Strategies to improve the performance of female health workers in West Bengal: A cross-sectional survey

DIPANKAR MAJI, YVAN HUTIN, R. RAMAKRISHNAN, SHAH HOSSAIN, SOBHAN DE

ABSTRACT

Background. Female health workers in India face an increasing workload that affects their performance. We did a study in 2 districts of West Bengal, India, to quantify their workload and identify determinants of good performance.

Methods. We randomly sampled female health workers from the health department's list. First, we quantified the time allocated to tasks through observations of work sessions. Second, we estimated the prevalence ratio (PR) of above-average performance for three indicators (DPT-booster coverage, antenatal check-up coverage and family planning performance) according to selected potential determinants.

Results. Female health workers spent 26% of their time in documentation. We recruited 42 female health workers (average population covered: 6495). Larger floor space (PR 2.5; 95% CI 1.2–5.3), use of simplified documentation procedures (PR 2.5; 95% CI 1.2–5.2) and monthly supervision (PR 3.0; 95% CI 1.1–8.5) were associated with above-average DPT-booster coverage. Availability of a private space was associated with above-average coverage in antenatal check-up (PR 1.9; 95% CI 1.0–3.5) and family planning (PR 2.5; 95% CI 1.2–5.2). Workers who used existing resources to cope with multi-tasking performed better.

Conclusion. Female health workers spent excessive time in documentation which left less time for service delivery. Infrastructure, planning and supervision affected performance and these areas must be strengthened to improve primary healthcare services.

Natl Med J India 2010;23:137–42

INTRODUCTION

The umbrella term 'community health worker' embraces a variety of community health aides selected, trained and working in the communities from which they come.[1] The workforce of community health workers is the final common pathway for the implementation of all public healthcare programmes. A global crisis affects the health workforce, from training and recruitment to retention and management.[2] The *World Health Report 2006* suggested a number of levers related to jobs, support systems and work environment to optimize the performance of health workers.[2] Little research has been conducted globally on the effects of various factors on performance outcomes.[1,3,4]

In India, female health workers (FHWs) undergo an 18-month course in nursing and midwifery after 10 years of formal school education. They work in 'subcentres', the most distal government health facility that caters to a population of about 5000 people (3000 in tribal or hilly areas). FHWs offer a wide range of services. The large number of functions may increase workload and reduce performance.[3] The responsibilities of FHWs have increased with the inclusion of (i) annual mass drug administration for filariasis and the Integrated Disease Surveillance Project [IDSP] (2004), (ii) outreach immunization and maternity benefit scheme (2005), and (iii) iodized salt surveys (2006). In 2006, the new National Rural Health Mission started to provide funds to subcentres and assigned the responsibility of financial management to the FHWs. Documentation is one of the main burdens of FHWs. They maintain a family register for couples in the reproductive age group and children under 5 years of age. In addition, most FHWs keep separate subsidiary registers for beneficiaries of antenatal care, temporary contraceptives or primary immunization. Some subcentres also have a male health worker (MHW), but this position is filled less often.

In 2006, a review commissioned by the health department of the state of West Bengal highlighted problems at the subcentre level (A.F. Ferguson, Government of West Bengal, unpublished report). These included workload, physical condition of infrastructure, career paths, monitoring, supervision and community involvement. The state assigns 18 different routine tasks to FHWs. The review indicated that FHWs spent 16% of their time preparing reports and 19% of their time in meetings (A.F. Ferguson, Government of West Bengal, unpublished report) and suggested some interventions. However, no quantification and no measurement of the effect were available to support these recommendations. To identify interventions that could improve health outcomes, we conducted a study among FHWs to quantify the proportion of time assigned to categories of specific tasks and identify the determinants associated with performance.

METHODS

Study design and population

We conducted the study from August to November 2007 among FHWs working in the peripheral subcentres of two districts (South and North-24 Parganas) of West Bengal. We excluded

Government of West Bengal, India
DIPANKAR MAJI, SOBHAN DE   Department of Health and Family
    Welfare

World Health Organization, India Country Office, New Delhi, India
YVAN HUTIN   presently WHO, China Country Office, Beijing, China

National Institute of Epidemiology (Indian Council of Medical Research), Chennai, India
R. RAMAKRISHNAN

National Institute of Communicable Diseases, New Delhi, India
SHAH HOSSAIN

Correspondence to YVAN HUTIN; *hutiny@who.int*

FHWs who had joined their subcentre in 2007, those who had any chronic major illness or surgery and those who had been on leave for more than 3 months during our retrospective reference period (January–July 2007). The study had two components. First, a descriptive cross-sectional study quantified the tasks of the FHWs (sampling unit: 3-hour observation sessions of FHWs). Second, an analytical cross-sectional study identified determinants of performance (sampling unit: FHWs).

Quantification of the tasks

Sampling. We sampled 3-hour sessions during which we recorded 36 observations of various activities of FHWs every 5 minutes. Assuming that the most frequent category of task (vaccination) would come in 18% of observations,[5,6] we needed a sample size of 13 sessions for a precision of 5%, a confidence interval of 95% and a design effect of 2. Adding 10% extra for each of the 10 other categories of task, we finally obtained a sample size of 26 sessions. We observed these 26 sessions in a sub-sample of 26 FHWs selected at random from among the larger sample of those selected for the second, analytical component of the study (sampling described below).

Data collection. We considered different categories of tasks that were collectively inclusive and mutually exclusive. We collected information on time spent for clinic activities, outreach sessions, field visits, school visits, meetings and data management. We collected data on clinic duty during the observation sessions. In addition, we interviewed FHWs with a semi-structured questionnaire regarding the various phases of non-clinic duty for which observations were not possible.

Data analysis. We estimated the absolute time allotted to different categories of tasks and calculated the overall proportion of time spent by task, including weighted means and confidence intervals (CI).

Identification of performance determinants

Sampling. We selected FHWs at random from the district personnel records. We estimated the sample size using a subcentre population ≤6000 (average population served by a FHW) as the key parameter that would be of interest for comparisons, with equal proportions of participants with and without the characteristic. The prevalence of above-average performance in 3-antenatal check-up coverage was 32% among FHWs who served a population ≤6000. To detect a prevalence ratio (PR) of 2.5, the Epi Table software (Epi-Info, Centers for Disease Control, Atlanta, GA, USA) generated a sample size of 40 FHWs. Adding 5% for incomplete responses, we obtained a sample size of 42.

Data collection for characteristics used for comparisons. We used a pre-tested, self-administered, structured questionnaire in Bengali, the local language, to collect data from FHWs on 5 broad categories of potential predictors of performance. These were (i)

planning and management, (ii) work-load, (iii) time-related factors, (iv) facilities at the subcentre, (v) supervision and monitoring, and (vi) community support.

Data collection for performance outcomes. We extracted data on the performance of FHWs from subcentre records. These addressed (i) coverage of the first DPT-booster among 16–24-month-old children, (ii) coverage of 3 antenatal check-ups, and (iii) proportion of unprotected couples accepting sterilization, intrauterine device or oral pills. We selected these performance indicators because of their highest variability among FHWs, as per a pilot review of records in 5 randomly chosen administrative blocks.

Data analysis. We estimated mean, median, range, inter-quartile range and frequencies for different characteristics of the FHWs. We set the cut-off level for comparisons as the mean of the study subjects, except for floor space (median) that had a skewed distribution. Programme goals of the government were either too high or too low to discriminate. We calculated the PR of good performance and CIs among those with and without the comparison characteristics. We stratified the analysis to identify effect modifiers and confounding factors. We estimated the power of the study with reference to different comparison criteria. We used Epi Info and Epi Table software (CDC, Atlanta, GA, USA) for data analysis.

Quality assurance, human subjects protection

We subjected the protocol to peer review, translated the questionnaires into Bengali and back-translated them into English. We pilot-tested all instruments on 4 FHWs. We double-entered the data into computers. We explained the research nature of the project, assured the participants that they would not suffer any consequence for the findings, ensured confidentiality through codes and took written consent. We obtained clearance from the Ethical Committee of the National Institute of Epidemiology (NIE, under the Indian Council of Medical Research, ICMR), Chennai, Tamil Nadu.

RESULTS

We recruited 42 FHWs from whom we obtained complete responses. They were scattered over 30 of 51 community development blocks in the 2 districts. We collected data on time allocation by activities from 26 of the 42 FHWs.

General characteristics

Each FHW served a population size that averaged 6495 (Table I). Only 1 of the 42 FHWs resided within her subcentre area. Four of the 42 FHWs had to travel >1 km on foot or by hired vehicle to reach their subcentre. FHWs spent an average of 16.4 hours per week in travel between their home and their duty station and an average of 27.3 hours per week at work.

TABLE I. Working environment of female health workers, South and North-24 Parganas districts, West Bengal, India, 2007

Characteristic	Mean	Median	Range	Interquartile range
Subcentre population load	6495	6422	3100–10 232	5225–8037
Average distance from villages served (km)	2.6	2.6	0.9–6.0	1.8–3.0
Time commuting from home to work each week (hours)	16.4	14.5	5.8–38.0	11.6–19.9
Time spent at the work place per week (hours)	27.3	25.9	18.8–40.0	24.5–30.0
Floor space in subcentre clinic (sq. feet)	162	142	40–475	114–192

TABLE II. Proportion of time allocated to different categories of tasks by female health workers, South and North-24 Parganas districts, West Bengal, India, 2007

Category of task	Mean (95% confidence interval)
Recording and reporting	26 (18–33)
Immunization of children and pregnant women	20 (14–27)
Ante- and post-natal maternal care (excluding immunization)	11 (8–15)
Meetings	11 (7–15)
Treatment of minor ailments	10 (6–13)
Family planning	5 (3–7)
Child care	5 (3–6)
Care for malaria, leprosy and tuberculosis	2 (1–3)
Health education	2 (1–2)
Fund management	1 (1–2)
Others	7 (5–10)
Total	100

Quantification of tasks

Data recording and reporting accounted for 26% (95% CI 23%–29%) of the total work of FHWs, the largest proportion of time allocated to any single task (Table II). Immunization required the second highest allocation (20%); 5% and 2% of time was allocated to family planning and general health education, respectively. The FHWs spent an average of 13 hours per week in the subcentre clinic. They used 0.7% (95% CI 0.4%–1%) and 25% (95% CI 18%–32%) of the clinic hours on general health education and data management work, respectively, and spent an average of 3.6 hours per week on reporting at home. They used 1% of their working hours (0.4 of 29.8 hours) for fund management.

Factors associated with DPT booster coverage

Holding the standard, recommended number of sessions (i.e. 4 or more sessions per month including 2 outreach sessions) was not associated with a higher than average DPT booster coverage. However, FHWs who optimized their immunization sessions with a minimum number of 17 beneficiaries performed better than average in DPT-booster coverage (PR 2.0; 95% CI 1.1–3.6; Table III). FHWs serving a population of ≤6000 were less likely to have a DPT-booster coverage above average, possibly because FHWs covering smaller population sizes were less likely to optimize their immunization sessions (PR 0.2; 95% CI 0.1–0.7, data not shown). FHWs who followed a time-saving strategy for contraceptive motivation performed better in DPT-booster coverage too. Those monitored monthly for individual performance, as well as those who saw good work appreciated had better coverage. Coverage was higher in subcentres with more than 142 sq. feet of floor space. FHWs who updated only the family register performed better (PR 2.5; 95% CI 1.2–5.3; stratified analysis, data not shown) than those maintaining both the family and subsidiary registers (PR 1.1; 95% CI 0.54–2.1). Prioritization of houses was associated with better performance only among FHWs spending more time at work than the average (PR 1.7; 95% CI 1.1–2.8; stratified analysis, data not shown).

Factors associated with antenatal care coverage

FHWs who used clinic attendance for health education performed better in 3-antenatal check-up coverage (PR 2.1; 95% CI 1.1–3.8). Monthly visit of trained birth attendants at the subcentre was also associated with better service coverage (PR 2.2; 95% CI 1.5–3.1).

FHWs spending less time on travel performed better. However, this was no longer significant once adjusted for use of clinic attendance for health education (adjusted PR 1.8; 95% CI 0.84–3.9; Table IV). FHWs who had privacy for examination had better antenatal check-up coverage. FHWs who saw good work being appreciated had lower coverage.

Factors associated with family planning coverage

FHWs serving a population of ≤6000 and those who had provision for privacy performed better family planning services (PR 2.0; 95% CI 1.0–3.9 and PR 2.5; 95% CI 1.2–5.2, respectively; Table V). Monthly monitoring of individual performance and appreciation of good work were not associated with better performance. More than one supervisory visit in a month was not associated with better performance in any of the 3 services (Tables III to V). Similarly, performance did not differ significantly if community leaders were present in the meetings or involved in community motivation (Tables III to V). However, calculated statistical power for these comparisons ranged from 12% to 38%. So, we could not exclude a significant association.

DISCUSSION

Floor space was associated with higher DPT booster coverage in our study. Limited floor space caused overcrowding and discomfort, while sufficient area allowed focus and facilitated communication. In addition, performances in antenatal check-up coverage and family planning services were better where the subcentre had arrangements for privacy. Although floor space by itself was not associated with antenatal check-up or family planning performance, a private place for examination cannot be secured in the absence of sufficient floor space. Among the FHWs who did not have private space for examination, more than one-third cited lack of space as the reason for absence of privacy. Good infrastructure contributes to the motivation of healthcare workers.[7] In addition, availability of equipment and supplies improves performance.[8,9] More specifically, in Egypt, availability of arrangements for privacy was associated with better intrauterine device coverage.[10] The National Rural Health Mission is providing funds to construct new subcentre buildings. These will have 550 sq. feet of floor space and one separate examination room, thereby addressing floor space and privacy. However, it will take time to construct 850 subcentres to replace the current rented accommodations in the 2 districts.

Quantification of the tasks of the FHWs indicated that they spent the largest share of their time in documentation. This exceeded the 23% time spent on all non-clinical activities among primary care health workers in Jordan.[5] FHWs have to submit a general 10-page report and 6 other reports every month. In addition, 2 weekly surveillance reports are requested. Maintenance of a subsidiary register recording individual services in addition to the family register was associated with a lower DPT-booster coverage. These subsidiary registers provided no extra information but were easier to use for the FHWs. Overburdened community health workers are overwhelmed and stressed.[11,12] Improvement, minimization and streamlining of documentation activities would save time, decrease pressure and enable more focus on healthcare delivery.

The inputs needed to make the community health worker programme successful are often underestimated.[1] Faced with a large workload, FHWs had to use their time wisely to be effective. FHWs with various management skills that reflected a mental mapping of the tasks to be done performed better according to our

TABLE III. Performance of female health workers in DPT-booster coverage according to selected performance determinants, South and North-24 Parganas district, West Bengal, India, 2007

Determinant	Above-average DPT-booster coverage* according to characteristics						Prevalence ratio (95% confidence interval)
	Among those with			Among those without			
	n	Total	%	n	Total	%	
Planning and management							
House visits prioritized	4	8	50	12	27	44	1.1 (0.50–2.5)
Standard number of monthly immunization sessions	20	38	53	1	4	25	2.1 (0.38–12)
Optimized immunization sessions with ≥17 beneficiaries	12	17	71	9	25	36	2.0 (1.1–3.6)
Family register updated at 1–3-week intervals	8	14	57	13	28	46	1.2 (0.67–2.3)
Subsidiary registers updated at 1–3-week intervals	16	31	52	5	11	46	1.1 (0.55–2.4)
Opportunistic planning before outreach sessions	18	29	62	3	13	23	2.7 (0.96–7.6)
Clinic attendance used for health education	13	20	65	8	22	37	1.8 (0.94–3.4)
Time saving strategy for family planning motivation	9	11	82	12	31	39	2.1 (1.3–3.6)
Meeting with Anganwadi workers >1 a month	16	32	50	5	10	50	1.0 (0.49–2.0)
Visited by trained birth attendants at least once a month	5	7	71	16	35	46	1.6 (0.86–2.8)
Opinion leaders used for community motivation	17	32	53	4	10	40	1.3 (0.58–3.0)
Work-load							
Population of subcentre ≤6000	5	17	29	16	25	64	0.46 (0.21–1.0)
Male health worker in position at the subcentre	9	15	60	12	27	44	1.4 (0.75–2.4)
Time factors							
Time spent on journey <average (16.4 hours/week)	12	26	46	9	16	56	0.82 (0.45–1.5)
Time spent at work >average (27.3 hours/week)	13	18	72	8	24	33	2.2 (1.2–4.1)
Residence within the block	8	17	47	13	25	52	0.90 (0.48–1.7)
Facilities at subcentre							
Floor space >median (142 sq. feet)	15	21	71	6	21	29	2.5 (1.2–5.2)
Secured storage space	17	32	53	4	10	40	1.3 (0.58–3.0)
<1 km from stoppage of public vehicle	20	38	53	1	4	25	2.1 (0.38–12)
Supervision and monitoring							
Involvement of health supervisor in problem-solving	15	31	48	6	11	55	0.89 (0.46–1.7)
Visit of superiors >1 a month	2	5	40	19	37	51	0.78 (0.25–2.4)
Monthly individual performance monitoring	18	28	64	3	14	21	3.0 (1.1–8.5)
Perception that good work is appreciated	17	25	68	4	17	24	2.9 (1.2–7.1)
Community support							
Community leader attended ≥80% of meetings	13	21	62	8	21	38	1.6 (0.86–3.1)
Community leaders involved in community motivation	7	11	64	14	31	45	1.4 (0.78–2.6)

* threshold 79% (average coverage)

performance indicators. First, for antenatal check-up, use of clinic contact for health education and maintenance of regular contacts with trained birth attendants was associated with better coverage. Second, for family planning, FHWs who used their time efficiently (e.g. prioritization of potential beneficiaries and use of existing opportunities to communicate with them) performed better. The benefit of these time-saving strategies for family planning actually spilled over in terms of DPT-booster coverage, because of overlaps in target groups and topics. In the area of immunization, optimizing the sessions with a maximum number of beneficiaries was associated with better performance. Training of community health workers is an important determinant of performance.[1] However, training should not be limited to subject matter topics. Training programmes should also develop managerial skills among FHWs so that they could use their time efficiently.

DPT-booster coverage was higher among FHWs whose individual performances were monitored monthly and those whose performance was appreciated. However, our study did not point to a benefit of supportive supervision in the areas of antenatal check-ups or family planning. In the study area, managers reviewed individual performance only for immunization indicators. This strict focus of attention towards immunization did not benefit other services. Supportive supervision is a well-identified motivator

for healthcare workers.[7] Appreciation of the work done by the supervisors was a strong motivator for rural health workers in Vietnam.[13] Furthermore, recognition and performance feedback were associated with better performance in Armenia.[4] While supervision is often quoted and underlined,[11,14,15] the specific practices or activities that are effective during a supervision visit are not always clear.[16] Since our study pointed to the effectiveness of supervision in the field of immunization, the techniques and approaches used there should be replicated for other areas of health services delivery.

Our study had three main limitations. First, the study was powered for PRs of 2. However, 69 of 84 PRs were below this value. Of these, 66 (96%) were non-significant. Thus, we lacked power and may have failed to identify associations between some determinants and outcomes. However, those associations that we identified as significant would not be affected. Second, this being a cross-sectional study, it was not possible to formally ascertain the direction of the cause–effect relationships. For example, appreciation of the work performed may have been a cause or a consequence of the high DPT booster coverage. Thus, the direction of the causality, if any, cannot be ascertained in the case of this association. Third, our small sample size and our low power limited our capacity to conduct a meaningful multivariate analysis.

TABLE IV. Antenatal check-up performance of female health workers according to selected performance determinants, South and North-24 Parganas districts, West Bengal, India, 2007

Determinant	Above-average antenatal check-ups* according to characteristics						Prevalence ratio (95% confidence interval)
	Among those with			Among those without			
	n	Total	%	*n*	Total	%	
Planning and management							
House visits prioritized	3	8	38	20	34	59	0.64 (025–1.6)
Optimized immunization sessions with ≥17 beneficiaries	10	17	59	13	25	52	1.1 (0.65–2.0)
Family register updated at 1–3-week intervals	5	14	36	18	28	64	0.56 (0.26–1.2)
Subsidiary registers updated at 1–3-week intervals	18	31	58	5	11	46	1.3 (0.63–2.6)
Opportunistic planning before outreach sessions	17	29	59	6	13	46	1.3 (0.66–2.5)
Clinic attendance used for health education	15	20	75	8	22	36	2.1 (1.1–3.8)
Time saving strategy for family planning motivation	7	11	64	16	31	52	1.2 (0.70–2.2)
Meeting with Anganwadi workers >1 a month	20	32	63	3	10	30	2.1 (0.78–5.6)
Visited by trained birth attendants at least once a month	7	7	100	16	35	46	2.2 (1.5–3.1)
Opinion leaders used for community motivation	20	32	63	3	10	30	2.1 (0.78–5.6)
Work-load							
Population of subcentre ≤6000	12	17	71	11	25	44	1.6 (0.94–2.7)
Male health worker in position at the subcentre	5	15	33	18	27	67	0.50 (0.23–1.1)
Average distance of the villages <mean (2.6 km)	11	21	52	12	21	57	0.92 (0.53–1.6)
Time factors							
Time spent on journey <average (16.4 hours/week)	18	26	69	5	16	31	2.2 (1.0–4.8)
Time spent at work >average (27.3 hours/week)	9	16	56	14	26	54	1.1 (0.60–1.8)
Facilities at subcentre							
Private space available for case examination	15	21	71	8	21	38	1.9 (1.0–3.5)
Floor space >median (142 sq. feet)	12	21	57	11	21	52	1.1 (0.63–1.9)
Secured storage space	17	32	53	6	10	60	0.89 (0.49–1.6)
Toilet for female attendees	8	12	67	15	30	50	1.3 (0.78–2.3)
Supervision and monitoring							
Technical supervision of worker by health supervisor	21	36	58	2	6	33	1.8 (0.55–5.6)
Involvement of health supervisor in problem-solving	20	31	65	3	11	27	2.4 (0.87–6.4)
Visit of superiors > once a month	3	5	60	20	37	54	1.1 (0.51–2.4)
Monthly individual performance monitoring	14	28	50	9	14	34	0.78 (0.45–1.3)
Perception that good work is appreciated	10	25	40	13	17	77	0.52 (0.30–0.9)
Community support							
Community leader attended ≥80% of meetings	9	21	43	14	21	67	0.64 (0.36–1.2)
Community leaders involved in community motivation	6	11	55	17	31	55	0.99 (0.53–1.9)

* threshold 66% (average performance in terms of coverage of 3 visits)

In summary, we identified 4 groups of determinants of good performance for FHWs. These included (i) adequate infrastructure (floor space and privacy), (ii) a capacity to focus on essential documentation activities, (iii) planning and management skills and (iv) supportive supervision. On the basis of these conclusions, we suggest 4 main recommendations.

1. Subcentres need to be upgraded as per the norms of the National Rural Health Mission to satisfy the requirements of privacy and floor area.
2. The data management system needs to be revised and optimized to eliminate duplication of records or registers.
3. Induction and on-the-job training must impart basic planning and management skills among FHWs so that they can prioritize activities, handle multiple tasks and use all existing opportunities.
4. Supervisors must extend effective supervision for immunization and apply it to other areas of work. This includes monthly monitoring of individual performances and recognition of good work.

Such multifaceted interventions are more likely to be effective in improving community health worker programmes.[17] In the future,

better operational research projects with more statistical power may further refine our findings. Meanwhile, monitoring and evaluation plans, possibly with the use of Lot Quality Assurance Sampling (LQAS),[18] could evaluate the impact of the interventions we propose.

REFERENCES

1 WHO. *Community health workers: What do we know about them? The state of the evidence on programmes, activities, costs and impact on health outcomes of using community health workers*. Geneva:Evidence and Information for Policy, Department of Human Resources for Health, WHO; 2007. Available at *http://www.who.int/hrh/documents/community_health_workers_brief.pdf* (accessed on 9 June 2009).
2 WHO. *Working together for health: The World Health Report 2006*. Geneva, Switzerland:WHO; 2006. Available at *http://www.who.int/whr/2006/whr06_en.pdf* (accessed on 9 June 2009).
3 Franco L, Bennett S, Kanfer R, Stubblebine P. Determinants and consequences of health worker motivation in hospitals in Jordan and Georgia. *Soc Sci Med* 2004;**58:** 343–55.
4 Fort AL, Voltero L. Factors affecting the performance of maternal health care providers in Armenia. *Hum Resour Health* 2004;**2:**8.

TABLE V. Family planning performance of female health workers according to selected performance determinants, South and North-24 Parganas district, West Bengal, India, 2007

Determinant	Above-average family planning performance* according to characteristics						Prevalence ratio (95% confidence interval)
	Among those with			Among those without			
	n	Total	%	*n*	Total	%	
Planning and management							
House visits prioritized	4	8	50	17	34	50	1.0 (0.46–2.2)
Optimized immunization sessions with ≥17 beneficiaries	8	17	47	13	25	52	0.91 (0.48–1.7)
Family registers updated at 1–3-week intervals	6	14	43	15	28	54	0.80 (0.40–1.6)
Subsidiary registers updated at 1–3-week intervals	15	31	48	6	11	55	0.89 (0.46–1.7)
Opportunistic planning before outreach sessions	13	29	45	8	13	62	0.73 (0.40–1.3)
Clinic attendance used for health education	13	20	65	8	22	36	1.8 (0.94–3.4)
Time saving strategy for family planning motivation	9	11	82	12	31	39	2.1 (1.3–3.6)
Meeting with Anganwadi workers > once a month	14	32	44	7	10	70	0.63 (0.36–1.1)
Visited by trained birth attendants at least once a month	4	7	57	17	35	49	1.2 (0.57–2.4)
Opinion leaders used for community motivation	18	32	56	3	10	30	1.9 (0.69–5.1)
Work-load							
Population of subcentre ≤6000	12	17	71	9	25	36	2.0 (1.0–3.9)
Male health worker in position at the subcentre	8	15	53	13	27	48	1.1 (0.60–2.1)
Time factors							
Time spent on travel <average (16.4 hours/week)	15	26	58	6	10	60	1.5 (0.75–3.1)
Time spent at work >average (27.3 hours/week)	12	28	67	9	24	38	1.8 (0.96–3.3)
Residence within the block	11	17	65	10	25	40	1.6 (0.89–2.9)
Facilities at subcentre							
Private space available for case examination	15	21	71	6	21	29	2.5 (1.2–5.2)
Floor space >median (142 sq. feet)	11	21	52	10	21	48	1.1 (0.60–2.0)
Secured storage space	18	32	56	3	10	30	1.9 (0.69–5.1)
Toilet for female attendees	9	12	75	12	30	40	1.9 (1.1–3.2)
Supervision and monitoring							
Technical supervision of worker by health supervisor	19	36	53	2	6	33	1.6 (0.49–5.1)
Involvement of health supervisor in problem-solving	15	31	48	6	11	55	0.89 (0.46–1.7)
Visit of supervisors >once a month	2	5	40	19	37	51	0.78 (0.25–2.4)
Monthly individual performance monitoring	14	28	50	7	14	50	1.0 (0.53–1.9)
Perception that good work is appreciated	13	25	52	8	17	47	1.1 (0.59–2.1)
Community support							
Community leader attended ≥80% of meetings	11	21	52	10	21	48	1.1 (0.60–2.0)
Community leaders involved in community motivation	6	11	55	15	31	48	1.1 (0.59–2.2)

* threshold 6.1% (average proportion of unprotected eligible couples accepting family planning measure in the reference period)

5 Khoury SA, Mawajdeh S. Performance of health providers in primary health care services in Jordan. *East Mediterr Health J* 2004;**10:**372–81.

6 Nelson EC, Jacobs AR, Breer PE. A study of the validity of the task inventory method of job analysis. *Med Care* 1975;**13:**104–13.

7 Willis-Shattuck M, Bidwell P, Thomas S, Wyness L, Blaauw D, Ditlopo P. Motivation and retention of health workers in developing countries: A systematic review. *BMC Health Serv Res* 2008;**8:**247.

8 Fagbule D, Kalu A. Case management by community health workers of children with acute respiratory infections: Implications for national ARI control programme. *J Trop Med Hyg* 1995;**98:**241–6.

9 Curtale F, Siwakoti B, Lagrosa C, LaRaja M, Guerra R. Improving skills and utilization of community health volunteers in Nepal. *Soc Sci Med* 1995;**40:**1117–25.

10 Hong R, Montana L, Mishra V. Family planning services quality as a determinant of use of IUD in Egypt. *BMC Health Serv Res* 2006;**6:**79.

11 Manongi RN, Marchant TC, Bygbjerg IC. Improving motivation among primary health care workers in Tanzania: A health worker perspective. *Hum Resour Health* 2006;**4:**6.

12 Haq Z, Iqbal Z, Rahman A. Job stress among community health workers: A multi-method study from Pakistan. *Int J Ment Health Syst* 2008;**2:**15.

13 Dieleman M, Cuong PV, Anh LV, Martineau T. Identifying factors for job motivation of rural health workers in North Viet Nam. *Hum Resour Health* 2003;**1:**10.

14 Haines A, Sanders D, Lehmann U, Rowe AK, Lawn JE, Jan S, *et al.* Achieving child survival goals: Potential contribution of community health workers. *Lancet* 2007;**369:**2121–31.

15 Kelly JM, Osamba B, Garg RM, Hamel MJ, Lewis JJ, Rowe SY, *et al.* Community health worker performance in the management of multiple childhood illnesses: Siaya District, Kenya, 1997–2001. *Am J Public Health* 2001;**91:**1617–24.

16 Bosch-Capblanch X, Garner P. Primary health care supervision in developing countries. *Trop Med Int Health* 2008;**13:**369–83.

17 Rowe AK, de Savigny D, Lanata CF, Victora CG. How can we achieve and maintain high-quality performance of health workers in low-resource settings? *Lancet* 2005;**366:**1026–35.

18 Bhuiya A, Hanifi SM, Roy N, Streatfield PK. Performance of the lot quality assurance sampling method compared to surveillance for identifying inadequately-performing areas in Matlab, Bangladesh. *J Health Popul Nutr* 2007;**25:**37–46.