

# Supportive Supervision And Immunization Coverage: Evidence From India.

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## Abstract

In this paper, authors have used operation definition of Supportive supervision to studying its role in improving immunization coverage in developing country settings. Comparison of immunization coverage before and after the initiation of supportive supervision is analyzed. Despite of methodological limitations, the study infers that supportive supervision improves immunization coverage and also serves an efficient tool to strengthen the local health system.

## INTRODUCTION

Immunization is one of the few cost effective public health interventions to reduce vaccine preventable deaths. However in India, the vaccination coverage under the UIP is not reaching the adequate level consistently. Hence the country has not been able to optimally utilize vaccinations to reduce the burden of vaccine preventable diseases. Availability of vaccines does not necessarily translate into vaccination. Inadequate supervision and management is one of the frequently identified barriers for keeping up the consistently high vaccination coverage<sup>1</sup>. The objective of the study was to understand and application of role of supportive supervision in routine and catch up session immunization program at Bellary District of Karnataka-India.

Supportive supervision is defined as process that promotes quality at all levels of the health system by strengthening relationships within the system, focusing on the identification and resolution of problems, and helping to optimize the allocation of resources -promoting high standards, teamwork, and better two-way communication.<sup>2</sup>. For the purposes of paper, we have defined it as any support provided by both internal and external agencies in effective implementation of the immunization program.

In order to sustain the gains made in polio immunization and to improve the immunization coverage against other vaccine preventable diseases, the Government of Karnataka constituted State Operation Core Group (OCG) on Routine Immunization in the year 2004. Surveillance Medical Officer of National Polio Surveillance Project (NPSP) and UNICEF

facilitated the formation of OCG through brainstorming and consultations. The function of the State Core Group was to provide technical supervision and guidance to the ongoing immunization program in the state. At the initiation of this group, several activities were started related to vaccination program in the state including micro planning, re-orientation to health workers and medical officers, logistics planning. The District Core Group on Routine Immunization was the analogous of state core group at the district level. There has been no evidence from India to check whether presence of such technical groups to support supervision would translate into improving the coverage. We chose to study Bellary district, Karnataka state of India, as it had highest number of polio cases (polio caser reflects overall poor routine immunization in any area) in the world during the year 2003 and we wanted to check improvements in the high-risk district. This paper aims at studying the role played by supportive supervision of state and district core groups in improving immunization coverage.

## METHODS

### STUDY SETTINGS

Bellary district of Karnataka state-India has been chosen as study areas as this district had 18 confirmed cases of Poliomyelitis in the year 2003 with low routine immunization coverage. As it has been considered that failure to implement routine immunization services is one of the important reasons for emergence of polio transmission in many districts like Bellary in India<sup>3</sup>.

**STUDY DESIGN**

We evaluated planning, improvements in trainings, newer logistical and vaccine arrangements made based on the framework of Reach Every District (RED) strategy of WHO as mentioned in figure-1. The activities under supportive supervision introduced in Bellary were mainly the following:-

Clear Job descriptions –descriptions of job or instructions for implementing mop-up activities were provided on simple checklist so that all team members had ready access to them and use them to do this work

Work schedules –District health officers and Taluk level officers were given the outline in the form of a pre planned work schedule that provided date, time and content framework for mop-up operations.

Mentoring –was in the form of regular ongoing problem solving and on job support, both planned and unplanned.

Assessing the work performance-workers and supervisors were given checklists to assess the work performance with every team member on a regular basis. All work deficiencies found by the assessment were supposed to be responded to, by providing guidance counseling and sometimes further training to address the deficiency.

Diary and reports-Each member was expected to maintain a work diary and write brief, regular reports that identify activities including all problems in the field on a daily basis. Daily evening feed backs between the team members, supervisors and health officers were used for corrections and improvements.

Training and Handholding support: All staff appointed to different levels of the system were provided orientation training and inputs to maintain technical quality and standards of skill especially since carrying out catch-up campaign was specialized task.

The special activities of supportive supervision to improve immunization coverage were conducted in Bellary district during the months of July and August 2007. A survey was conducted in the month of August 2007 to estimate improvement in immunization coverage. The immunization coverage was evaluated through a community-based study of children aged 0–2 years in the entire Bellary district. The participation in the study was voluntary and informed consent was taken from the subjects. The analysis was done at University of California, Los Angeles with permission of

IRB from University of California Los Angeles for data analysis. (IRB# 007-06-084-02). A detailed description of the methods of survey is described elsewhere.<sup>4</sup> Hence the comparison of background rates of immunization and the current rates may provide a tool to check the effectiveness of measures suggested by state and district core groups on routine immunization.

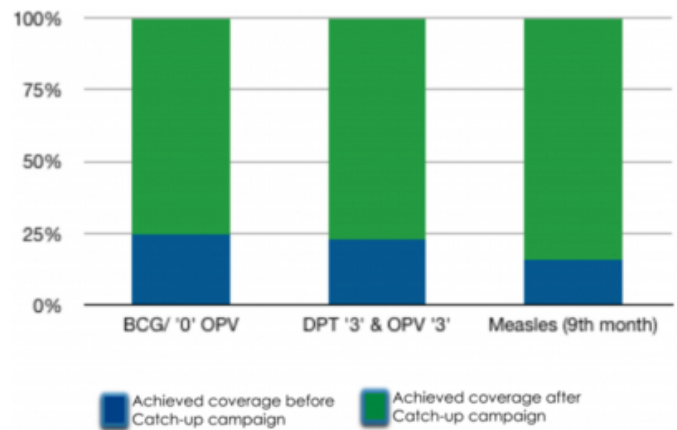
The coded information was entered village wise in Microsoft excel. The names and all other personal identifiers were removed from the data before data analysis. Data analysis was performed using SPSS Statistics 17.0, R 2.11, year 2010 and Version 2007, Microsoft Excel, Microsoft Corporation, USA.

**RESULTS**

To estimate the improvements in coverage for various antigens, we clustered vaccines that are given at same age into one group each. Hence BCG and OPV booster formed group.1, OPV and DPT 1,2,3 into group 2 and measles was analyzed as group.3. There were 14 different subgroups for each group of vaccine. We performed screening tests to determine whether we need to conduct parametric or non-parametric ANOVA to detect differences between two timeframes.

**Figure 1**

Figure 1



**Fig.1: Before and After coverage for various antigens**

Fig.1 depicts the information from routine immunization coverage reports of the district. It shows that only 28% of total eligible children were immunized for BCG and OPV '0' doses prior to and 85% of them were immunized during catch-up campaign. Coverage for DPT '3' and OPV '3' was 25% and 84% for before and after catch-up campaigns. For Measles coverage at 9<sup>th</sup> month, these proportions were 15%

and 81%. The details of the numbers of the children (taluk-wise, and dose-wise) are presented in Table.1.

**Figure 2**

Table.1: Coverage of VPD antigens before and after supportive supervision

Sl.no	Taluk	BCG & Zero OPV Regular Beneficiaries + Dropouts			DPT & OPV (1,2,3 & Booster) Regular Beneficiaries + Dropouts			Measles ( 9th month )		
		Before		After	Before		After	Before		After
		Eligible	Coverage	Coverage	Eligible	Coverage	Coverage	Eligible	Coverage	Coverage
1	Taluk.1	4267	961	3158	14854	4812	12547	4070	1021	3622
2	Taluk.2	2447	884	2286	8936	1324	6532	2584	358	2084
3	Taluk.3	1050	340	920	4184	1142	3858	1171	480	1050
4	Taluk.4	679	118	676	2666	658	2395	7041	224	5032
5	Taluk.5	2072	468	1846	3663	932	3207	1903	358	1624
6	Taluk.6	1382	458	1253	4387	834	3816	942	218	843
7	Taluk.7	477	188	347	1184	332	925	619	110	518
TOTAL		12374	3417	10488	39874	10634	33580	18330	2769	14773

**Figure 3**

Table.2: Bartlett’s Homoscedasticity Test

Vaccines	Bartlett’s K-sq Statistic	p-value	Decision
BCG and OPV booster	0.19	0.6629	Homoscedastic
OPV and DPT 1, 2, and 3	0	0.9945	Homoscedastic
Measles	1.7033	0.1919	Homoscedastic

**Figure 4**

Table.3: Shapiro-Wilk’s Normality Test

Vaccines	Shapiro-Wilk’s Statistic (W)	p-value	Decision
BCG and OPV booster	0.855813	0.0267	Normality rejected
OPV and DPT 1, 2, and 3	0.792699	0.0041	Normality rejected
Measles	0.824522	0.0102	Normality rejected

**Figure 5**

Table.4: Summary Statistic for Time- Friedman  $\chi^2$  testing (Stratified for Taluk)

Cochran-Mantel-Haenszel Statistics (Based on Rank Scores)				
Vaccine	DF	Value	p-value	Decision
BCG and OPV booster	1	7.0000	0.0082	Time is significant
OPV and DPT 1, 2, and 3	1	7.0000	0.0082	Time is significant
Measles	1	7.0000	0.0082	Time is significant

(Total Sample Size for all the 3 vaccines = 14)

**Figure 6**

Table.5: Analysis Of Maximum Likelihood Parameter Estimates

BCG and OPV booster							
Parameter	df	Estimate	se	Wald 95% C.I	Wald $\chi^2$	Pr > $\chi^2$	Decision
Intercept	1	-0.0545	0.1241	-0.2978 0.1887	0.19	0.6603	
Time	1	-1.1206	0.0828	-1.2828 -0.9583	183.24	<.0001	Significantly different
Time	1	0.0000	0.0000	0.0000 0.0000	.	.	

OPV and DPT 1, 2, and 3							
Parameter	df	Estimate	se	Wald 95% C.I	Wald $\chi^2$	Pr > $\chi^2$	Decision
Intercept	1	-0.1261	0.0910	-0.3044 0.0522	1.92	0.1657	
Time	1	-1.2719	0.0616	-1.3926 -1.1512	426.80	<.0001	Significantly different
Time	1	0.0000	0.0000	0.0000 0.0000	.	.	

Measles							
Parameter	df	Estimate	se	Wald 95% C.I	Wald $\chi^2$	Pr > $\chi^2$	Decision
Intercept	1	-0.1572	0.2490	-0.6453 0.3308	0.40	0.5278	
Time	1	-1.5923	0.1808	-1.9467 -1.2378	77.53	<.0001	Significantly different
Time	1	0.0000	0.0000	0.0000 0.0000	.	.	

Based on the results from Table.1 and Table.2, homoscedasticity assumption got accepted but normality assumption got rejected. As both of these assumptions are very vital to perform parametric ANOVA, we decided not to perform a parametric ANOVA in this case. Further, Box-Cox transformation of the response variable also failed to depict normal distribution for any of the vaccine groups. Hence, we have conducted nonparametric ANOVA (Freidman  $\chi^2$ ).

For all three groups of vaccine, we had formulated a null hypothesis that percentage of children covered is not equally distributed over time after controlling for taluk. The null hypotheses got rejected (p=0.0082) hence it means that the percentage of children covered significantly varies over time, after controlling for taluk, for three vaccine groups.

Further, we tested the pure count data to check for over-dispersion. Our null hypothesis was that number of children covered is not over-dispersed and it follows the Poisson distribution for vaccine groups (against alternative hypotheses that number of children covered is over-dispersed and it follows the Negative binomial distribution for respective vaccine group). The null hypotheses got rejected in the likelihood ratio test since the value of the LR statistic is greater than the corresponding  $\chi^2$  value. Hence, it means that the number of children covered is over-dispersed and it significantly follows the negative binomial distribution for vaccine groups.

To overcome the problem of over-dispersion, we decided to perform negative Binomial Modeling for the number of children covered under each vaccine groups of 1, 2 and 3.

By formulating null hypotheses that the number of children covered is equally distributed over time for each vaccine group, we concluded that number of children covered varies significantly over time for each group of vaccines.

Hence, both non-parametric ANOVA and ML tests show that time is significant. It indicates that the percentage of coverage and number of children covered significantly differs due to supportive supervision for all the groups of three vaccines.

### **LIMITATIONS**

Methodological issues arise when we try to quantify supportive supervision as it involves many components such as improvement in planning, better training and coordination among others.<sup>5, 6, 7</sup> However, all these efforts are seen as mediators in the causal pathway from poor coverage to better coverage. Hence, our focus was only to check whether the increase in coverage is significant over the period of time, wherein supportive supervision has taken place. Although reporting effect measure modification of each components such as planning, improvements in trainings and newer logistical and vaccine arrangements made would have been ideal, they do not fall under the scope of current paper.<sup>8</sup> Also, measuring supportive supervision of processes such as routine immunization also poses methodological challenge. Hence, we decided to estimate the role of supervision only for a specific period of time.

### **DISCUSSION**

Although, the top down typical hierarchical model is in practice in general but this sort of top-down fault finding supervision may not be workable everywhere.<sup>9</sup> This is primarily because, despite of all facilities, the human problems in the local contexts are varied. This is further substantiated by Clements et al 2006<sup>9</sup> that understanding complex human problems are important to improve vaccination program in the local cosmology. Nevertheless, more supportive humane interactions with health workers appears to be sustainable “supportive supervision” model evolving in the modern time.<sup>10</sup>

From health service point of view the supportive supervision intervention yielded in numerous ways such as; a) The immunization program managers have understood the significance of supportive supervision's; b) this has helped to removed the preconceived notion of supportive supervision is not the solution to improve the vaccination coverage and indirectly helped to remove such barrier; c)

enhanced the working knowledge to frame and refine the various supervisory tools.

From vaccination policy point of view, the state government is willing to consider the supportive supervisory guidelines, tools, forms, formats and performance review tools. This study also streamlined the realistic need of financial needs for field supportive supervisory travel and other relevant expenses, which may be incorporated for future budgeting process of vaccination program. Providing supportive supervision in specified period of time in a way like catalyst in boosting up the immunization coverage in defined geographical area by several ways.<sup>11</sup>

There are many reasons for lack of practicing any model for supportive supervision in implementation of Universal Immunization Program (UIP).<sup>12</sup> First, supervision and implementation of UIP is mainly thought to be prerogative state function and local Governments might not like involving external agencies. Second, there may not be enough manpower for any external agency to provide supportive supervision on a large scale.<sup>13</sup> Third, from a legal perspective, it is not possible to involve external agencies in some of the supervisory functions such as financial or taking disciplinary actions.

Apart from guiding the system towards improved coverage of missed children, supportive supervision provides an opportunity to identify and solve other challenges faced by local health system.<sup>14, 15</sup> For example in Bellary, supervisors discovered and addressed several problems such as: several uncovered urban areas were discovered to be outside the ambit of any health service delivery due to abolition of a category of health centers (PPCs.), several vacant positions of Auxillary Nurse Midwife (ANM) vacancy for the past 4-5 years, some of the urban areas were severely understaffed (for eg only 2 workers/1.6 lakhs population in one town), identification of several hard to reach areas with inaccessible roads (about 26 villages in one block were not covered for 3-4 years) and strengthening the existing tiers of supervision at all levels. In the similar lines, Nkowane et al, 2009 also mentions that midwives supportive supervision has immensely added value to strengthen the vaccination program.<sup>16</sup>

### **CONCLUSION**

Supportive supervision is often consistent missing link in efficient implementation of public health programs in India. Our paper has demonstrated that supportive supervision has an independent role and might be a significant contributor

for overall immunization program strengthening. Despite of limitations, our paper contributes to the fact that supportive supervision not only improves immunization coverage immediately but also serves an efficient tool to strengthen the local health system to deliver services. It is imperative that as a country, India starts strengthening supportive supervision at all levels.<sup>17</sup>. Evaluation of supervisory structure and function along with establishment of feedback mechanisms can improve the current status.

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