) technical assistant, ☐(25) leprosy control officer, ☐(26) technician, ☐(27) laundry superintendent, ☐(28) superintendents, med. wkshop / hospital maintenance, ☐(29) biostatistics officer / biostatistics asst., ☐(30) statistics officer / record asst., ☐(31) biochemist, ☐(32) biologist, ☐(33) chiropodist, ☐(34) optician, ☐(35) occupational therapist, ☐(36) physiotherapist, ☐(37) entomologist, ☐(38) health educator, ☐(39) planning officer, ☐(40) nutrition officer, ☐(41) dietitian, ☐(42) catering officer, ☐(43) hostal warden, ☐(44) curator of instruments, ☐(45) blood donor organizer, ☐(46) audiologist, ☐(47) health education officer, ☐(48) school dental therapist, ☐(49) sterilization machine operator, ☐(50) environmental health officer, ☐(51) launderer / washerman, ☐(52) resident housekeeper, ☐(53) mortuaryman, ☐(54) dental clinic assistant, ☐(55) orderlies, ☐(56) prosector, ☐(57) administrative class, ☐(58) personnel class, ☐(59) executive / clerical / messenger class, ☐(60) supplies & stores, ☐(61) secretarial class, ☐(62) works superintendent / foreman / artisan / tradesman, ☐(63) estate officer, ☐(64) transport officer, ☐(65) driver, ☐(66) security guard / watchman, ☐(67) labourer / scavenger, ☐(68) telephonist / telephone operator, ☐(69) malaria control worker, ☐(70) investigation officer, ☐(71) other (*specify*) .....)

B3) Type of present workplace (*select only one from the following*):
☐(1) teaching hospital, ☐(2) specialized hospital, ☐(3) regional hospital, ☐(4) district hospital, ☐(5) mission hospital, ☐(6) health center/polyclinic, ☐(7) community/rural/school/MCH clinic, ☐(8) maternity home, ☐(9) MOH headquarters, ☐(10) Regional Health Administration, ☐(11) District Health Administration, ☐(12) training institution, ☐(13) research center, ☐(14) other (*specify* .....)

B4) Present rank at your workplace (*select only one from the following*):
☐(1) director, ☐(2) senior staff (except director), ☐(3) junior staff

B5) Location (region/district) of present workplace (*select only one from the following*): **Page 2**

- Greater Accra ☐(100) MOH HQ / Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital / Research Center, ☐(101) Accra Metropolitan Assembly, ☐(102) Dangbe East, ☐(103) Dangbe West, ☐(104) Ga, ☐(105) Tema
- Volta ☐(200) Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital, ☐(201) Akatsi, ☐(202) Keta, ☐(203) Ketu (Ketu), ☐(204) Ho, ☐(205) Hohoe, ☐(206) Jasikan, ☐(207) Kadjebi, ☐(208) Kpando, ☐(209) Krachi, ☐(210) Nkwanta, ☐(211) Adidome (North Tongu), ☐(212) Sogakope (South Tongu)
- Eastern ☐(300) Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital, ☐(301) Akwapim South, ☐(302) Asuogyaman, ☐(303) Birim North, ☐(304) Birim South, ☐(305) East Akim, ☐(306) Fanteakwa, ☐(307) Kwaebibirim, ☐(308) Afram Plains, ☐(309) Kwahu South, ☐(310) Akwapim North, ☐(311) Manya Krobo, ☐(312) New Juaben, ☐(313) Suhum Kraboa Coaltar, ☐(314) West Akim, ☐(315) Yilo Krobo
- Central ☐(400) Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital, ☐(401) Agona, ☐(402) Ajumako Enyan Esiam, ☐(403) Asikuma Odoben Brakwa, ☐(404) Assin, ☐(405) Ewutu-Efutu-Senya, ☐(406) Abura Asebu, ☐(407) Cape Coast, ☐(408) Gomoa, ☐(409) Komenda-Edina-Eguafo-Abirem, ☐(410) Mfantsiman, ☐(411) Upper Denkyira, ☐(412) Twifo Heman Lower Denkyira
- Western ☐(500) Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital, ☐(501) Ahanta West, ☐(502) Aowin Suaman, ☐(503) Bibiani-Anwhiaso-Bekwai, ☐(504) Jomoro, ☐(505) Juabeso-Bia, ☐(506) Mpohor-Wassa East, ☐(507) Nzema East, ☐(508) Sefwi Wiawso, ☐(509) Shama-Ahanta-East, ☐(510) Wassa Amenfi, ☐(511) Wassa West
- Ashanti ☐(600) Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital / Health Learning Material Center, ☐(601) Adansi East, ☐(602) Afigya Sekyere, ☐(603) Ahafo-Ano North, ☐(604) Ahafo-Ano South, ☐(605) Amansie East, ☐(606) Asante-Akim North, ☐(607) Asante-Akim South, ☐(608) Atwima, ☐(609) Bosomtwe-Atwima-Kwanwoma, ☐(610) Adansi West, ☐(611) Ejisu-Juabeng, ☐(612) Ejura-Sekyeredumase, ☐(613) Kumasi Metropolitan, ☐(614) Kwabre, ☐(615) Amansie West, ☐(616) Offinso, ☐(617) Sekyere East, ☐(618) Sekyere West
- Brong-Ahafo ☐(700) Regional Health Administration / Regional Hospital / Training Institution / Research Center, ☐(701) Asunafo, ☐(702) Asutifi, ☐(703) Atebubu, ☐(704) Berekum, ☐(705) Dorman, ☐(706) Jaman, ☐(707) Kintampo, ☐(708) Nkoranza, ☐(709) Sene, ☐(710) Sunyani, ☐(711) Tano, ☐(712) Techiman, ☐(713) Wenchi
- Northern ☐(800) Regional Health Administration / Regional Hospital / Training Institution, ☐(801) Bole, ☐(802) East Gonja, ☐(803) Mamprusi East, ☐(804) Gushiegu-Karaga, ☐(805) Nanumba, ☐(806) Saboba Chereponi , ☐(807) Savelugu-Nanton, ☐(808) Tamale, ☐(809) Tolon- Kumbugu, ☐(810) Gonja West, ☐(811) West Mamprusi, ☐(812) Yendi, ☐(813) Zabzugu-Tatale
- Upper East ☐(900) Regional Health Administration / Regional Hospital / Training Institution / Research Center, ☐(901) Bawku East, ☐(902) Bawku West, ☐(903) Bolgatanga, ☐(904) Bongo, ☐(905) Builsa, ☐(906) Kassena-Nankana
- Upper West ☐(1000) Regional Health Administration / Regional Hospital / Training Institution, ☐(1001) Jirapa Lambussie, ☐(1002) Lawra, ☐(1003) Nadowli, ☐(1004) Sissala, ☐(1005) Wa

B6-B7) How long have you been working as stated "B2"?
……years and …… months

B8-B9) How long have you been working for MOH?
……years and …… months

PART C: IN-SERVICE TRAINING ISSUES

C1) Have you ever had In-Service Training after starting working for MOH?
☐(1) yes , ☐(2) no

C2-C6) If you answered YES in "C1", give the results of In-Service Training courses you participated since Jan 1996.

course subject / course theme	participated in last two years? *(tick one)*	C2) method used *(select one or more from <Group A> see below*	C3) year	C4) duration in days	C5) how useful? *(select one from <Group B> see below*	C6) % used *(select one from <Group C> see below*
clinical skills (1) basic clinical skills	☐ yes, ☐ no		19.....	.....days		
clinical skills (2) chronic diseases	☐ yes, ☐ no		19.....	.....days		
clinical skills (3) emergency care	☐ yes, ☐ no		19.....	.....days		
clinical skills (4) infection control	☐ yes, ☐ no		19.....	.....days		
clinical skills (5) specialized clinical skills	☐ yes, ☐ no		19.....	.....days		
public health skills (6) ARI	☐ yes, ☐ no		19.....	.....days		
public health skills (7) community health	☐ yes, ☐ no		19.....	.....days		
public health skills (8) diarrhoea	☐ yes, ☐ no		19.....	.....days		
public health skills (9) EPI/NID	☐ yes, ☐ no		19.....	.....days		
public health skills (10) Guinea worm	☐ yes, ☐ no		19.....	.....days		
public health skills (11) health education	☐ yes, ☐ no		19.....	.....days		
public health skills (12) infectious diseases	☐ yes, ☐ no		19.....	.....days		
public health skills (13) leprosy	☐ yes, ☐ no		19.....	.....days		
public health skills (14) malaria	☐ yes, ☐ no		19.....	.....days		
public health skills (15) nutrition	☐ yes, ☐ no		19.....	.....days		
public health skills (16) public health care	☐ yes, ☐ no		19.....	.....days		
public health skills (17) STD/AIDS	☐ yes, ☐ no		19.....	.....days		
public health skills (18) TB	☐ yes, ☐ no		19.....	.....days		
public health skills (19) TBA training	☐ yes, ☐ no		19.....	.....days		
RH (20) reproductive health	☐ yes, ☐ no		19.....	.....days		
RH (21) safe motherhood	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (22) bioethics	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (23) computer skills	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (24) drug supply mgt.	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (25) financial mgt.	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (26) information mgt.	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (27) health mgt.	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (28) hospital mgt.	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (29) human resource dev't	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (30) office mgt.	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (31) personnel mgt.	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (32) store mgt.	☐ yes, ☐ no		19.....	.....days		
management and administrative skills (33) survey methods	☐ yes, ☐ no		19.....	.....days		
(34) others *(specify* .....)	☐ yes, ☐ no		19.....	.....days		

<Group A> *What method was used for the course?* *(more than one answer is acceptable)*
(1) lecture, (2) group work, (3) field work, (4) brain-storming, (5) other

<Group B> *How useful was the course for you personally? (select only one from the following)*
(1) very useful, (2) useful, (3) fair, (4) poor, (5) very poor

<Group C> *Estimated percentage of what you use in your daily work out of what you learned in the course.* *(select only one from the following)*
(1) 100%, (2) 80%, (3) 60%, (4) 40%, (5) 20%, (6) 0%

C7) How often do you need In-Service-Training?
☐(1) once a year, ☐(2) once in two years, ☐(3) once in three years, ☐(4) once in four years,
☐(5) no In-Service Training is needed

C8) If you selected one of (1), (2), (3), and (4) in "C7", give the reason(s). *(more than one answer is acceptable)*
☐(1) to gain new skills/technology, ☐(2) to exchange information with staff of other facilities,
☐(3) to get promoted, ☐(4) to get relief from the routine duty pressure, ☐(5) other (*specify* .....)

C9) If you selected (6) in "C7", give the reason(s). *(more than one answer is acceptable)*
- ☐(1) because a course is not fruitful but boring,
- ☐(2) because participation in courses is not accompanied by incentives,
- ☐(3) because co-workers have to take over my duties during the course,
- ☐(4) other *(specify* .....)

C10) If you selected one of (1), (2), (3), and (4) in "C7", for which subject would you like to participate in further training? Tick in the box(es). *(more than one answer is acceptable)*

	course subject / course theme	tick here		course subject / course theme	tick here
clinical skills	(1) basic clinical skills	☐	HIV	(18) TB	☐
	(2) chronic diseases	☐		(19) TBA training	☐
	(3) emergency care	☐		(20) reproductive health	☐
	(4) infection control	☐		(21) safe motherhood	☐
	(5) specialized clinical skills	☐	management and administration skills	(22) bioethics	☐
public health skills	(6) ARI	☐		(23) computer skills	☐
	(7) community health	☐		(24) drug supply mgt.	☐
	(8) diarrhoea	☐		(25) financial mgt.	☐
	(9) EPI/NID	☐		(26) information mgt.	☐
	(10) Guinea worm	☐		(27) health mgt.	☐
	(11) health education	☐		(28) hospital mgt.	☐
	(12) infectious diseases	☐		(29) human resource dev't	☐
	(13) leprosy	☐		(30) office mgt.	☐
	(14) malaria	☐		(31) personnel mgt.	☐
	(15) nutrition	☐		(32) stores mgt.	☐
	(16) public health care	☐		(33) survey methods	☐
	(17) STD/AIDS	☐	(34) others *(specify* .....)		☐

C11-C14) Arrange the following statements according to the order of your priority.
- (1) I would like to have a yearly training schedule for easier participation planning
- (2) I would like to have a linkage with incentives and staff reassignment
- (3) I would like to have mobile outreach training programs for cost and time savings
- (4) I would like to have a training record card / certificate

C11) 1st priority: .....
C12) 2nd priority: .....
C13) 3rd priority: .....
C14) 4th priority: .....

C15-C18) Arrange the following support you need to perform your present duties according to the order of your priority.
- (1) working tools
- (2) sufficient salary
- (3) better conditions of service
- (4) opportunity for further education

C15) 1st priority: .....
C16) 2nd priority: .....
C17) 3rd priority: .....
C18) 4th priority: .....

C19) Which of the following do you readily have access to presently? *(more than one answer is acceptable)*
☐(1) working tools, ☐(2) sufficient salary, ☐(3) better conditions of service,
☐(4) opportunity for further education, ☐(5) none

C20) How do you rate your present output with the above support?
(select one from the following)
☐(1) 100%, ☐(2) 80%, ☐(3) 60%, ☐(4) 40%, ☐(5) 20%, ☐(6) 0%

END OF QUESTIONS

Thank you very much for your cooperation. Should you have any comments or questions regarding this questionnaire, please do not hesitate to contact Training Unit, Human Resource Development Division, Ministry of Health (Phone & Fax 021 6604172)

This MOH questionnaire was developed and printed with a technical assistance from Japan International Cooperation Agency (JICA) and German Development Cooperation (GTZ)

QUESTIONNAIRE "FORM B"
(For health facilities)

FORM B
(for Health Facilities)

QUESTIONNAIRE OF NEEDS AND BASELINE SURVEY FOR IN-SERVICE TRAINING

Purpose	The purpose of this questionnaire is to assess the training needs of personnel in the health facilities to help the MOH plan relevant In-Service Training (IST) for health workers. Your answers to each question raised here will be reflected on an IST system for all health workers in Ghana. Your cooperation is very much appreciated.
How to fill out	You are requested to fill out this questionnaire form either by selecting the most suitable option(s) ☑, or by writing the answer(s).

PART A: HEALTH FACILITY[10] INFORMATION

A1) Name of your health facility: .....

A2-A4) Date of the establishment of your health facility: day ...../ month ...../ year 19.....

A5) Type of the health facility *(select only one from the following)*:

- ☐(1) teaching hospital,
- ☐(2) specialized hospital
- ☐(3) regional hospital,
- ☐(4) district hospital,
- ☐(5) mission hospital,
- ☐(6) health center/polyclinic,
- ☐(7) community/rural/school/MCH clinic,
- ☐(8) maternity home,
- ☐(9) MOH headquarters,
- ☐(10) Regional Health Administration,
- ☐(11) District Health Administration,
- ☐(12) training institution,
- ☐(13) research centre
- ☐(14) other (*specify* .....)

A6-A9) If you selected one of (1), (2), (3), (4), (5) and (6) in "A5", give data for the following.

Bed Occupancy Rate in 1997	: A6) .....(%)
Total Outpatients Attendance in 1997	: A7) .....outpatients
Number of inpatients on 6th June 1998	: A8) .....inpatients
Number of outpatients on 6th June 1998	: A9) .....outpatients

A10) Location (region/district) of the health facility (*select only one from the following*):

- Greater Accra ☐(100) MOH HQ / Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital / Research Center, ☐(101) Accra Metropolitan Assembly, ☐(102) Dangbe East, ☐(103) Dangbe West, ☐(104) Ga, ☐(105) Tema

- Volta ☐(200) Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital, ☐(201) Akatsi, ☐(202) Keta, ☐(203) Ketu (Keta), ☐(204) Ho, ☐(205) Hohoe, ☐(206) Jasikan, ☐(207) Kadjebi, ☐(208) Kpando, ☐(209) Krachi, ☐(210) Nkwanta, ☐(211) Adidome (North Tongu), ☐(212) Sogakope (South Tongu)

- Eastern ☐(300) Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital, ☐(301) Akwapim South, ☐(302) Asuogyaman, ☐(303) Birim North, ☐(304) Birim South, ☐(305) East Akim, ☐(306) Fanteakwa, ☐(307) Kwaebibirim, ☐(308) Afram Plains, ☐(309) Kwahu South, ☐(310) Akwapim North ☐(311) Manya Krobo, ☐(312) New Juaben, ☐(313) Suhum Kraboa Coaltar, ☐(314) West Akim, ☐(315) Yilo Krobo

- Central ☐(400) Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital, ☐(401) Agona, ☐(402) Ajumako Enyan Esiam, ☐(403) Asikuma Odoben Brakwa, ☐(404) Assin, ☐(405) Ewutu-Efutu-Senya, ☐(406) Abura Asebu, ☐(407) Cape Coast, ☐(408) Gomoa, ☐(409) Komenda-Edina-Eguafo-Abirem, ☐(410) Mfantsiman, ☐(411) Upper Denkyira, ☐(412) Twifo Hemaa Lower Denkyira

- Western ☐(500) Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital, ☐(501) Ahanta West, ☐(502) Aowin Suaman, ☐(503) Bibiani-Anwhiaso-Bekwai, ☐(504) Jomoro, ☐(505) Juaboso-Bia, ☐(506) Mpohor-Wassa East, ☐(507) Nzema East, ☐(508) Sefwi Wiaso, ☐(509) Shama-Ahanta-East, ☐(510) Wassa Amenfi, ☐(512) Wassa West

- Ashanti ☐(600) Regional Health Administration / Regional Hospital / Training Institution / Teaching Hospital / Health Learning Material Center, ☐(601) Adansi East, ☐(602) Afigya Sekyere, ☐(603) Ahafo-Ano North, ☐(604) Ahafo-Ano South, ☐(605) Amansie East, ☐(606) Asante-Akim North, ☐(607) Asante-Akim South, ☐(608) Atwima, ☐(609) Bosomtwe-Atwima-Kwanwoma, ☐(610) Adansi West, ☐(611) Ejisu-Juaben, ☐(612) Ejura-Sekyeredumase, ☐(613) Kumasi Metropolitan, ☐(614) Kwabre, ☐(615) Amansie West, ☐(616) Offinso, ☐(617) Sekyere East, ☐(618) Sekyere West

- Brong-Ahafo ☐(700) Regional Health Administration / Regional Hospital / Training Institution / Research Center, ☐(701) Asunafo, ☐(702) Asutifi, ☐(703) Atebubu, ☐(704) Berekum, ☐(705) Dormaa, ☐(706) Jaman, ☐(707) Kintampo, ☐(708) Nkoranza, ☐(709) Sene, ☐(710) Sunyani, ☐(711) Tano, ☐(712) Techiman, ☐(713) Wenchi

- Northern ☐(800) Regional Health Administration / Regional Hospital / Training Institution, ☐(801) Bole, ☐(802) East Gonja, ☐(803) Mamprusi East, ☐(804) Gushiegu-Karaga, ☐(805) Namumba, ☐(806) Saboba Chereponi, ☐(807) Savelugu-Nanton, ☐(808) Tamale, ☐(809) Tolon- Kumbugu, ☐(810) Gonja West, ☐(812) West Mamprusi, ☐(813) Yendi, ☐(814) Zabzugu-Tatale

- Upper East ☐(900) Regional Health Administration / Regional Hospital / Training Institution / Research Center, ☐(901) Bawku East, ☐(902) Bawku West, ☐(903) Bolgatanga, ☐(904) Bongo, ☐(905) Builsa, ☐(906) Kassena-Nankana

- Upper West ☐(1000) Regional Health Administration / Regional Hospital / Training Institution, ☐(1001) Jirapa Lambussie, ☐(1002) Lawra, ☐(1003) Nadowli, ☐(1004) Sissala, ☐(1005) Wa

A11-A42) Number of the staff of the health facility *(fill out the following table)*:

< The number of staff currently at post>

	director	Senior staff (except director)	junior staff	total
Technical staff / Support staff	A11)	A12)	A13)	A14)
Administration staff / Clerical staff	A15)	A16)	A17)	A18)
Other staff *	A19)	A20)	A21)	A22)
total	A23)	A24)	A25)	A26)

< The staff establishment as by the "*MOH Staffing Norm*">

	director	senior staff (except director)	junior staff	total
Technical staff / Support staff	A27)	A28)	A29)	A30)
Administration staff / Clerical staff	A31)	A32)	A33)	A34)
Other staff*	A35)	A36)	A37)	A38)
total	A39)	A40)	A41)	A42)

* Other staff include only "driver", "security guard/watchman", and "labourer/scavenger". All other types of staff should be categorized either into "*technical staff / support staff*" or into "*administration staff / clerical staff*"

PART B: IN-SERVICE TRAINING ISSUES

B1) What type of In-Service Training is presently available for the staff of your health facility? *(more than one answer is acceptable)*

- ☐(1) internal / external self-initiated training
- ☐(2) internal On-the-Job-Training (OJT) within your health facility
- ☐(3) internal structured training within your health facility
- ☐(4) external training courses provided by District Health Administration, Regional Health Administration, HRDD, Non-Governmental Organizations, etc..
- ☐(5) other type (*specify* .....)
- ☐(6) no In-Service Training is available.

B2-B8) How much is budgeted for the training in your health facility in 1998?

GOG	: B2)	.....cedis
Internal Generated Fund	: B3)	.....cedis
Health Fund	: B4)	.....cedis
Project Fund	: B5)	.....cedis
Donation	: B6)	.....cedis
Other (*specify* .....)	: B7)	.....cedis
total	: B8)	.....cedis

B9) How many Training Coordinators do you presently have in your health facility? *(select only one from the following)*:

☐(0) 0, ☐(1) 1, ☐(2) 2, ☐(3) 3, ☐(4) 4, ☐(5) more than 4 Training Coordinators

B10) If you selected one of (1), (2), (3), (4), and (5) in "B1", what are his/her/their major responsibilities? *(more than one answer is acceptable)*

- ☐(1) to plan for internal training
- ☐(2) to plan for external training
- ☐(3) to facilitate internal training
- ☐(4) to act as a resource person for external training
- ☐(5) other *(specify* .....)

B11) How many times was your health facility requested to send your staff to training courses outside of the facility in 1997?

.....times

B12) How many times did your health facility actually send your staff to training courses outside of the facility in 1997?

.....times

B13) Maximum number of the staff of your health facility who can be released to training courses at the same time with the health facility still functioning

.....staff

B14) How many days in advance would you need to be informed to release your staff to participate in a training course outside your health facility?

.....days

END OF QUESTIONS

Thank you very much for your cooperation. Should you have any comments or questions regarding this questionnaire, please do not hesitate to contact Training Unit, Human Resource Development Division, Ministry of Health (Phone & Fax 021 660472)

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ANNEX 3

OPEN-ENDED QUESTIONS
FOR FOCUS GROUP DISCUSSIONS

(1) How useful are CPE program in daily life?

(2) Who is responsible for nominating participants in the forth-coming CPE program?

(3) In what way, participants are nominated at workplace?

(4) What are the objectives of and reasons for participating CPE programs among the health workers?

(5) What are deterring factors toward participating CPE programs?