Future Health Systems
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WORKING PAPER 2 | BANGLADESH SERIES

Rapid methods for monitoring the utilization of healthcare facilities by the poor: Findings from a pilot project in rural Bangladesh

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Bhuiya A[1], Hanifi SMA[1], Chowdhury M[2], Jahangir Md.[3], Gwatkin D R[4]

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1 – ICDDR,B; 2 – BRAC, 3 – Government of Bangladesh, 4 – Independent Consultant

Preface

The aim of the Future Health Systems (FHS) Research Programme Consortium Future Health Systems is to find ways to translate political and financial commitments to meet the health needs of the poor. The consortium addresses fundamental questions about the design of future health systems, and work closely with actors who are leading the transformation of health systems in their new realities. This consortium addresses fundamental questions about the design of future health systems, and works closely with people who are leading the transformation of health systems in their own countries. Our research themes are:

- Protecting the poor against the impact of health-related shocks
- Developing innovations in health provision
- Understanding health policy processes and the role of research

Working papers are intended to make available initial findings and ideas from the research of members of the consortium. These are scholarly inquiries aimed at provoking further discussion and investigation. Comments and suggestions on these papers are welcome, and can be directed to the authors.

The FHS consortium is appreciative of the support provided by the United Kingdom Department for International Development (DFID). The ideas represented in these papers are the responsibility of the authors, and do not reflect the policies of DFID.

Future Health Systems is a Research Programme Consortium supported by the UK Department for International Development. Partners are Johns Hopkins Bloomberg School of Public Health, USA; China Health Economics Institute; ICDDR,B, Bangladesh; Indian Institute of Health Management Research; Institute of Development Studies, UK; Makerere University School of Public Health, Uganda; University of Ibadan, Nigeria
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Introduction

There has been growing concern about the inequities in the utilization of health care services by the socially disadvantaged in any setting. Health programme personnel always aim to increase the level of utilization of the services they provide to people from all segments of society. Despite all-out efforts, the utilization rates are quite often inversely correlated with the socioeconomic status or any other marker of disadvantageousness that identify a population group. Focused attention given to the disadvantaged groups can be of help in improving the situation. A prerequisite for focusing attention is monitoring of the service utilization by the disadvantaged group with a known degree of reliability. Commonly, data from surveillance and cross sectional surveys are used to assess the level of utilization of the services by populations from various socioeconomic groups, and especially by the most disadvantaged among them. Surveillance, being very resource intensive is not quite practical for this purpose. Cross sectional surveys, especially the thirty cluster sampling (Henderson & Sundaresan, 1982) scheme, with 210 respondents are considered to be reasonably practical and has been in use for monitoring the coverage of EPI services for quite some time. In fact, the task of covering 210 respondents from the targeted socioeconomic group per catchment area of a service facility is not so small a task when a large number of service facilities are to be monitored. In addition the task of data analysis and their interpretation also becomes technical, requiring expertise beyond the domain of programme management.

The other method which has recently been discussed is the use of the benefit incident ratio technique in monitoring the utilization of services by the poor or any other disadvantaged group in the society. The method is simple to some extent, but nevertheless, involves complex statistical manipulation. In this respect, there is a clear need for innovations in monitoring service utilization by the most disadvantaged sections of society.

Other than the abovementioned methods, there has not been any simple and less resource demanding method which can be practically used by the programme managers at the facility level. Some of the methods which are used in the industrial sectors for quality control, has the potential for adoption in monitoring service utilization in general and by the most disadvantaged in particular. Such techniques include lot quality assurance sampling (LQAS) and sequential sampling techniques. The LQAS method is more rapid, simple and time efficient (Jutand & Salamon, 2000), and may be less costly than many others (Singh, Jain, Sharma, & Verghese, 1996), for it is based on a much smaller sample size. LQAS is also found to be effective in improving public health services like immunization coverage by identifying low performing areas (Lanata, Stroh, Jr.Black, & Gonzales, 1990; Tawfik, Hoque, & Siddiqi, 2001). The sequential sampling method is quite similar to LQAS, needing a smaller sample size than cross sectional or fixed sample schemes.

Keeping the above in mind, the present exercise applied benefit incidence, LQAS and sequential sampling methods in monitoring the utilization of health services by the poorest section of the population in two upazilas in Bangladesh. The practical challenges in adopting the methods and the consistency in the conclusions made by using the three methods have been examined and their possible use has been discussed.

Methods and Materials

The project areas

The project was implemented in Nabinagar upazila of Brahmanbaria district and Shibalaya upazila of Manikganj district. Nabinagar is situated around 50 kilometers east of Dhaka while Shibalaya is situated 30 kilometers from Dhaka. Nabinagar is remote and has been one of the lowest performing areas in the country in terms of health and family planning. Shibalaya is closed to Dhaka and one of the high performing areas in the country (NIPORT, August 2003).

Shibalaya Upazila consists of 7 union parishads and has a population of 159,837. The population density is 803 per square kilometers (BBS, July 2003). 30.3% of the main earners of households were involved in daily wage related activities like rickshaw pulling or employment in agriculture or construction. 48.0% of main earners cannot read or write. In this area, about 6.2% of households had no land and 50.3% had less than 50 decimals of land. 28.9% of households had a television, 25.5% had a radio, 65.8% had a clock, 15.4% had a phone, and 35.6% had a bicycle. The Shibalaya Upazila Health Complex was established in 1965. Annually, about 28,000 people attend the health complex to take health services. In addition, a private clinic has been providing health services in the upazila since January 2006. Seven Union Health and Family Welfare Centers (UHFWC) have been providing health services at union level and nearly 10,000 patients attend a UHFWC on average, annually.

Nabinagar Upazila consists of 20 union parishads and has a population of 428,250. The population density is 1,209 per square kilometer (Population Census 2001, BBS). 28.5% of the main earners of households are involved in daily wage related activities like rickshaw pulling or employment in agriculture or construction. 52.0% of main earners cannot read or write. In this area, about 5.1% of households had no land and 59.0 % had less than 50 decimals of land. 23.0% of households had a television, 31.5% had a radio, 66.9% had a clock, 15.5% had a phone, and 6.1% had a bicycle. The Nabinagar Upazila Health Complex (UHC) has been providing health care services at the upazila level since 1981. Around 30,000 people visit the UHC for health services annually. A private health clinic located at the upazila headquarters has also been providing health care services since 2000. The

private clinic charges the patients on a sliding scale based on household economic status- 50 taka (around 70 US cents) from the better-off and 30 taka from the poor. At the union level, public health services have been provided through the UHFWC run by the public sector. There are 19 UHFWCs in Nabinagar and nearly 6,000 patients attend a UHFWC on average, annually.

Methods of data collection

A survey in the community was carried out in both the areas during August 2005 to obtain a distribution of households by socioeconomic status. The survey was carried out among 600 households in each upazila, which were selected using a two stage sampling scheme. At the first stage, the villages were selected by using probability proportional to size (PPS) technique, and at the second stage 20 households were systematically randomly chosen from the selected villages. Information on household socioeconomic status was collected from the head of the household or any informed member in the absence of the head of the household by using a questionnaire.

Data on socioeconomic indicators similar to the ones included in the community survey were collected from the attendees at the UHC, union health and family welfare centres, satellite clinics, EPI sessions and private clinics. Table 1 provides more information on the coverage of the survey in the various facilities.

Table 1: Sampling methods used and length of data collection for health facility monitoring

Facilities	Scope	Duration of data collection	
		Phase 1	Phase 2
UHC	Covered all units of each UHC	One week	One month
UHFWC	Three unions selected from each site, one from within 5 kilometers, one from 10-12 kilometers, and one from more than 15 kilometers	One week	One month
EPI sessions (Village)	From the monthly activity plan, 3 sessions were selected randomly out of 24. Total of 9 sessions were observed from each site.	Nine days	-
Satellite clinic sessions	From the monthly activity plan, 2 sessions were selected randomly out of 8. Total of 6 sessions were observed from each site	Six days	-
Private clinic	One from each site covering all units	One week	One month

Table 2: Number of attendees interviewed from various facilities

Interview status	Number of attendees					
Phase one	Community (%)	UHC (%)	UHFWC (%)	EPI (Village) (%)	SC (%)	Private clinic (%)
Interviewed	91.9	97.2	100.0	100.0	100.0	100.0
Nabinagar	92.7	97.6	100.0	100.0	100.0	100.0
Shivalaya	91.2	96.2	100.0	100.0	100.0	100.0
Absent	8.1	0.0	0.0	0.0	0.0	0.0
Nabinagar	7.3	0.0	0.0	0.0	0.0	0.0
Shivalaya	8.8	0.0	0.0	0.0	0.0	0.0
Refused	0.0	2.8	0.0	0.0	0.0	0.0
Nabinagar	0.0	2.4	0.0	0.0	0.0	0.0
Shivalaya	0.0	3.8	0.0	0.0	0.0	0.0
Total	1200	2491	1060	792	271	418
Nabinagar	600	1755	816	816	176	262
Shivalaya	600	736	244	244	95	156
Phase two	Not done			Not done	Not done	
Interviewed	Not done	95.3	97.3	Not done	Not done	96.7
Nabinagar		94.8	97.4			96.2
Shivalaya		96.6	96.6			99.6
Absent	Not done	0.0	0.0	Not done	Not done	0.0
Nabinagar		0.0	0.0			0.0
Shivalaya		0.0	0.0			0.0
Refused	Not done	4.7	2.7	Not done	Not done	3.3
Nabinagar		5.3	2.6			3.8
Shivalaya		3.4	3.4			0.4
Total	Not done	9684	3025	Not done	Not done	1801
Nabinagar		6848	2642			1539
Shivalaya		2836	383			262

Identification of Poor

Assets and quantity of land owned by the households, occupation, reading, and writing capacity of the main income earner were used to identify poor households.

Methods of Data Analysis

Benefit Incident Ratio

Data were analyzed to assess the performance of the facilities in terms of reaching the poor. The poor were identified on the basis of weighted asset scores where the weights were obtained from principal component analysis of the assets owned by the households in the community. Scores were divided into quintiles and households from the lowest quintile were considered as poorest. The asset index for a household was calculated by summing the score based on assets owned weighted by weighing factors derived from principal component analysis. The resulting index was standardized to have a mean of zero and a

standard deviation of one (Filmer & Pritchett, 2001; Gwatkin, Rustein, Johnson, Suliman, & Wagstaff, 2003). The households in the community were divided into quintiles based on asset scores implying that the households in the lowest quintile are the poorest and those in the highest quintiles are the richest in the community. Details of the methods can be found elsewhere (Hotelling, 1933).

Facility level index for the attendees' households was calculated from the asset data obtained from the attendees, using the weights associated with various assets derived from the community data. The households of the attendees in the facility were also divided into five groups on the basis of asset index scores using the cut off points of quintiles for the community. Proportions of attendees in the facilities by asset quintiles were compared with those of the communities. If the proportion of households of the attendees in each of the five quintiles were 20%, then the populations from the various asset quintiles in the community can be thought to be equally represented. Any deviation from 20% would indicate under or over representation of the population of that quintile.

In assessing the utilization of the services by the poor defined by the reading and writing ability of the main income earner, distribution of households in the community by the reading and writing capacity was calculated from the community survey. A similar distribution for the patients attending the facilities was also calculated by the reading and writing capacity of the main earners. The distributions derived from the community survey were compared with those derived from the patients to see any deviation from the community distribution. As with asset quintiles this allows one to examine whether the representations of the members from the households with earner without reading capacity are at per with their share in the community. In a similar way it can be done with any other indicators used for categorizing poor households.

Sequential sampling

The sequential sampling method was applied to assess the performance of the facilities in serving the poor. In sequential test procedures the sample size needed to make a decision is not known in advance but rather determined by the sample results. In the sequential method, sample information is processed and evaluated as it becomes available, rather than at the end of the sampling process, as is done in fixed sample methods. The procedure continues to collect information only until enough evidence is available to make a decision confidently. The procedure was first developed by Wald (1947). The procedure determines a likelihood ratio after each observation is made, whether enough information is available to accept or reject the null hypothesis. Let us assume that L_1 represents the likelihood function of the sample result with k samples when H_1 is true, and let L_0 represent the likelihood function

when H_0 is true. The ratio L_1/L_0 is the likelihood ratio. When this ratio is large, the evidence points to H_1. When it is small, the evidence points to H_0. Intermediate values are inconclusive. A sequential test can be performed by calculating L_1/L_0 after each new observation is available by applying the following:

1. Stop with a reject H_0 decision if $L_1/L_0 > A$ (h_2+sk);
2. Stop with an accept H_0 decision if $L_1/L_0 < B$ $(-h_1+sk)$; and
3. Continue to sample is $B \leq L_1/L_0 \leq A$.

Boundary values of A and B are chosen to satisfy Type I and Type II error specifications for the hypothesis test. Letting α and ß represent probabilities of these errors respectively, A and B can be calculated according to

$A = (1- ß)/α, \qquad B = ß/(1-α).$

The calculation of L_1/L_0 for each observation is tedious, but it can be shown mathematically that comparing L_1/L_0 to A and B for each observation is equivalent to comparing with h_2+sk and $-h_1+sk$ respectively, where

$r1= \ln(p_1/p_0)$, $r2=\ln[(1-p_0)/(1-p_1)]$
$a=\ln A= \ln\{(1- ß)/α$, $b= -\ln B=\ln[(1- α)/ß]$
$s= r_2/(r_1+r_2)$, $h_1=b/(r_1+r_2)$, $h_2=a/(r_1+r_2)$

In a plot of dk (cumulative number of non-conformities) versus k (observation) $dk=-h_1+sk$ and $dk=h_2+sk$ represent parallel lines, namely the “accept” and “reject” boundary lines. The test can be carried out by simply plotting dk versus k for each observation and continuing to sample until either the accept or reject boundary is crossed. In practice, now-a-days, one can get the values calculated by using a software and produce a table or a chart quite easily. For more details on sequential sampling one can consult Wald and McWilliams (McWilliams, 1988; Wald, 1947).

In our case the equivalent of non-conformities in terms of quality of industrial product was the number of patients from quintiles other than the lowest quintile. We performed the assessment at three levels of utilization by the non-poor: a) 20% as the lower limit and 40% as the upper limit (equivalent to 80% and 60% in terms of poor); b) 40% as the lower limit and 60% as the upper limit (equivalent to 60% and 40% in terms of poor); and c) 60% as the lowest limit and 80% as the higher limit (equivalent to 40% and 20% in terms of poor). The calculation was done by using SISA software (SISA, Retrieved 20 Sep 2006). Table 4 and

Appendices 17,18 and 19 presents the upper and lower boundaries of numbers of non-poor for various numbers of patients to decide the acceptance or the rejection of the facility in serving the poor. The same findings are also presented in charts (Figures 4, 5, and 6; Appendices 8-16).

Lot Quality Acceptance Sampling (LQAS)

In LQAS, a defective article is defined as one that fails to conform to specifications in one or more quality characteristics. A common procedure in LQAS is to consider each submitted lot of product separately and to base the decision of acceptance or rejection of the lot on the evidence of one or more samples chosen at random from the lot (Grant & Leavenworth, 1988)

Any systematic plan for single sampling requires that three numbers be specified. One is the number of articles 'N' in the lot from which the sample is to be drawn. The second is the number of articles 'n' in the random sample drawn from the lot. The third is the acceptance number 'd'. The acceptance number is the maximum allowable number of defective articles in the sample. More than 'd' defectives will cause the rejection of the lot. For instance, if we have a situation with N=50, n=5, and d=0, it implies that "Take a random sample of size 5 from a lot of 50. If the sample contains more than 0 defectives, reject the lot; otherwise accept the lot." LQAS uses binomial probability to calculate the probability of accepting or rejecting a lot.

To apply the above in the context of monitoring utilization of health services by the poor, let us assume that the proportion of poor among the patients attending the facility is *p*. In a health facility with an infinitely large number of users, the probability *P(a)* of selecting a number *a* of poor in a sample size *n* is calculated as:

$$P(a) = \frac{n!}{a!(n-a)!} p^a q^{n-a}$$

Where *p* = the proportion of poor attending the health facility

q= (*1-p*)

n=the sample size

a= the number of individuals in the sample who are poor

n-a= the number of non-poor in the sample, usually denoted by *d*.

LQAS aids the investigator in choosing the sample size and the permissible value of *n-a* and interpreting the results. In order to use LQAS in the context of monitoring the utilization

of a facility, the following five initial decisions must be made (Rosero, Grimaldo, & Raabe, 1990; Valadez, 1991; Valadez & Bamberger, 1994).

1. Firstly, the services to assess. This is selected by the health systems manager. In our case, let it be the attendance in the outdoor services.

2. Second, the facility to monitor (e.g., UHC, union health and family welfare centre and the like).

3. Third, the target attendance to receive the services (e.g. any patient attending the facility, infants etc.).

4. Fourth, a triage system must be defined for classifying the level of usage by the poor as adequate, somewhat inadequate, and very inadequate. This needs to be decided by the programme managers, policy makers or other stakeholders related to the health service delivery.

5. Fifth, the levels of the provider and consumer risks[1]. In most cases it may be around 10-15%.

Using the information from the above five decisions, a series of operating characteristics (OC) curve[2], or their corresponding probability tables can be constructed with the above binomial formula. From the OC curves, one can select the sample size (i.e. *n*) and the number of non-poor allowed (i.e. d) in the LQAS sample for a given level of provider and consumer risk before deciding that a health area has inadequate utilization by the poor.

Let us assume that a consensus has been reached among the various stakeholders of the health service delivery in Bangladesh, that facilities with 80% or more poor in their users can be considered as performing adequately. While facilities with 50% or less poor patients ought to be considered as very inadequately performing and be identified for attention. The ones in the mid-range 50% to 80% may be considered somewhat fine and for the time being

[1] Provider risk – probability of wrongly classifying a facility as very unsatisfactory which can put the reputation of the facility at risk; Consumer risk – probability of wrongly classifying a very inadequately performing health facility as adequate which can put the poor in the area at health risk.

[2] An OC curve depicts the probabilities of accepting a lot based on the proportion of nonconformance in the lot, the sample size, and the value of *d,* allowable non-conformances. An OC curve enables decision makers to examine the possible risks involved.

they need no special attention. By using these information, probabilities of detecting "adequately performing" or "inadequately performing" health facilities can be calculated. Table 3 presents such probabilities along with provider and consumer risks for various combinations of sample sizes and maximum allowable non-poor patients in the sample.

Table 3. Example of the application of the LQAS methodology to detect the probability of 80% or 50% poor among the users in a health facility according to sample sizes ranging from 8 to 28, and number of non-poor cases ranging from 0 to 10.

Sample size (n)	No. in the sample non-poor (d)	Probability of detecting health facilities with 80% poor as adequate (a)	Probability of detecting health facilities with 50% poor as inadequate (b)	Provider Risk (1-a)	Consumer Risk (1-b)	Total classification error (1-a)+(1-b)
8	0	0.17	1	0.83	0	0.83
	1	0.50	0.96	0.50	0.04	0.54
	2	0.79	0.83	0.21	0.17	0.38*
	3	0.94	0.64	0.06	0.36	0.42
12	0	0.07	1.00	0.93	0.00	0.93
	1	0.28	1.00	0.73	0.00	0.73
	2	0.56	0.98	0.46	0.02	0.48
	3	0.80	0.93	0.21	0.07	0.28
	4	0.93	0.81	0.07	0.19	0.27*
	5	0.98	0.61	0.02	0.39	0.41
14	0	0.04	1	0.96	0	0.96
	1	0.20	1	0.80	0	0.80
	2	0.45	0.99	0.55	0.01	0.56
	3	0.70	0.97	0.30	0.03	0.33
	4	0.87	0.91	0.13	0.09	0.22*
	5	0.96	0.79	0.04	0.21	0.25
19	0	0.01	1	0.99	0	0.99
	1	0.08	1	0.92	0	0.92
	2	0.24	1	0.76	0	0.76
	3	0.46	1	0.54	0	0.55
	4	0.67	0.99	0.33	0.01	0.34
	5	0.84	0.97	0.17	0.03	0.20
	6	0.93	0.92	0.07	0.08	0.15*
	7	0.98	0.82	0.02	0.18	0.20
28	5	0.50	1	0.50	0	0.50
	6	0.68	1	0.32	0	0.32
	7	0.81	0.99	0.19	0.01	0.20
	8	0.91	0.98	0.09	0.02	0.11
	9	0.96	0.96	0.04	0.04	0.08*
	10	0.99	0.90	0.01	0.10	0.11

** - Optimal decision rule for a sample size.*

Source: Adopted from Valadez 1991, p:73.

Probabilities in Table 3 were calculated using the binomial formula. In each case, the upper and lower thresholds of the triage system were 80% and 50% respectively. The values in Table 3 imply that in a sample of 28, if there are 9 or more non-poor, then the facility can be

classified as inadequately performing in terms of serving the poor under the assumed triage of proportions (50%-80%) of the poor.

In our case, LQAS was applied in three scenarios with three levels of proportions of the poor in the facilities. In the first scenario, if the proportion of attendees in the facilities from the lowest quintile is less than 20%, then the facility is considered inadequate. If the proportion is more than 40%, then the facility is considered to be adequately performing. If the proportion is between 20%-40%, then no decision can be made. Under the above scenario, a facility can be considered as inadequately performing if in a sample of 50 attendees there are 35 or more from quintiles other than the lowest. The magnitude of misclassification in this case would be 11%.

In the second scenario, if the proportion of attendees from the lowest quintile is less than 40% then the facility is to be considered as inadequately performing in serving the poor. If the proportion is more than 60% then the facility is to be considered as adequately serving the poor. If the proportion is in between 40%-60% then no clear decision can be made. Under this scenario a facility can be considered as inadequately performing if in a sample of 50 patients, 25 or more are from quintiles other than the lowest quintiles. The magnitude of misclassification in this case would be 16%.

The third scenario was with 60% as the lower and 80% as the higher thresholds. Under this scenario, a facility can be considered as inadequately serving the poor if in a sample of 50 there are 14 or more patients from higher than lowest quintiles. The magnitude of misclassification in this case would be 11%.

Details of LQAS methods and their performance have been reported elsewhere (Valadez 1991, Bhuiya et al., 2006).

Findings

Benefit Incident Ratio

Figure 1 presents the proportion of attendees at the outdoor services at the Shivalaya UHC by asset quintiles. It can be seen that the proportion of attendees from the lowest quintile in the community exceeded 20%. The proportion from the highest quintile was also slightly higher than 20%, while the proportions in the 2nd to 4th quintiles were lower than 20%. These data imply that the users from the lowest and highest quintiles were over represented in the facility compared to their proportions present in the community. On the other hand, the users from the middle quintiles were under represented.

The utilization of the UHFWC in Shivalaya also presents a similar picture (Figure 2). People from the poorest quintiles were over represented than they were in the community.

However, for the use of EPI sessions the users from the lowest and highest quintiles were represented as much as they were in the community (Appendix 4).

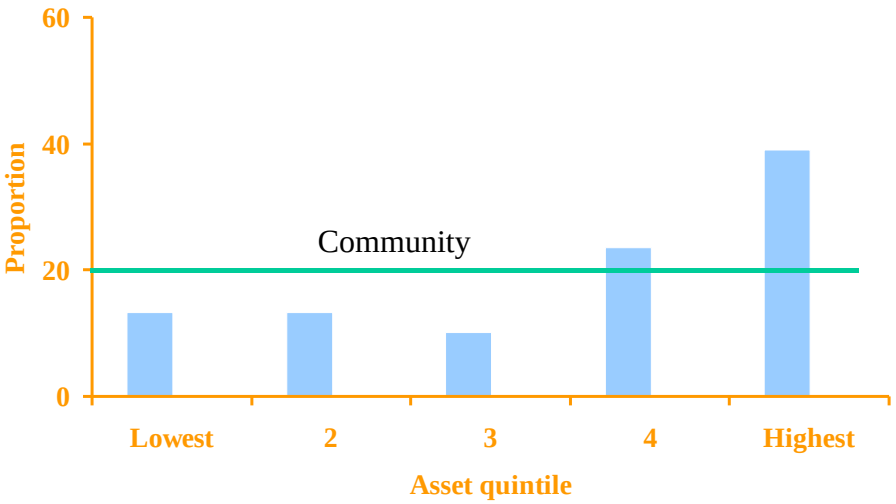
Figure 3 presents the distribution of attendees in the private clinic in Shivalaya. It can be seen that the pattern is just the opposite of the public facilities. The users from the highest and second highest quintiles were over represented in the private clinics and those from the lowest three quintiles were under represented.

A similar pattern of utilization by populations of various asset quintiles was also observed for public facilities in Nabinagar (Appendix 1, 2, and 5). As in the case of the private clinic in Shivalaya, the users from richer sections were also over represented in utilizing the private clinic in Nabinagar (Appendix 3).

Figure 1. Proportion of attendees in the UHC (Out-door) by asset quintile, Shivalaya

Figure 2. Proportion of attendees in the Union Health and Family Welfare Centres by asset quintile, Shivalaya

Figure 3. Proportion of attendees in the private clinic by asset quintile, Shivalaya



When the reading and the writing ability of the main income earner of the household is used as an indicator of socioeconomic status, it can be seen that in Shivalaya the outdoor service

recipients from households with main income earners without the ability to write are at per with their proportion in the community (Appendix 8). However, patients from households with writing ability of the main income earner are represented more in the facility than they are in the community. The situation in Nabinagar is slightly different than Shivalaya (Appendix 9).

Sequential Tests

Table 4 presents sequential tests under scenarios 1, 2 and 3. The corresponding figures are also presented in Figures 4, 5 and 6, respectively. The two parallel straight lines in the graphs (Figures 4, 5, and 6) are the boundaries of the acceptance and rejection regions for the facility to be considered as adequately performing under scenario 1 in terms of serving the people from the lowest quintile. As shown in the table, no decision can be made on the basis of information from less than 8, 5, and 3 attendees in scenarios 1, 2, and 3 respectively. If the number of cumulative attendees falls between the lines, then the interviews of patients for assessing their asset quintile should be continued in order to decide on the performance of the facility in terms of reaching poor. As can be seen inFigure 4, the 13th attendees brought the cumulative number of poor into the acceptance region, i.e. above the upper line. Collection of asset information can be stopped at this point, with the decision that the facility is serving the people from the lowest quintile adequately under scenario 1.

Figure 5 plots the acceptance and rejection regions for scenario 2. It can be seen that under scenario 2, no decision can be made by interviewing 50 attendees. It took nearly 63 respondents to bring the cumulative number in the rejection region.

Figure 6 plots the acceptance and rejection regions under scenario 3. It can be seen that with the 30^{th} respondent, the cumulative number of patients from the lowest quintile shifted to the rejection region. This implies that the decision about the inadequate performance of the health facility in terms of serving the poor can be made only after interviewing 30 patients.

It should be mentioned that if the above decisions are made for a large number of instances, it is likely that 5% of such decisions might in fact be wrong.

Application of sequential sampling schemes by using the writing ability of the main income earner also has been made. The findings can be seen in Appendix 19 and 20.

Table 4: Cumulative number of attendees from the lowest quintiles among 50 randomly chosen attendees in sequence in Shibalaya UHC by sequence of patients under various cutoff levels, June 2006

Trial No.	Threshold (20%-40%)		Cumulative no. of poor attendees	Threshold (40%-60%)		Cumulative no. of poor attendees	Threshold (60%-80%)		Cumulative no. of poor attendees
	Lower boundary	Upper boundary		Lower boundary	Upper boundary		Lower boundary	Upper boundary	
1	Continue	3	0	Continued	4	1	Continued	4	1
2	Continue	3	0	Continued	4	1	Continued	4	1
3	Continue	4	1	Continued	5	2	1	5	2
4	Continue	4	2	Continued	5	3	1	6	3
5	Continue	4	3	1	6	4	2	6	4
6	Continue	5	3	1	6	4	3	7	4
7	Continue	5	4	2	7	5	3	8	5
8	1	5	4	2	7	5	4	8	6
9	1	5	5	3	8	6	5	9	7
10	1	6	6	3	8	7	5	10	8
11	2	6	6	4	9	7	6	11	9
12	2	6	6	4	9	7	7	11	10
13	2	7	7	5	10	8	8	12	11
14	3	7	8	5	10	9	8	13	12
15	3	7	8	6	11	9	9	13	12
16	3	8	9	6	11	10	10	14	13
17	3	8	9	7	12	10	10	15	13
18	4	8	9	7	12	10	11	16	14
19	4	8	9	8	13	10	12	16	14
20	4	9	10	8	13	11	13	17	15
21	5	9	10	9	14	11	13	18	15
22	5	9	10	9	14	11	14	18	15
23	5	10	11	10	15	12	15	19	16
24	5	10	11	10	15	12	15	20	16
25	6	10	11	11	16	12	16	20	16
26	6	10	11	11	16	12	17	21	16
27	6	11	12	12	17	13	17	22	17
28	7	11	13	12	17	14	18	23	18
29	7	11	14	13	18	15	19	23	19
30	7	12	14	13	18	15	20	24	19
31	8	12	14	14	19	15	20	25	19
32	8	12	14	14	19	15	21	25	19
33	8	13	14	15	20	15	22	26	19
34	8	13	14	15	20	16	22	27	20
35	9	13	15	16	21	17	23	28	21
36	9	13	16	16	21	18	24	28	22
37	9	14	16	17	22	18	25	29	22
38	10	14	17	17	22	19	25	30	23
39	10	14	18	18	23	20	26	30	24
40	10	15	19	18	23	21	27	31	25
41	10	15	20	19	24	22	27	32	26
42	11	15	21	19	24	23	28	33	27
43	11	15	22	20	25	24	29	33	28
44	11	16	22	20	25	24	30	34	28
45	12	16	22	21	26	24	30	35	28
46	12	16	22	21	26	24	31	35	29
47	12	17	22	22	27	24	32	36	30
48	12	17	23	22	27	25	32	37	31
49	13	17	23	23	28	25	33	37	31
50	13	17	24	23	28	26	34	38	32

Figure 4. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 20%-40%; alpha 5%; power 80%) in Shibalaya UHC, June 2006

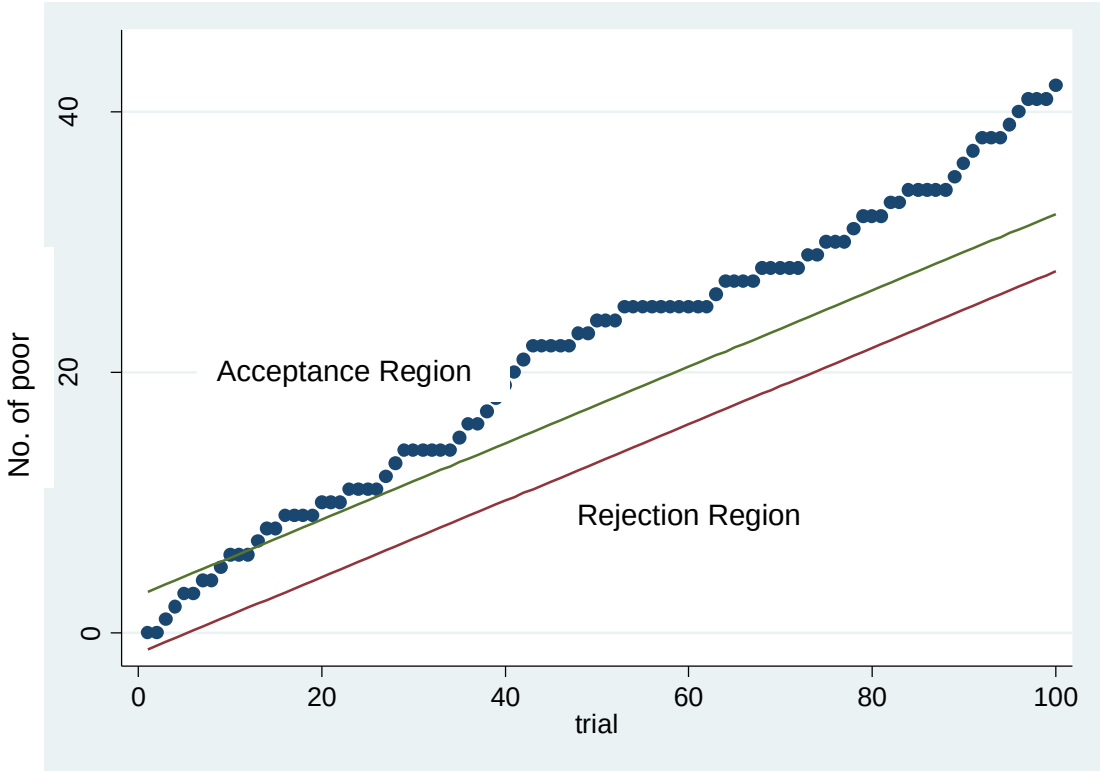


Figure 5. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 40%-60%; alpha 5%; power 80%) in Shivalaya UHC, June 2006

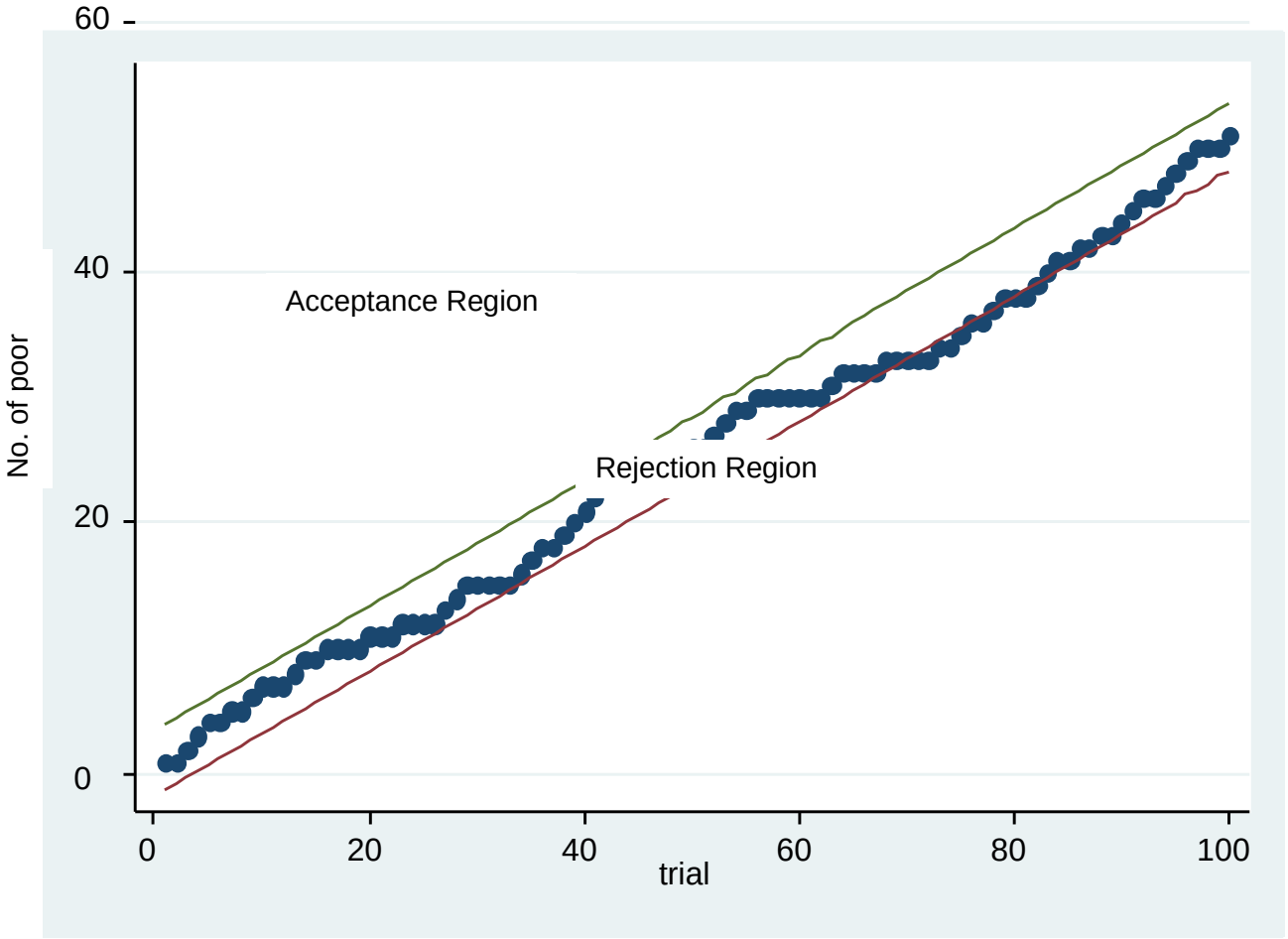
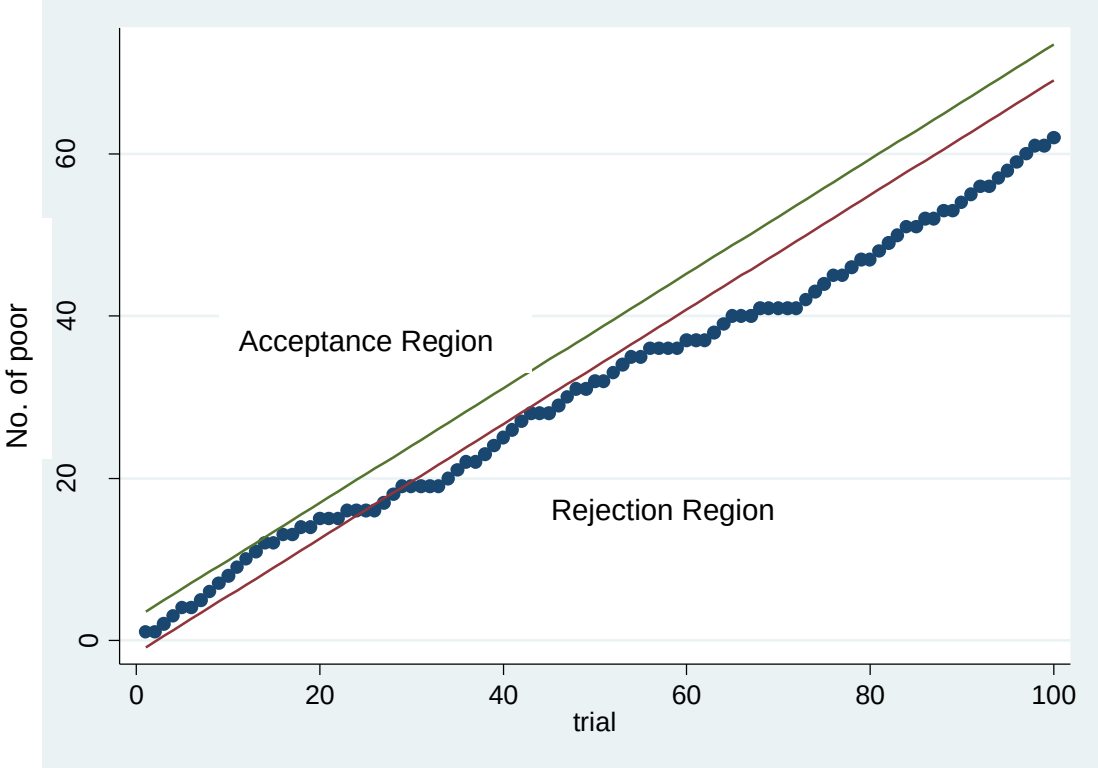


Figure 6. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 60%-80%; alpha 5%; power 80%) in Shibalaya UHC, June 2006



LQAS

In LQAS, we assumed three scenarios with three levels of utilization by the poor. Under the first scenario, a facility is considered inadequately performing in terms of reaching the poor if the users from the lowest quintiles represented less than 20% at the facility. A facility was considered inadequately performing if the users from the lowest quintile represent more than 40% in the facility. If the users from the lowest quintile are represented between 20%-40%, then the situation is somewhat in between and the facility cannot be classified as either adequately or inadequately performing. With the above cut off points of performance, it is estimated that in a sample of 50 users if there are 35 or more from the second or higher quintiles than the facility can be classified as inadequately performing with an error of 11%.

The second scenario was with the thresholds of 40% and 60%. In other words, a facility will be considered as inadequately performing in serving the poor if among the users there were less than 40% from the lowest quintiles. The facility will be considered as adequately performing if among the users there are 60% or more from the lowest quintiles. If among the users, there are 40% to 60% from the lowest quintiles than the status of the facility in terms

of serving the poor will be indeterminate. Under the above three conditions in a sample of 50 attendees, a maximum of 25 patients from quintiles other than the lowest quintile will be allowed. As soon as there are more than 25 patients from the second and higher quintiles, the facility will be labeled as inadequately performing in serving the poor. Such a decision will have a probability of 16% error of misclassification.

The third scenario comprises cutoff points of 60% and 80%. The maximum allowable non-poor in a sample of 50 is 14 with a level of error of 11%.

Table 5 presents the findings based on LQAS under the three scenarios mentioned above. A sample of 50 attendees were selected from the patients attending the Shivalaya UHC during June 2006. The application of the above decision rule i.e. having 35 or more from quintiles other than the lowest quintile would result in classifying the facility as not performing adequately in serving the poor. Of the 50 randomly chosen attendees, only 30 were from quintiles higher than the lowest quintile, meaning that the facility had enough attendees from the lowest quintile to have passed the test of adequately serving the patients from the lowest quintile. If four samples of 50 are chosen from the number of attendees in a week, and their position in the asset quintiles are assessed, then the facility passed during all the weeks with the exception of the third week under scenario 1 (Table 5). Under scenario 2, the facility passed the test only during the second week. The facility failed in all the weeks under scenario 3. Table 6 presents results for Shivalaya UHFWC.

Table 5. Decision about the monthly, weekly and daily utilization of the Shivalaya UHC by people from the lowest quintiles using LQAS based on information from 50 randomly chosen attendees, June 2006

Period of evaluation	Threshold 20%-40% Error =11% Maximum number of non-poor (failure) permitted is 35		Threshold 40%-60% Error =16% Maximum number of non-poor (failure) permitted is 25		Threshold 60%-80% Error =11% Maximum number of non-poor (failure) permitted is 14	
	Number of non-Poor	Judgment	Number of non-Poor	Judgment	Number of non-Poor	Judgment
Month	30	P	31	F	25	F
Week						
1	29	P	28	F	22	F
2	35	P	24	P	17	F
3	39	F	26	F	21	F
4	34	P	27	F	23	F
Total		3 pass		1 pass		0 pass
Day						
1	37	F	31	F	23	F
3	33	P	29	F	23	F
4	40	F	30	F	24	F
5	30	P	25	P	21	F
6	34	P	25	P	18	F
7	36	F	32	F	26	F
8	33	P	24	P	17	F
10	40	F	34	F	27	F
11	34	P	30	F	21	F
12	35	P	25	P	20	F
13	35	P	28	F	24	F
14	41	F	35	F	28	F
15	37	F	34	F	24	F
17	39	F	26	F	19	F
18	37	F	31	F	23	F
19	35	P	26	F	17	F
20	39	F	26	F	19	F
21	31	P	31	F	24	F
22	39	F	29	F	27	F
24	38	F	29	F	23	F
25	26	P	28	F	17	F
26	32	P	28	F	21	F
27	39	F	23	P	16	F
28	36	F	25	P	21	F
29	37	F	30	F	23	F
Total		11 pass		6 pass		0 pass

Table 6. Decision about the monthly, weekly and daily utilization of the Shivalaya UHFWC by people from the lowest quintiles using LQAS based on information from 50 randomly chosen attendees, June 2006

Period of evaluation	Threshold 20%-40% Error =11% Maximum number of non-poor (failure) permitted is 35		Threshold 40%-60% Error =16% Maximum number of non-poor (failure) permitted is 25		Threshold 60%-80% Error =11% Maximum number of non-poor (failure) permitted is 14	
	Number of non-Poor	Judgment	Number of non-Poor	Judgment	Number of non-Poor	Judgment
Month	36	F	29	F	20	F
Week						
1	36	F	29	F	22	F
2	*	*	*	*	*	*
3	34	P	28	F	22	F
4	33	P	25	P	20	F
Total		2 Pass		1Pass		0 Pass

** Number of attendees is less than 50*

LQAS was also applied by using the writing and capacity of the main earner of the household. The findings are presented in Appendix 23.

Discussion

All three methods provided information about the pro-poor nature of the services. The benefit incident analysis showed the over representation of the attendees at the government facilities and under representation in the private facilities from the lowest quintile. However, it did not resort to formal statistical hypothesis testing in terms of identifying how big a deviation from 20% should be of concern. One can, of course, compare the proportions in the facility with 20% by using statistical tests. Such tests, however, would require the denominators from which the community proportion and the facility proportion were derived. In addition, a computation of the test statistics and associated probability to make an inference about the difference between the proportions of patients from the lowest quintiles would also be warranted. In case of LQAS and sequential sampling plans, the issue regarding how big a difference would be of significance is embedded in the procedure. In effect, the procedures operationalized those formal statistical testing in terms of number of non-conforming attendees, which in this case, were from the quintiles other than the lowest quintiles, with predetermined levels of error and power. The sequential plan has the advantage of plotting the cumulative number of non-poor against the number of attendees assessed for their SES as they come, and provide a powerful visual tool for the facility

managers. To have an equivalent in LQAS may not be that straightforward. Benefit incident analysis, however, has the advantage of visual presentation without the formal statistical inference procedures built in. The caveat in the sequential sampling plan is that in some instances it may lead to a large number of trials before a facility can be validly classified as pro-poor or not under the given parameters. This issue has been addressed in LQAS. LQAS combines the sequential test procedures with a fixed sample scheme in the sense that it allows decision-making by testing a fixed number of cases with a predetermined level of error.

In a situation leading to a non-stop examination of cases under sequential sampling, one can also resort to double sampling, meaning that if sequential sampling does enable a decision making than one can take another sample. However, more than two samples do not provide any additional advantage. One of the real problems in having double sampling in case of patients coming to a facility is that by the time the decision to take another sample is made, it is too late to take another sample for there may not be any more attendees in the facility. LQAS has taken care of this issue of not being able to make a decision, for it combines sequential sampling and fixed sample methods. In case of LQAS, as we have seen, the number of attendees to be included in the sample is predetermined given the level of errors and thresholds, and thus it totally avoids the situation of no decision making. Methodologically speaking, the sequential plan and LQAS are almost similar with the above weaknesses and strengths. Either of them would serve the purpose of drawing inferences about the pro-poor nature of the services in terms of utilization by the poor. Facility management staff members can easily be trained to adopt the methods.

Another challenge is the identification of the poor. We used asset quintiles for it allows the classification of attendees in terms of any interval such as deciles or quintiles, and in particular, allows the identification of the bottom twenty percent of the population. The challenge is to train facility managers to identify attendees from the lowest quintiles. This requires values for weights of assets and cut off points of asset scores based on the distribution of households in the community. Thus a community survey or an approximation from other surveys is required. Once the cutoff points are known, then the facility managers have to be trained in how to use the weights in calculating asset scores for the attendees, and how to use the cut off points to identify attendees from the lowest quintile. Easier alternatives exist that are simpler than usingasset scores. These include using the number of assets owned, or other indicators such as land, occupation of main income earner, level of education and the like. The challenge in using these is to get deciles and quintiles. Use of indicators other than asset scores would obviously make the adoption of the monitoring system very attractive.

Another practical issue one has to deal with in adopting these methods is to decide how frequently the assessment should be made or, in other words, how frequently the data at the facility and the community level should be collected. The answer to the frequency of data collection at the community level is somewhat dependent on the chances of changes in the SES of the community. In many instances, the changes in SES are slow. The frequency of assessment at the facility level is dependent on the facility managers to some extent and on the nature of services to be assessed. Again, it will largely depend on the nature of changes in the services or in the system. If the system is stable in terms of design, then perhaps, it is not useful to have very frequent assessments. If there is a special service for a short period and it is very important to make the service responsive to every section of the society, then perhaps it would be useful to increase the frequency of monitoring. The other issue to consider in deciding frequency is the presence of a pattern during certain days, weeks, or months of the year when the facility is used by certain segments of society more than usual. If such is the case, then these information should be used in deciding the timing and frequency of assessments. It may be mentioned that in the two upazilas where we worked, we examined the variation in use of the facilities by the SES of the attendees, and in most cases, no significant statistical variation was observed. This means that any day of the month would represent the pattern of the month satisfactorily.

In conclusion, benefit incident analysis can be a starting point for a facility to get a simple picture of the utilization of services by the poor. However, use of a sequential sampling scheme allows a more formal inference about the performance in terms of utilization of services by the poor. Having the opportunity of visual display in sequential sampling on a continual basis makes the procedure attractive, although LQAS is better than sequential sampling for its ability to make a decision within a fixed sample size.

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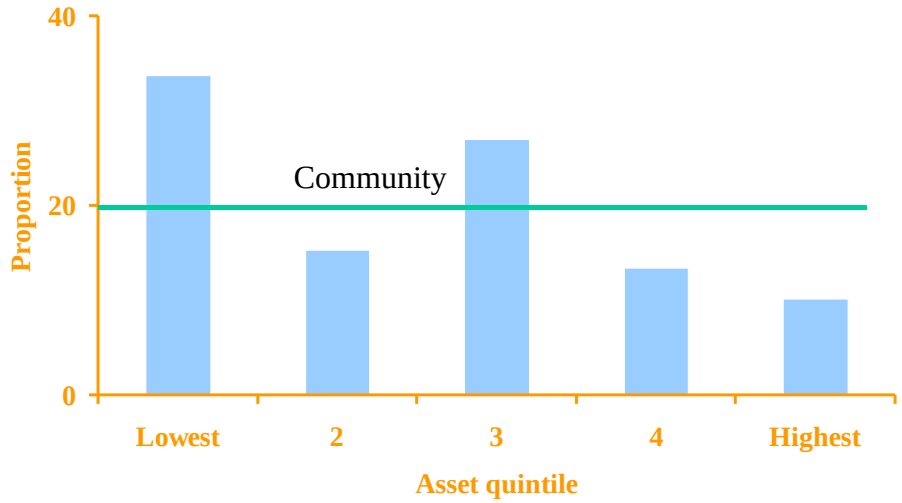
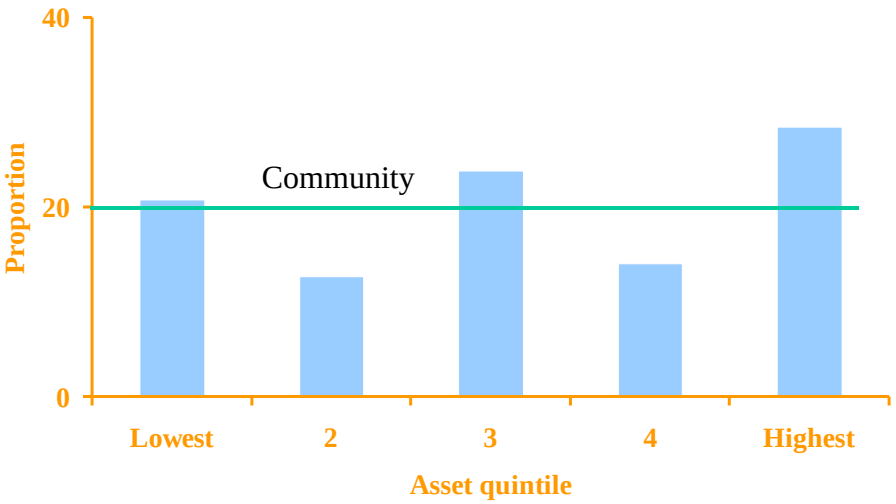
Appendices

Appendix 1. Proportion of attendees in the UHC (outdoor services) by asset quintile, Nabinagar.

Appendix 2. Proportion of attendees in the Union Health and Family Welfare Centre by asset quintile, Nabinagar



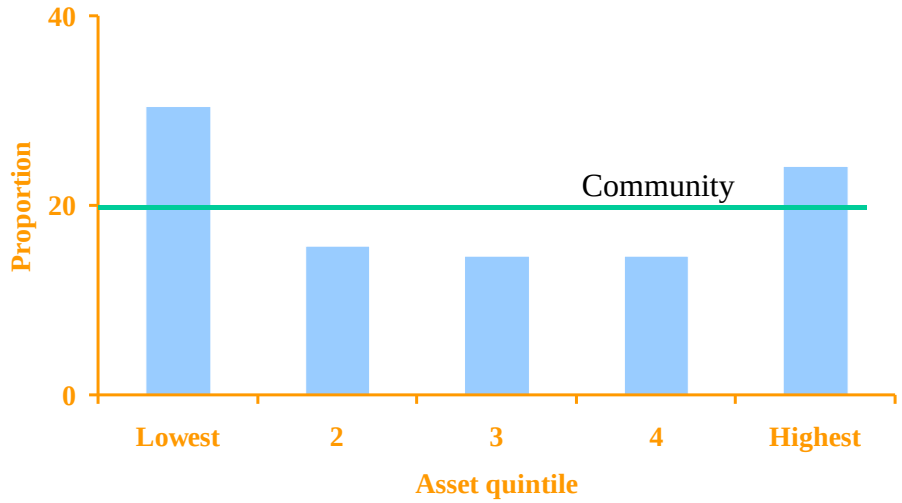
Appendix 3. Proportion of attendees in the private clinic by asset quintile, Nabinagar



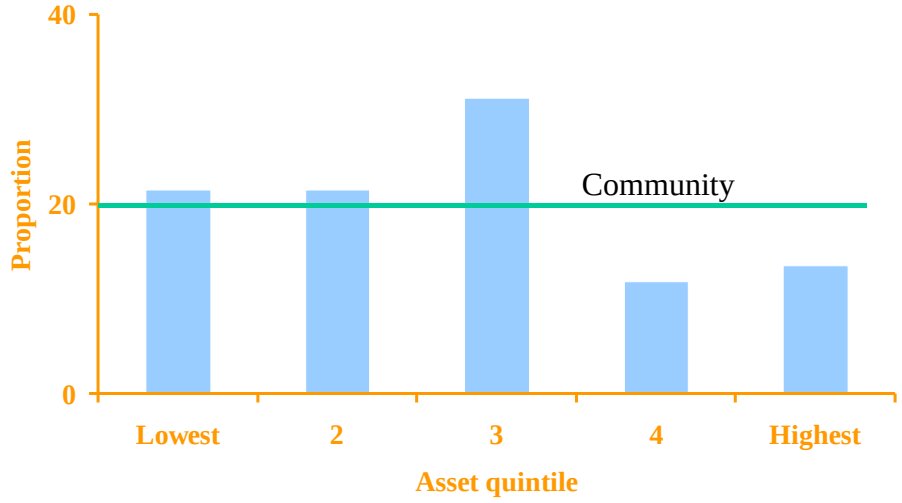
Appendix 4. Proportion of attendees in the EPI sessions at village level by asset quintile, Shivalaya

Appendix 5. Proportion of attendees in the EPI sessions at village level by asset quintile, Nabinagar

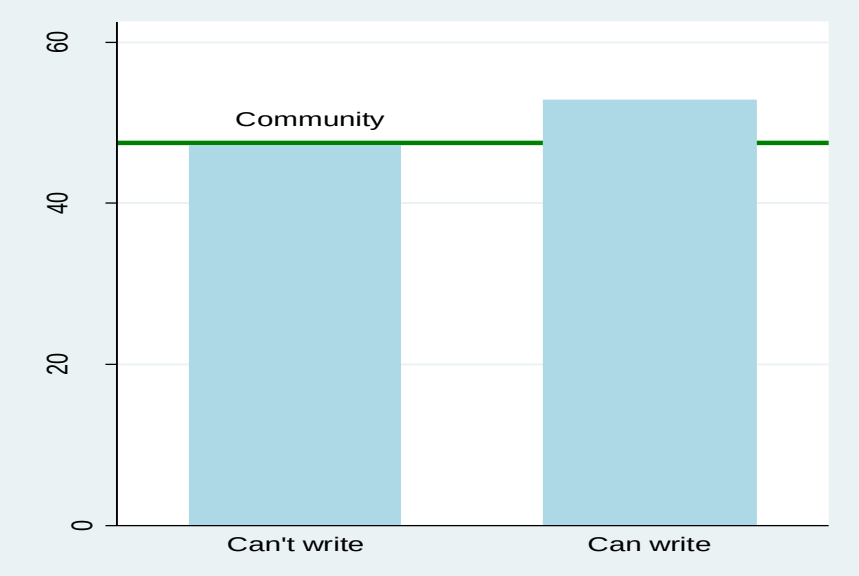
Appendix 6. Proportion of attendees in the Satellite Clinic by asset quintile, Shivalaya



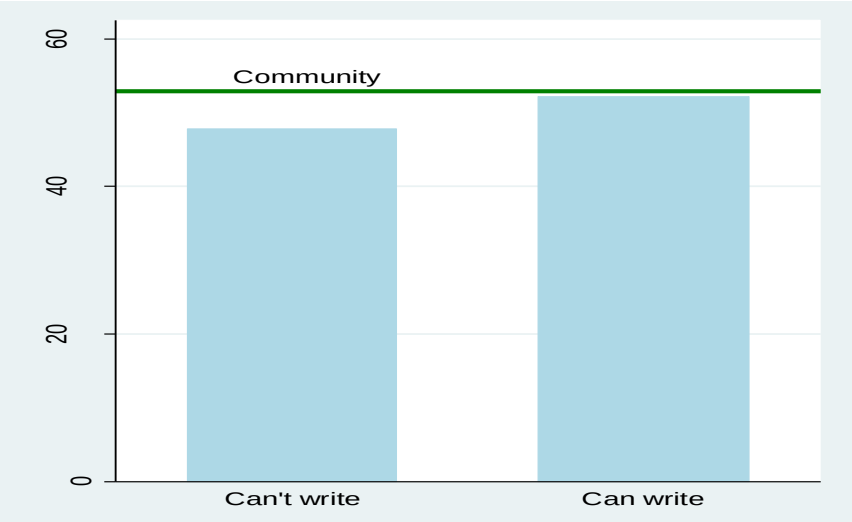
Appendix 7. Proportion of attendees in the Satellite Clinic by asset quintile, Nabinagar



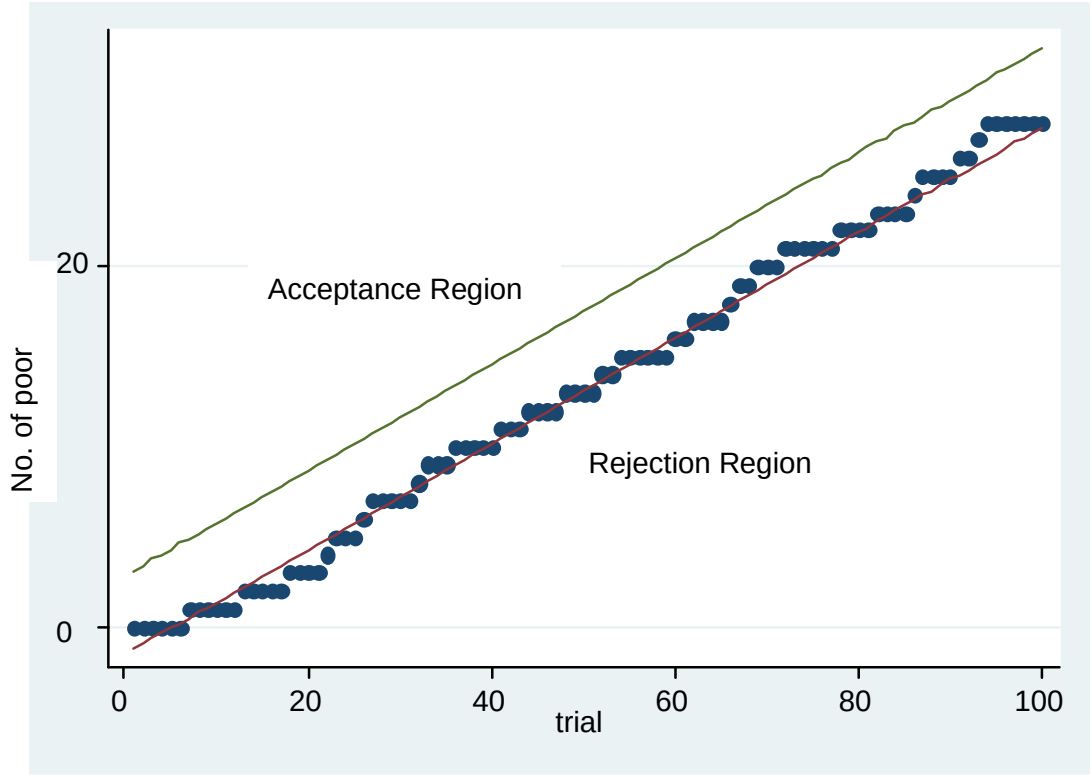
Appendix 8. Proportion of attendees in the UHC (Out-door) by writing ability of the main income earner of the household, Shivalaya, June 2006



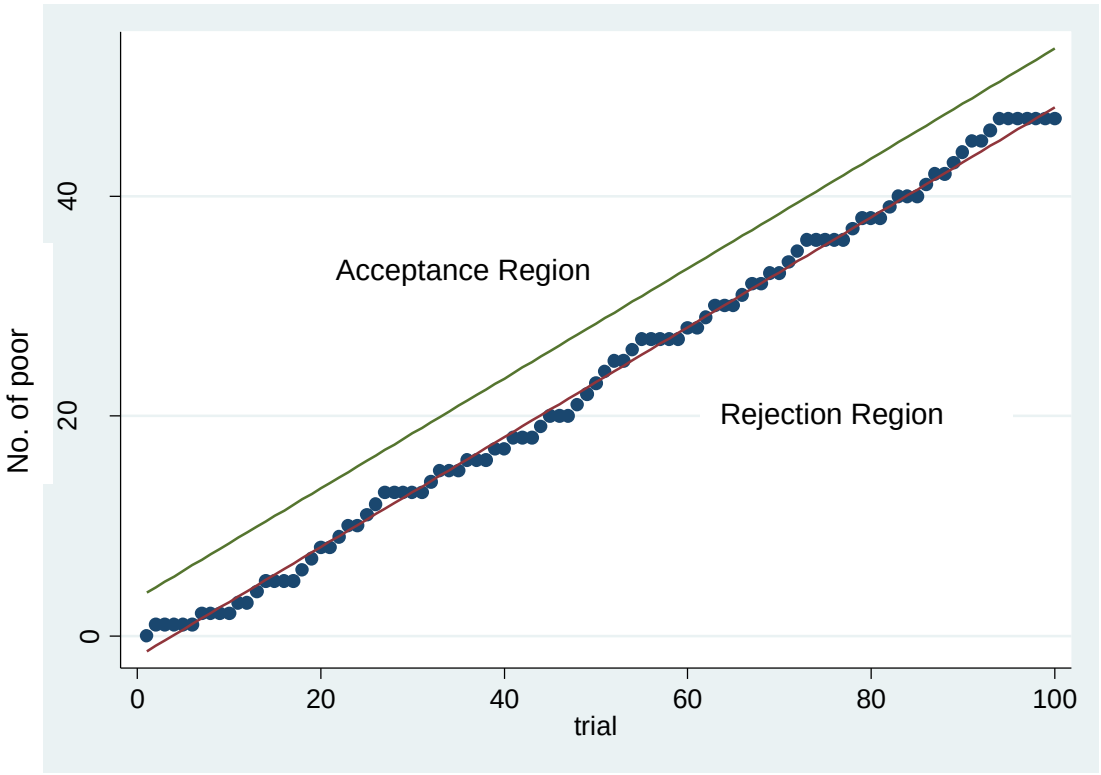
Appendix 9. Proportion of attendees in the UHC (Out-door) by writing ability of the main income earner of the household, Nabinagar, June 2006



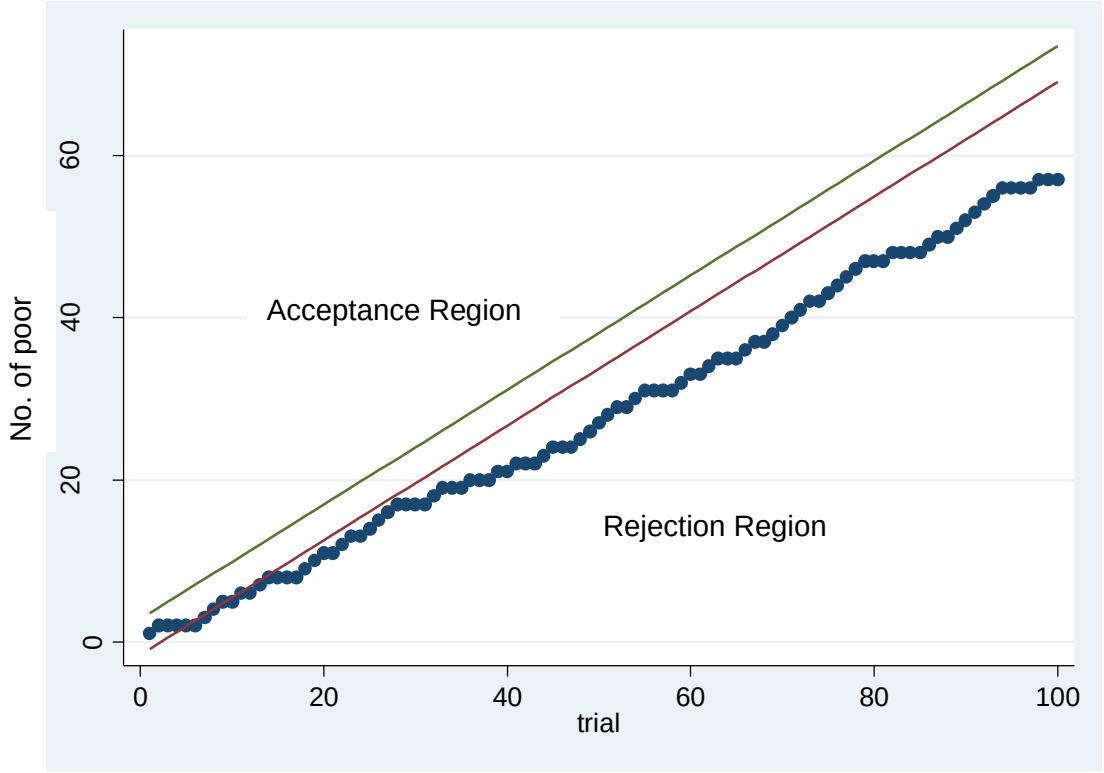
Appendix 10. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 20%-40%; alpha 5%; power 80%) in Shivalaya UHFWC, June 2006



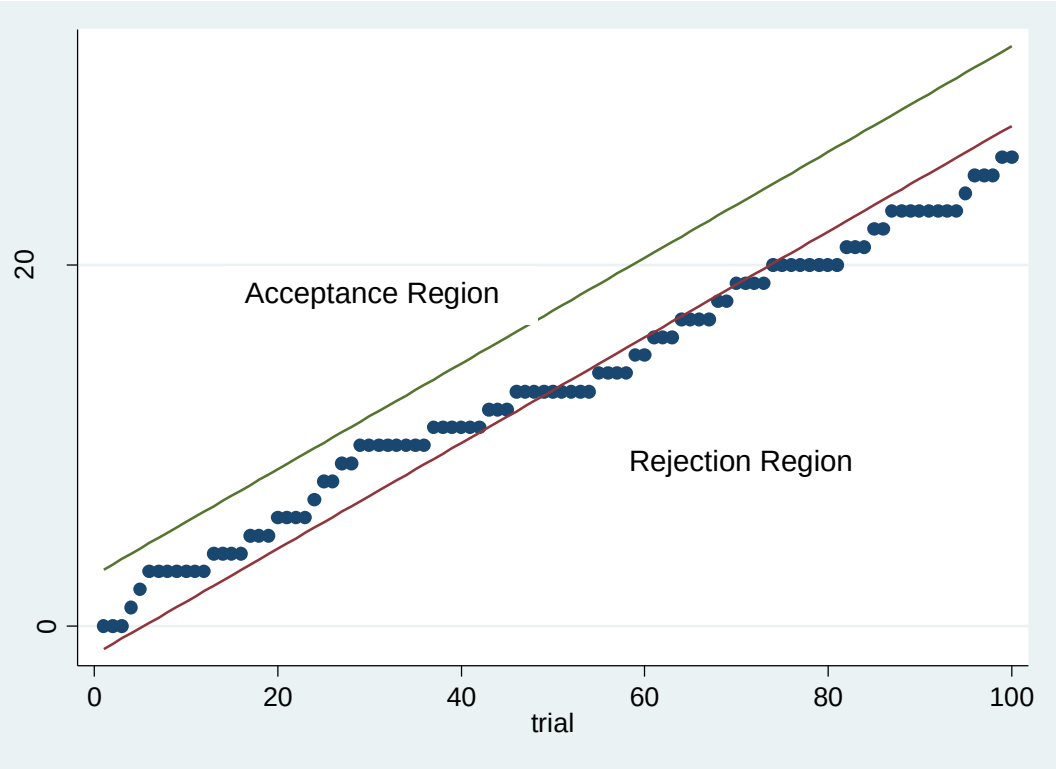
Appendix 11. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 40%-60%; alpha 5%; power 80%) in Shivalaya UHFWC, June 2006



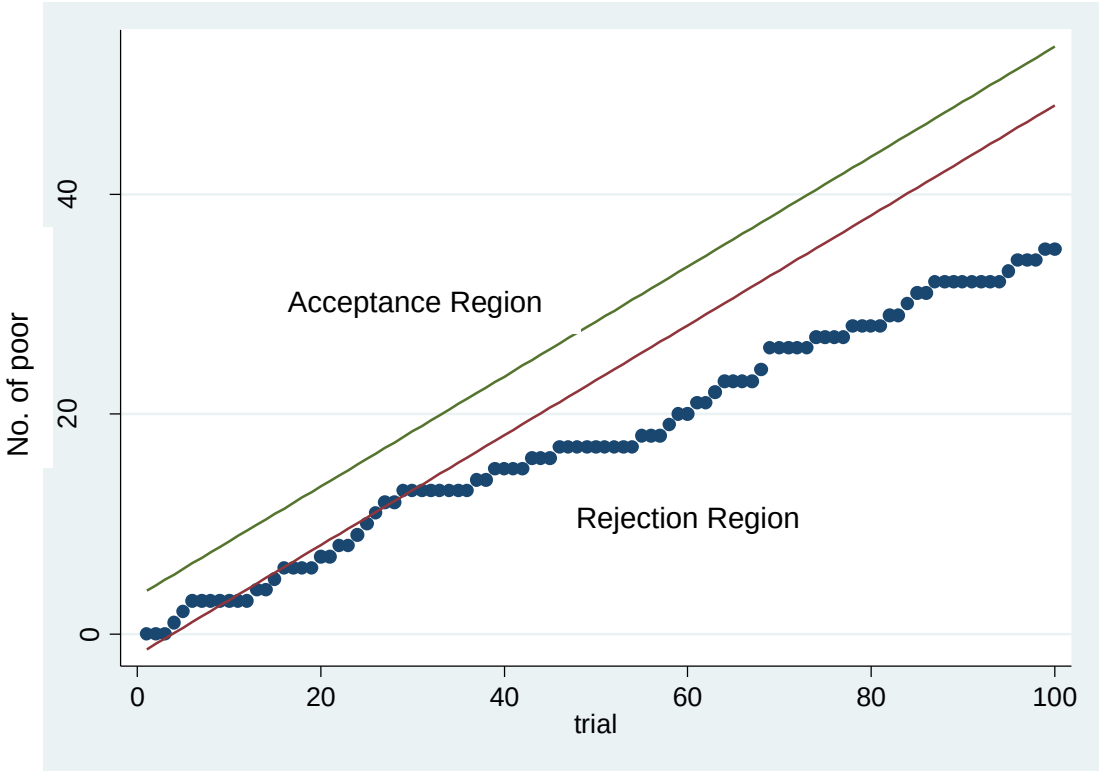
Appendix 12. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 60%-80%; alpha 5%; power 80%) in Shivalaya UHFWC, June 2006



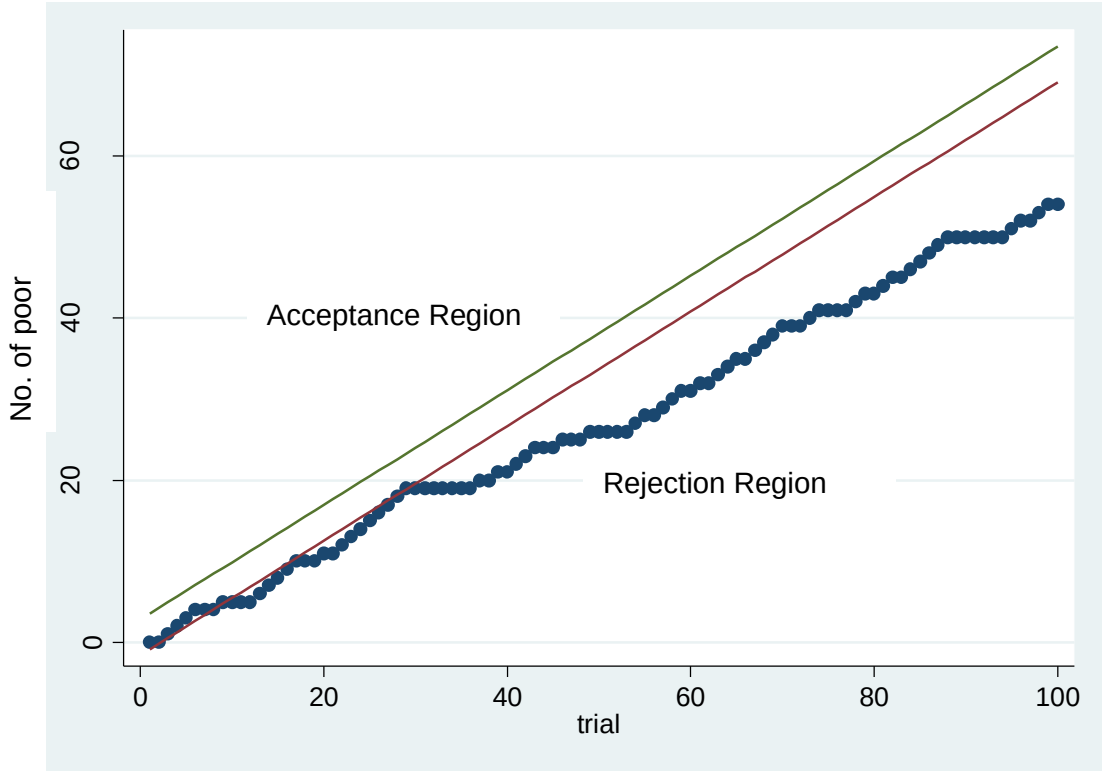
Appendix 13. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 20%-40%; alpha 5%; power 80%) in Nabinagar UHC June 2006



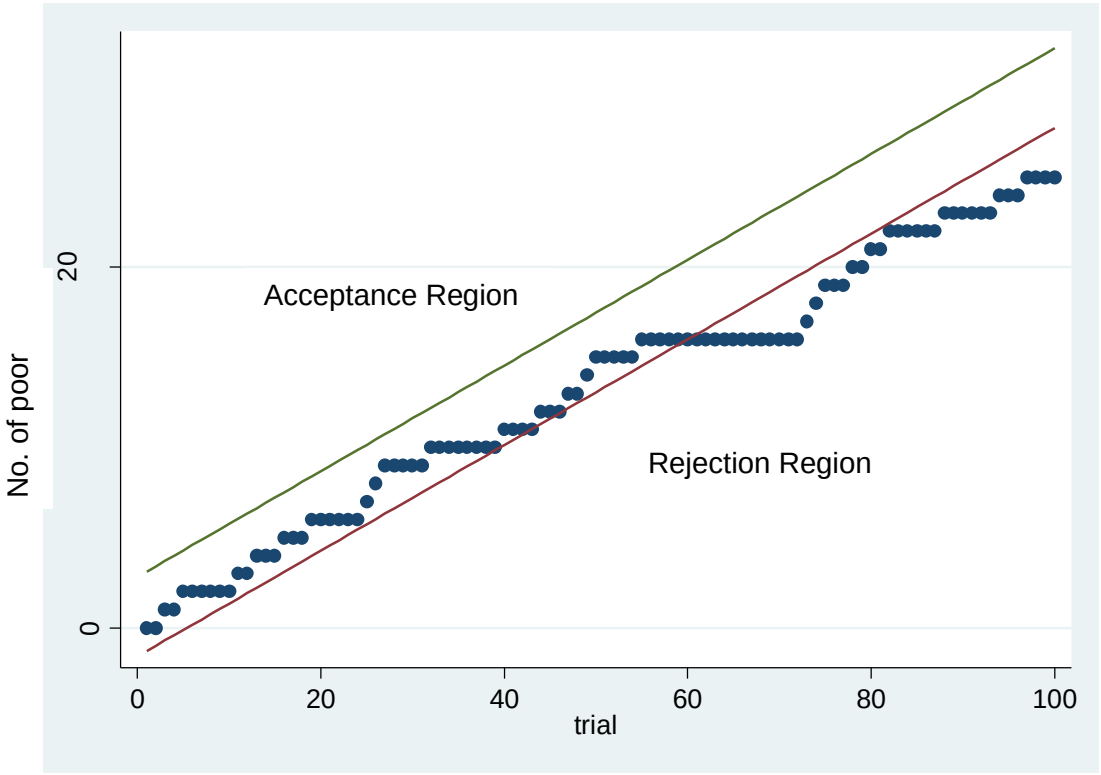
Appendix 14. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 40%-60%; alpha 5%; power 80%) in Nabinagar UHC, June 2006



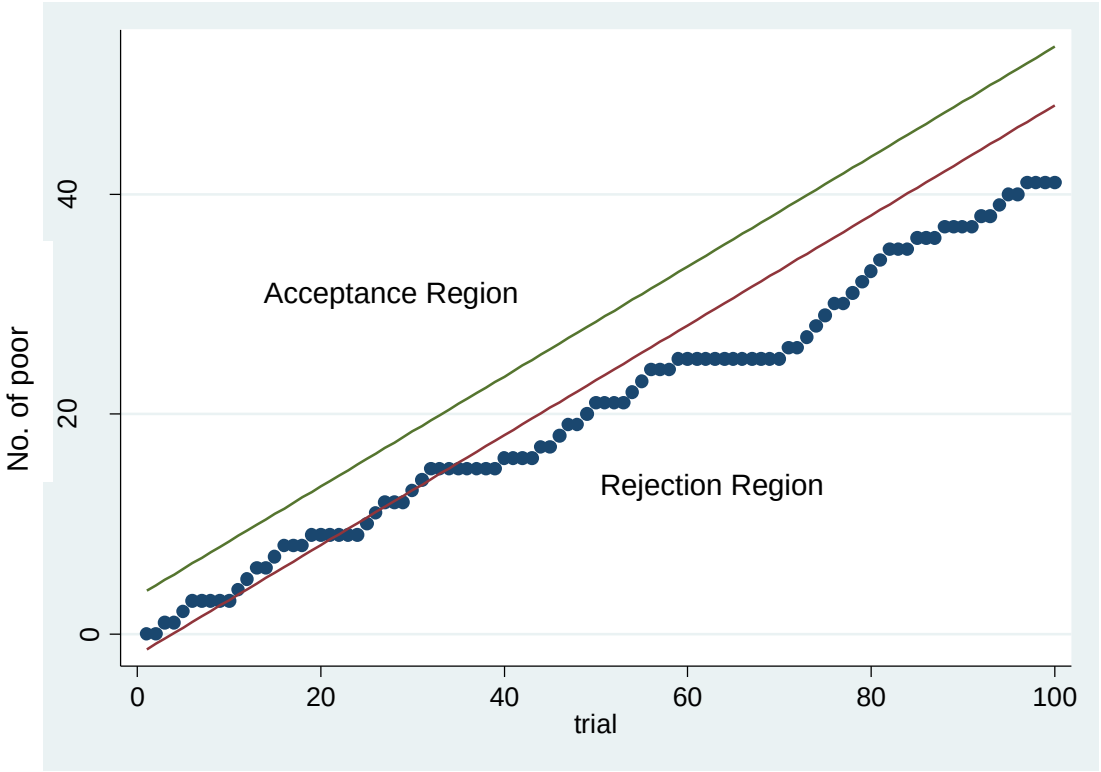
Appendix 15. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 60%-80%; alpha 5%; power 80%) in Nabinagar UHC, June 2006



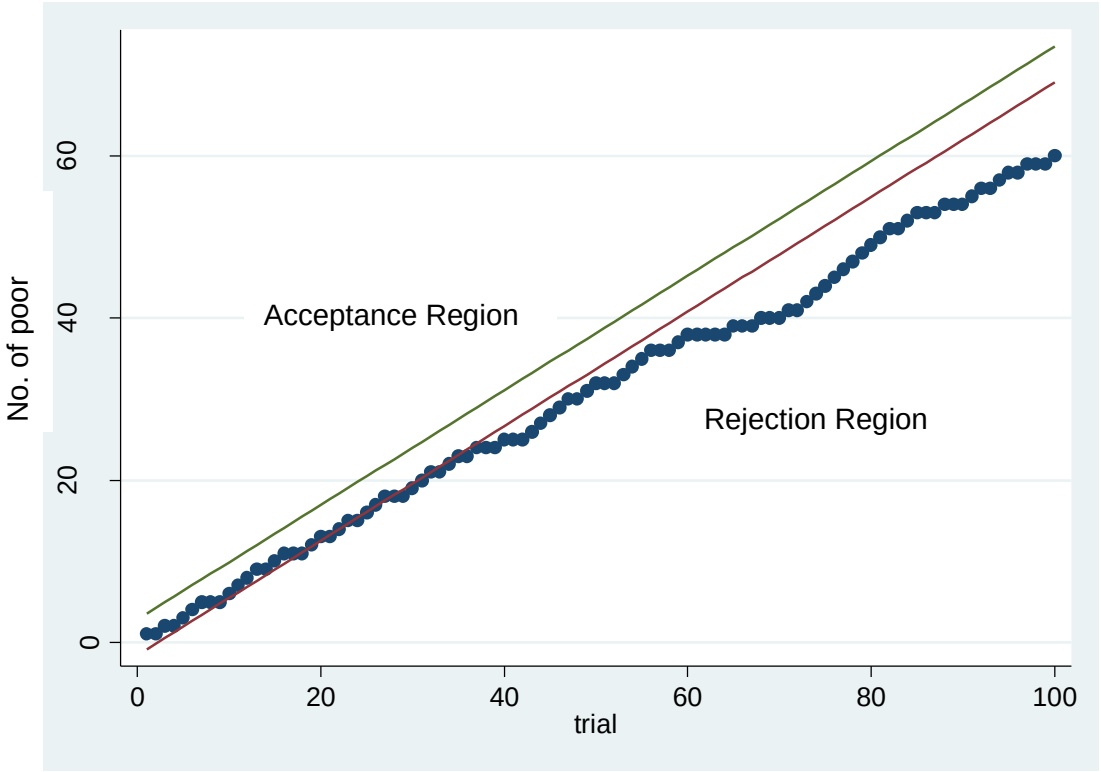
Appendix 16. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 20%-40%; alpha 5%; power 80%) in Nabinagar UHFWC, June 2006



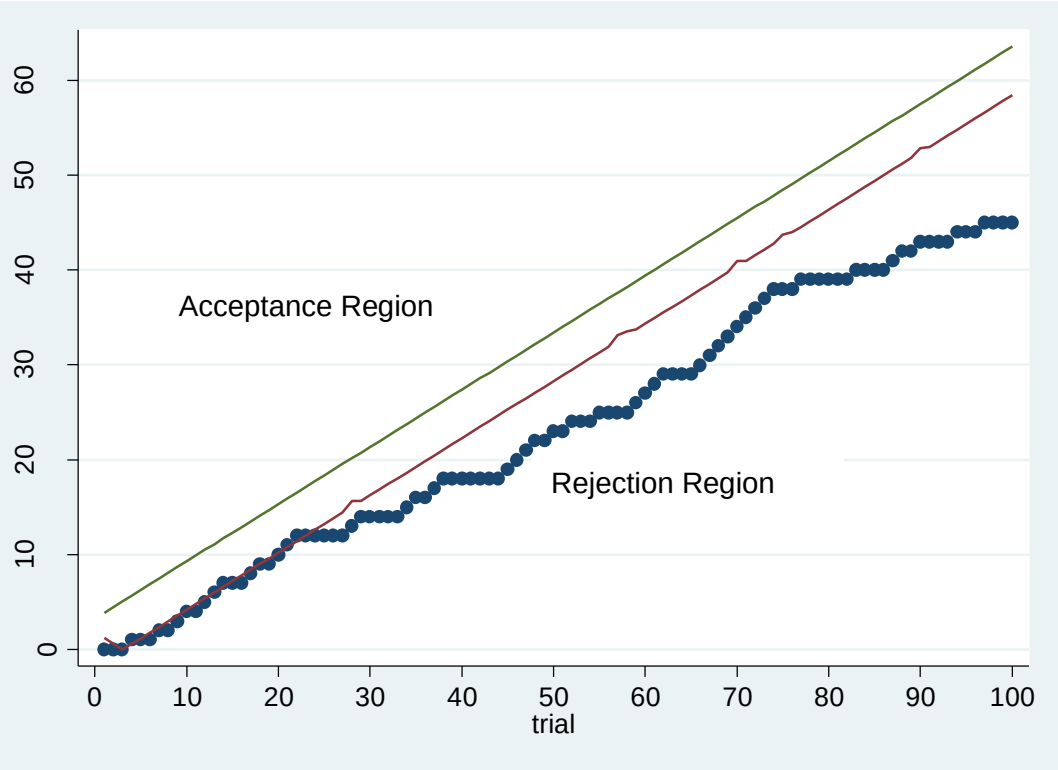
Appendix 17. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 40%-60%; alpha 5%; power 80%) in Nabinagar UHFWC, June 2006



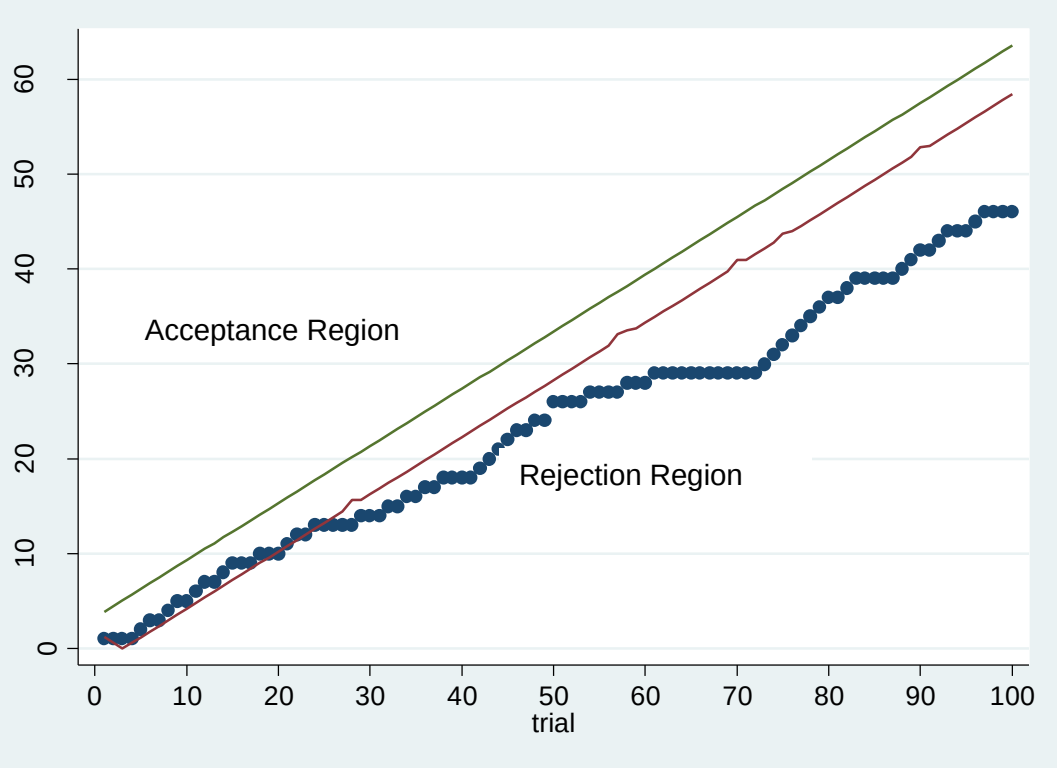
Appendix 18. Cumulative number of attendees from the lowest quintiles among the randomly chosen 100 attendees in sequence of arrival (threshold 60%-80%; alpha 5%; power 80%) in Nabinagar UHFWC, June 2006



Appendix 19. Cumulative number of attendees with main earner unable to write from the randomly chosen 100 attendees in sequence of arrival (threshold 50%-70%; alpha 5%; power 80%) in Shivalaya UHC, June 2006



Appendix 20. Cumulative number of attendees with main earner unable to write from the randomly chosen 100 attendees in sequence of arrival (threshold 50%-70%; alpha 5%; power 80%) in Nabinagar UHC, June 2006



Appendix 21. Cumulative number of attendees from the lowest quintiles among 50 randomly chosen attendees in sequence in Shivalaya Union Health and Family Welfare Centre by sequence of patients under various threshold levels, June 2006

Trial No.	Threshold (20%-40%)		Cumulative no. of poor attendees	Threshold (40%-60%)		Cumulative no. of poor attendees	Threshold (60%-80%)		Cumulative no. of poor attendees
	Lower boundary	Upper boundary		Lower boundary	Upper boundary		Lower boundary	Upper boundary	
1	Continued	3	0	Continued	4	0	Continued	4	1
2	Continued	3	0	Continued	4	1	Continued	4	2
3	Continued	4	0	Continued	5	1	1	5	2
4	Continued	4	0	Continued	5	1	1	6	2
5	Continued	4	0	1	6	1	2	6	2
6	Continued	5	0	1	6	1	3	7	2
7	Continued	5	1	2	7	2	3	8	3
8	1	5	1	2	7	2	4	8	4
9	1	5	1	3	8	2	5	9	5
10	1	6	1	3	8	2	5	10	5
11	2	6	1	4	9	3	6	11	6
12	2	6	1	4	9	3	7	11	6
13	2	7	2	5	10	4	8	12	7
14	3	7	2	5	10	5	8	13	8
15	3	7	2	6	11	5	9	13	8
16	3	8	2	6	11	5	10	14	8
17	3	8	2	7	12	5	10	15	8
18	4	8	3	7	12	6	11	16	9
19	4	8	3	8	13	7	12	16	10
20	4	9	3	8	13	8	13	17	11
21	5	9	3	9	14	8	13	18	11
22	5	9	4	9	14	9	14	18	12
23	5	10	5	10	15	10	15	19	13
24	5	10	5	10	15	10	15	20	13
25	6	10	5	11	16	11	16	20	14
26	6	10	6	11	16	12	17	21	15
27	6	11	7	12	17	13	17	22	16
28	7	11	7	12	17	13	18	23	17
29	7	11	7	13	18	13	19	23	17
30	7	12	7	13	18	13	20	24	17
31	8	12	7	14	19	13	20	25	17
32	8	12	8	14	19	14	21	25	18
33	8	13	9	15	20	15	22	26	19
34	8	13	9	15	20	15	22	27	19
35	9	13	9	16	21	15	23	28	19
36	9	13	10	16	21	16	24	28	20
37	9	14	10	17	22	16	25	29	20
38	10	14	10	17	22	16	25	30	20
39	10	14	10	18	23	17	26	30	21
40	10	15	10	18	23	17	27	31	21
41	10	15	11	19	24	18	27	32	22
42	11	15	11	19	24	18	28	33	22
43	11	15	11	20	25	18	29	33	22
44	11	16	12	20	25	19	30	34	23
45	12	16	12	21	26	20	30	35	24
46	12	16	12	21	26	20	31	35	24
47	12	17	12	22	27	20	32	36	24
48	12	17	13	22	27	21	32	37	25
49	13	17	13	23	28	22	33	37	26
50	13	17	13	23	28	23	34	38	27

Appendix 22. Cumulative number of attendees from the lowest quintiles among 50 randomly chosen attendees in sequence in Nabinagar UHC by sequence of patients under various threshold levels, June 2006

Trial No.	Threshold (20%-40%)		Cumulative no. of poor attendees	Threshold (40%-60%)		Cumulative no. of poor attendees	Threshold (60%-80%)		Cumulative no. of poor attendees
	Lower boundary	Upper boundary		Lower boundary	Upper boundary		Lower boundary	Upper boundary	
1	Continued	3	0	Continued	4	0	Continued	4	0
2	Continued	3	0	Continued	4	0	Continued	4	0
3	Continued	4	0	Continued	5	0	1	5	1
4	Continued	4	1	Continued	5	1	1	6	2
5	Continued	4	2	1	6	2	2	6	3
6	Continued	5	3	1	6	3	3	7	4
7	Continued	5	3	2	7	3	3	8	4
8	1	5	3	2	7	3	4	8	4
9	1	5	3	3	8	3	5	9	5
10	1	6	3	3	8	3	5	10	5
11	2	6	3	4	9	3	6	11	5
12	2	6	3	4	9	3	7	11	5
13	2	7	4	5	10	4	8	12	6
14	3	7	4	5	10	4	8	13	7
15	3	7	4	6	11	5	9	13	8
16	3	8	4	6	11	6	10	14	9
17	3	8	5	7	12	6	10	15	10
18	4	8	5	7	12	6	11	16	10
19	4	8	5	8	13	6	12	16	10
20	4	9	6	8	13	7	13	17	11
21	5	9	6	9	14	7	13	18	11
22	5	9	6	9	14	8	14	18	12
23	5	10	6	10	15	8	15	19	13
24	5	10	7	10	15	9	15	20	14
25	6	10	8	11	16	10	16	20	15
26	6	10	8	11	16	11	17	21	16
27	6	11	9	12	17	12	17	22	17
28	7	11	9	12	17	12	18	23	18
29	7	11	10	13	18	13	19	23	19
30	7	12	10	13	18	13	20	24	19
31	8	12	10	14	19	13	20	25	19
32	8	12	10	14	19	13	21	25	19
33	8	13	10	15	20	13	22	26	19
34	8	13	10	15	20	13	22	27	19
35	9	13	10	16	21	13	23	28	19
36	9	13	10	16	21	13	24	28	19
37	9	14	11	17	22	14	25	29	20
38	10	14	11	17	22	14	25	30	20
39	10	14	11	18	23	15	26	30	21
40	10	15	11	18	23	15	27	31	21
41	10	15	11	19	24	15	27	32	22
42	11	15	11	19	24	15	28	33	23
43	11	15	12	20	25	16	29	33	24
44	11	16	12	20	25	16	30	34	24
45	12	16	12	21	26	16	30	35	24
46	12	16	13	21	26	17	31	35	25
47	12	17	13	22	27	17	32	36	25
48	12	17	13	22	27	17	32	37	25
49	13	17	13	23	28	17	33	37	26
50	13	17	13	23	28	17	34	38	26

Appendix 21. Cumulative number of attendees from the lowest quintiles among 50 randomly chosen attendees in sequence in Nabinagar Union Health and Family Welfare Centre by sequence of patients under various threshold levels, June 2006

Trial No.	Threshold (20%-40%)		Cumulative no. of poor attendees	Threshold (40%-60%)		Cumulative no. of poor attendees	Threshold (60%-80%)		Cumulative no. of poor attendees
	Lower boundary	Upper boundary		Lower boundary	Upper boundary		Lower boundary	Upper boundary	
1	Continued	3	0	Continued	4	0	Continued	4	1
2	Continued	3	0	Continued	4	0	Continued	4	1
3	Continued	4	1	Continued	5	1	1	5	2
4	Continued	4	1	Continued	5	1	1	6	2
5	Continued	4	2	1	6	2	2	6	3
6	Continued	5	2	1	6	3	3	7	4
7	Continued	5	2	2	7	3	3	8	5
8	1	5	2	2	7	3	4	8	5
9	1	5	2	3	8	3	5	9	5
10	1	6	2	3	8	3	5	10	6
11	2	6	3	4	9	4	6	11	7
12	2	6	3	4	9	5	7	11	8
13	2	7	4	5	10	6	8	12	9
14	3	7	4	5	10	6	8	13	9
15	3	7	4	6	11	7	9	13	10
16	3	8	5	6	11	8	10	14	11
17	3	8	5	7	12	8	10	15	11
18	4	8	5	7	12	8	11	16	11
19	4	8	6	8	13	9	12	16	12
20	4	9	6	8	13	9	13	17	13
21	5	9	6	9	14	9	13	18	13
22	5	9	6	9	14	9	14	18	14
23	5	10	6	10	15	9	15	19	15
24	5	10	6	10	15	9	15	20	15
25	6	10	7	11	16	10	16	20	16
26	6	10	8	11	16	11	17	21	17
27	6	11	9	12	17	12	17	22	18
28	7	11	9	12	17	12	18	23	18
29	7	11	9	13	18	12	19	23	18
30	7	12	9	13	18	13	20	24	19
31	8	12	9	14	19	14	20	25	20
32	8	12	10	14	19	15	21	25	21
33	8	13	10	15	20	15	22	26	21
34	8	13	10	15	20	15	22	27	22
35	9	13	10	16	21	15	23	28	23
36	9	13	10	16	21	15	24	28	23
37	9	14	10	17	22	15	25	29	24
38	10	14	10	17	22	15	25	30	24
39	10	14	10	18	23	15	26	30	24
40	10	15	11	18	23	16	27	31	25
41	10	15	11	19	24	16	27	32	25
42	11	15	11	19	24	16	28	33	25
43	11	15	11	20	25	16	29	33	26
44	11	16	12	20	25	17	30	34	27
45	12	16	12	21	26	17	30	35	28
46	12	16	12	21	26	18	31	35	29
47	12	17	13	22	27	19	32	36	30
48	12	17	13	22	27	19	32	37	30
49	13	17	14	23	28	20	33	37	31
50	13	17	15	23	28	21	34	38	32

Appendix 22. Decision about the monthly, weekly and daily utilization of the Nabinagar UHC by people from the lowest quintiles using LQAS, based on information from 50 randomly chosen attendees, June 2006

Period of evaluation	Threshold 20%-40% Error =11% Maximum number of non-poor (failure) permitted is 35		Threshold 40%-60% Error =16% Maximum number of non-poor (failure) permitted is 25		Threshold 60%-80% Error =11% Maximum number of non-poor (failure) permitted is 14	
	Number of non-Poor	Judgment	Number of non-Poor	Judgment	Number of non-Poor	Judgment
Month	32	P	31	F	25	F
Week						
1	33	P	29	F	18	F
2	34	P	27	F	17	F
3	40	F	33	F	21	F
4	35	P	29	F	21	F
Total		3 Pass		0 Pass		0 Pass
Day						
1	30	P	27	F	21	F
3	37	F	30	F	17	F
4	39	F	36	F	22	F
5	33	P	29	F	21	F
6	39	F	34	F	18	F
7	39	F	33	F	22	F
8	41	F	33	F	21	F
10	34	P	33	F	25	F
11	37	F	32	F	21	F
12	34	P	33	F	23	F
13	36	F	33	F	20	F
14	35	P	31	F	19	F
15	35	P	28	F	18	F
17	39	F	32	F	19	F
18	30	P	27	F	23	F
19	36	F	33	F	18	F
20	33	P	27	F	16	F
21	35	P	28	F	22	F
22	40	F	35	F	24	F
24	35	P	31	F	17	F
25	33	P	27	F	21	F
26	38	F	30	F	19	F
27	34	P	28	F	18	F
28	37	F	30	F	23	F
29	39	F	33	F	26	F
Total		12 Pass		0 Pass		0 Pass

Appendix 23. Decision about the monthly, weekly and daily utilization of the Nabinagar UHFWC by people from the lowest quintiles using LQAS, based on information from 50 randomly chosen attendees, June 2006

Period of evaluation	Threshold 20%-40% Error =11% Maximum number of non-poor (failure) permitted is 35		Threshold 40%-60% Error =16% Maximum number of non-poor (failure) permitted is 25		Threshold 60%-80% Error =11% Maximum number of non-poor (failure) permitted is 14	
	Number of non-Poor	Judgment	Number of non-Poor	Judgment	Number of non-Poor	Judgment
Month	33	P	27	F	14	P
Week						
1	39	F	30	F	19	F
2	32	P	26	F	20	F
3	32	P	22	P	15	F
4	34	P	31	F	24	F
Total		3 Pass		1Pass		0 Pass
Day						
1						
3	32	P	21	P	11	P
4	28	P	25	P	13	P
5	30	P	24	P	15	F
6	33	P	26	F	18	F
7	36	F	29	F	14	P
8	28	P	23	P	15	F
10	35	P	29	F	15	F
11	33	P	28	F	19	F
12	31	P	22	P	18	F
13	41	F	34	F	18	F
14	31	P	25	P	14	P
15	35	P	27	F	14	P
17	30	P	26	F	13	P
18	43	F	33	F	25	F
19	32	P	27	F	16	F
20	38	F	29	F	21	F
21	32	P	25	P	13	P
22	35	P	30	F	18	F
24	35	P	30	F	22	F
25	30	P	29	F	21	F
26	36	F	30	F	20	F
27	30	P	26	F	19	F
28	33	P	24	P	12	P
29	27	P	19	P	13	P
Total		19 Pass		9 Pass		9 Pass

Total 25 days

Note: Number of attendees was less than 50 for each day in this FWC.

Appendix 23. Decision about utilization of the UHC by the people with main income earner unable to read using LQAS based on information from 50 randomly chosen attendees, June 2006

Area	Threshold 50%-70% Error =14% Maximum number of non-poor (failure) permitted is 19	
	Number of non-Poor	Judgment
Shivalaya	27	Fail
Nabinaagr	29	Fail