



ROLE OF INCENTIVES IN IMPROVING THE IMMUNIZATION COVERAGE IN DEVELOPING AND DEVELOPED COUNTRIES – SYSTEMATIC REVIEW AND META-ANALYSIS

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ABSTRACT Incentives have been used to boost uptake of essential health services across the world, over the years. This study reviews the global literature to find out lessons, challenges, mitigation of such incentives in the context of immunization programme. It also compares performance of such incentives between the developing and developed countries. Combination of system strengthening and beneficiary incentives has the power to improve the results substantially. However, we need to consider the ethical aspects, sustainability of the program and long-term effects of incentives on the future health related behavior.

KEYWORDS : Immunization Incentive Development

INTRODUCTION

Immunization is a highly cost effective way of improving survival in children in developing countries. Every year throughout the world, however, an estimate 27 million children and 40 million pregnant women do not receive the basic package of immunizations(as defined byWHO and UNICEF), and two to three million people die from diseases that can be prevented with vaccines. Immunization rates are in part based on official statistics and might be over-reported. In India, immunization services are offered free in public health facilities, but, despite rapid increases, the immunizationrate remains low in some areas. According to the National Family Health survey (NFHS-3), in India only 44% of children aged 1-2 years have received the basic package.

In this context it is important to examine the importance of Incentives(monetary/non-monetary) to beneficiaries in improving the vaccination/other health outcomes. This review critically examines the existing literature to estimate

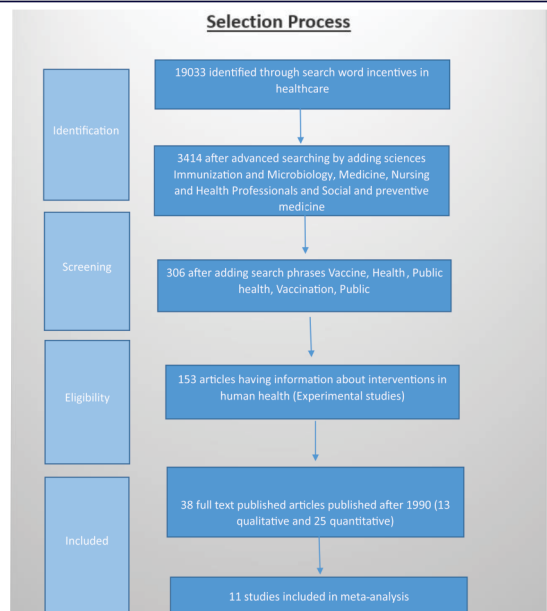
1. whether incentives to beneficiaries can improve the health outcome. Is there any statistically significant evidence through experimental studies?
2. Is there any difference in outcomes between Developed and developing countries?
3. What are the different challenges in providing incentives?

Methods

Search for studies

Several bibliographic databases like PubMed, Science Direct, ProQuest were searched to identify relevant studies. To be included, a study had to provide evidence of effects (Positive or Negative or no effect) of a financial incentive conditional upon specific health related behaviors. Preference was given to Immunization related experiments/ interventions. Only experimental or quasi-experimental study designs were included in the analysis. Though many qualitative, descriptive studies were reviewed, they were used as base to understand and improve the knowledge about the topic in the literature.

Key search phrases used were- Incentives in healthcare, Beneficiary incentives in healthcare, Incentives for vaccination, Conditional cash transfers in healthcare, Impact of cash transfers in healthcare, Incentives for behavioral change in health Out of 38 studies 13 are qualitative. Of the remaining 25 Quantitative studies 6 studies are about provider incentives which are not included in the analysis. This study intends to test the effectiveness of incentives to beneficiaries. Of the remaining 19 studies 8 studies test the variation of performance with the change in the quantity of incentives or time period of incentives or are based on the focus group/interview method, or about other health related outcomes like child nutrition or maternal health. Remaining 11 studies are quantitative studies using one of Randomized control study/Case control/Cohort/Longitudinal intervention as methodology. Of the 11 included in the study 4 are from developed countries and 7 are from developing countries like sub-Saharan/Latin American/ South east Asian countries which are comparable. Table below shows the classification of studies included.



INCLUSION AND EXCLUSION CRITERIA

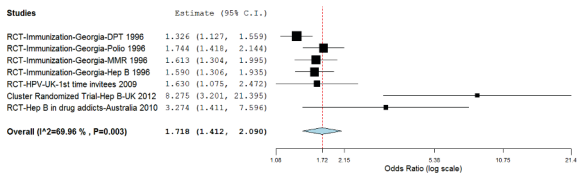
Included	Excluded
<ul style="list-style-type: none"> • Experimental studies including RCTs, Case control, cohort and interventional studies • Quantitative studies • Full text articles • Publications after 1990 • Published articles • Beneficiary incentives • Studies on vaccination, institutional delivery etc. • Appendices and database from Government website for Janani Suraksha Yojana study • English language with published original data 	<ul style="list-style-type: none"> • Observational studies • Qualitative studies (not used for meta-analysis, but are used for identifying challenges) • Limited access or abstract only • Published before 1990 unless they are seminal studies • Unpublished articles • Provider incentives • Studies on habitual health behaviors like smoking • Policy papers without original data

Data Analysis

Dichotomous outcome data were analyzed by calculating an odds ratio (OR) for each study as effect size, along with a 95% confidence interval. For meta-analysis Open Meta(Analyst) was used. Data was analyzed by comparing the proportions of the result (change in the health outcome which includes improved vaccination rates, decreased mortality etc.) in the study vs. control group. If there was no control, then results before and after intervention were compared. Heterogeneity was assessed via examination of forest plots and calculation of the I-squared statistic. Data were synthesized via meta-analyses grouped by timed endpoints. A cumulative Meta-analysis was calculated separately. Analysis was done separately for developing countries and developed countries.

RESULTS**Developed Countries**

Author/year	Geography	Qualitative/ Quantitative	Methodology	Statistical test used	Directionality	Remarks
Carolyn A. Day, Marian Shanahan, Handan Wand, Libby Topp, Paul S. Haber, Craig Rodgers, Rachel Deacon, Nick Walsh, John Kaldor, Ingrid van Beek, Lisa Maher (2015)	Australia	Quantitative	Randomized control trail	Logistic regression	Positive for increasing vaccination	
Karry C. Kerpelman, David B. Connell, Walter J. Gunn	Georgia	Quantitative	Randomized control trail	Chi-square, logit analysis	Positive for increasing immunization rates	Possibility of selection bias and consent bias
Eleni Mantzari, Florian Vogt , Ian Shemilt , YinghuiWei, Julian P.T. Higgins, Theresa M. Marteau (2015)	UK	Quantitative	Randomized control trail	Logistic regression analysis	Positive for increasing uptake of HPV vaccinations	do not allow conclusive inferences to be made regarding the absolute impact of incentives on completion of the program do not allow firm conclusions to be drawn regarding the possibility of incentives to negatively influence autonomy and people's ability to voluntarily make decisions, and thus coerce them
Tim Weaver*, Nicola Metrebian*, Jennifer Hellier, Stephen Pilling, Vikki Charles, Nicholas Little, Dilkushi Poovendran, Luke Mitcheson, Frank Ryan, Owen Bowden-Jones, John Dunn, Anthony Glasper, Emily Finch, John Strang (2014)	UK	Quantitative	cluster randomized controlled trial	Logistic regression	Positive for financial incentives	
Tania Barham, John A. Maluccio	Nicaragua	Quantitative	Randomized control trail	Regression	Positive for increase in vaccination coverage	Possibility of measurement error
Abhijit Vinayak Banerjee, Esther Duflo, Abdul Latif Jameel (2010)	India	Quantitative	Cluster Randomized control trial	Regression	Positive for increase in vaccination coverage	Couldn't look at the impact of density of population also couldn't look at the impact of initial coverage
Amie Shei, Federico Costa, Mitermayer G Reis and Albert I Ko	Brazil	Quantitative	Randomized control trail	Logistic Regression	Positive for improving child health	Regional differences not taken into account, chances of selection bias
S. Chandira, A.J. Khana, c, H. Hussaina, H.R. Usmanb, S. Khowajac, N.A. Halseya, S.B. Omera,d (2010)	Pakistan	Quantitative	Longitudinal Interventional study	Long rank test, Student's t-test for continuous variable, Chi-square test for categorical variables	Positive for improving immunization in developing countries	Cohorts were non-concurrent and possibility of sampling error
Stephen S Lim, Lalit Dandona, Joseph A Hoisington, Spencer L James, Margaret C Hogan , Emmanuela Gakidou (2010)	India	Quantitative	With vs without intervention, impact evaluation	Multi variable regression	Positive for incentives in improving institutional deliveries	unobserved confounding and selective uptake of the program in the matching and with-versus-without analyses
Saul S Morris, Rafael Flores, Pedro Olinto, Juan Manuel Medina (2004)	Latin America	Quantitative	Cluster randomized trial	Regression	Positive for conditional payments for preventive healthcare	trial was not blind. The investigators were constantly vigilant, partial implementation of the service-level package, which might be thought to limit the interest of the findings



Summary

Metric: Odds Ratio

Model Results

Estimate	Lower bound	Upper bound	p-Value
1.649	1.416	1.920	< 0.001

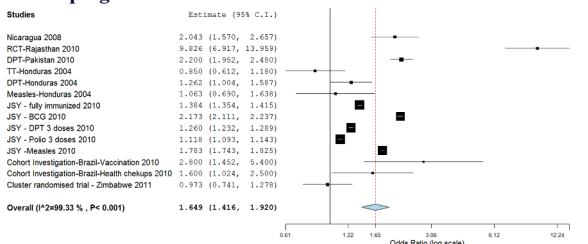
Heterogeneity

tau ²	Q(df=12)	Het. p-Value	I ²
0.068	1937.3	< 0.001	99.329

Results (log scale)

Estimate	Lower bound	Upper bound	Std. error
0.500	0.348	0.652	0.078

Developing Countries



Binary Random-Effects Model

Metric: Odds Ratio

Model Results

Estimate	Lower bound	Upper bound	p-Value
1.718	1.412	2.090	< 0.001

Heterogeneity

tau ²	Q(df=7)	Het. p-Value	I ²
0.040	19.974	0.003	69.961

Results (log scale)

Estimate	Lower bound	Upper Bound	Std. error
0.541	0.345	0.737	0.100

The bars in the analysis indicate confidence intervals of each study and square blocks represent the odds ratio. So in the developed countries, health output of a person receiving incentives is 1.7 times better than the person not receiving incentives (95%, CI 1.48-2.28, P<0.001). Same with Developing countries, health output of a person receiving incentives is 1.65 times better than the person not receiving incentives (95%, CI 1.416-1.920, P<0.001). That is a significant improvement in the results after incentivizing.

DISCUSSION

Despite recently renewed focus to overcome the challenges in improving the healthcare, investments have not yet achieved sustainable comprehensive public sector health programs in many countries. Even where services are reasonably adequate, demand sometimes remains low. When healthcare is accessed, transport and treatment costs and loss of earnings may cause poor families to descend further into poverty. 'Demand-side' financing (DSF)/Incentives to beneficiary approaches have been seen as means to ameliorate this situation, and have been employed in many different contexts ranging from low and middle-income countries to developed countries in attempts to help overcome barriers to access to health care. We considered the quantitative studies for evaluation though we used qualitative studies to understand the intricacies of incentives for beneficiaries in healthcare. Incentives include one or a combination of many of the forms below

- Conditional cash transfers (CCT) targeted at poor households which meet various conditions to receive payments
- No-monetary benefits like distribution of essential food products like lentils, rice etc.

- Vouchers exchanged for health services (Maternity/ Immunization), these vouchers can be used for purchasing various essential things within the vicinity of study population
- Unconditional cash transfers

Overall objective of this study was to examine if there is statistically significant evidence to suggest the improvement of health by providing incentives to beneficiaries. And if there is improvement is there any difference between developing vs developed countries? To examine the various challenges and scenarios involved in implementing the incentives.

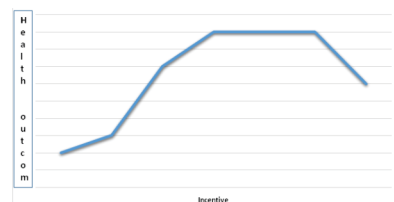
We have excluded the incentives to providers from this study, because in a country like India, it is more prudent to concentrate on incentives to beneficiaries than providers. While incentives to providers can be compared to push strategy, incentives for beneficiaries can be compared to pull strategy. Using a push strategy incentive can be provided for health workers, thus they work more proactively to improve the health outcome by persuading the people to participate in various public health programs. But we have a limited number of health workers and it is impossible to reach every target child for Immunization by incentivizing the providers alone. While pull strategy works more through word of mouth publicity especially in developing countries, where people turn out if they see some value for themselves. A person working as laborer, living on daily wages, has more chances of avoiding the health programs, as there is an opportunity cost involved in the form of his daily wages. If we can compensate him for the opportunity lost, then there is a good chance that he may turnout.

In our study, we tried to establish this through a meta-analysis of experimental studies conducted over the period of last 20 years. Results indicate that there is a significant improvement in the health outcome by incentivizing the beneficiaries in both developed and developing countries. On the contrary to the general belief, even in developed countries incentives lead to a significant improvement in the health outcomes. In fact, our analysis showed odds ratio of nearly 1.7 for both developed and developing countries.

This brings us to the next question, challenges involved in the implementation of Incentives for beneficiaries

1. How much incentives to give?

While it is clear that Incentives increase the outcome, how much incentive to give is an unanswered question. Not many studies included this component, and there is no evidence to suggest the amount of incentive to be given. What happens if increase the incentive? Will it increase the result or will it have negative effects? There is one study which showed that by increasing the incentive the results actually decreased (Koetsenruijter.J 2015et al.) Based on readings from various studies and our experience of vaccine administration we hypothesize that Health outcomes increase with the incentives till it reaches a peak and then plateaus. After reaching the plateau stage, if we still increase the incentives, then the outcomes may actually decrease. The following graph explains the relationship between incentives and the health outcomes.



Initially there is a slow growth phase till we reach a critical point, where the growth rate becomes maximum. That critical point could be opportunity cost of the person coming for vaccination/public health program. As we continue to increase the incentives, after a certain amount, the health outcome plateaus. Still if we continue to increase incentives, then the outcome may actually decrease. This is possibly because of arousal of suspicion (Mantzari E 2015 et al.), which if happens may jeopardize the entire project

1. What happens if we discontinue incentives?

Will the effects still continue? Or will it decrease? If it decreases will it get back to the previous state or will it get worse? There is no conclusive evidence to suggest these effects. We need to monitor for

long-term effects which requires large resources both capital and human. One study indicated that effects lasted till 3 months' post intervention (Weaver T 2014 et al.), but long-term monitoring was not done to draw conclusions about sustainability of the effects. There is a potential adverse effect of incentives on intrinsic motivation which might reduce the likelihood of future health-related behaviors without the offer of rewards (Mantzari E 2015 et al.), which might increase the cost of public health programs exponentially, which otherwise would have been rolled out easily.

2. Is it cost-effective?

Is incentivizing cost effective? Is there any alternative which can lead to better results with the same amount of resources? Again there is no conclusive evidence to answer this question. But one RCT done in Rajasthan, India (Banerjee. A2010 et al.) suggests that in a resource poor and low immunization setting the cost of Immunization by incentivizing is lower than cost of Immunization without incentives. This is because the fixed costs are spread between many people when the rate of Immunization increases and hence the overall cost per Immunization decreases. But it is not the same case with, in a high immunization and resourceful setting, where the improvement in immunization would be marginal with incentives, which might not be cost-effective. So it gives rise to the question, what is the range/coverage rates for immunization below which incentives are cost effective measure? More studies needed in this area, as there is no evidence in this area

3. Is it ethical to give incentives?

Ethical aspects of incentives in research and health programs have not received much attention. The appropriateness of incentives in healthcare still remains controversial and requires further research and discussion to answer all the questions. Grant (Grant RW, Sugarman J 2004) concludes that incentives become unethical when incentives involve dependency, risk is high, actions are degrading, incentive is significantly large to overcome the aversion to participate, or there is principled aversion. In case of incentives for immunization, since the incentives are small, they do not involve high risk, do not compromise dignity of persons, and being offered at immunization centers do not influence the people who are averted to immunizations.

CONCLUSIONS

Incentives for beneficiary/demand side financing is an effective way for improving immunization/other health outcomes, especially in a low immunization, poor resource setting. It is equally effective both in developed and developing countries, but the cost-effectiveness will be high in low coverage, developing countries due to the spread of fixed costs over number of recipients. Combination of system strengthening and beneficiary incentives has the power to improve the results substantially. However, we need to consider the ethical aspects, sustainability of the program and long-term effects of incentives on the future health related behavior.

Limitations

Studies included in the analysis are experimental studies with some common limitations like possibility of sampling error, selection bias and measurement bias.

We have included only 10 studies for our meta-analysis, which is a limitation. Also the heterogeneity is high owing to the fact that these studies are conducted in different countries, in various conditions, looking at diverse set of parameters. Also the method of analysis is varying across all studies.

We have used limited number of data bases like PubMed, science direct and Elsevier for searching. We didn't include non-English papers in the study.

REFERENCES

- Adato M, Roopnaraine T, Becker E 2011, Understanding use of health services in conditional cash transfer programs: Insights from qualitative research in Latin America and Turkey, *Social Science & Medicine* 72 (2011) 1921e1929
- Awoh AB, Plugge E. J 2016. Immunisation coverage in rural-urban migrant children in low and middle-income countries (LMICs): a systematic review and meta-analysis, *Journal of Epidemiology and Community Health* 2016;70:305-311
- Banerjee A, Hollis A, Pogge T 2010. The Health Impact Fund: incentives for improving access to medicines, *Lancet* 2010;375: 166-69
- Banerjee AV 2010 et al. Improving immunisation coverage in rural India: clustered randomised controlled evaluation of immunization campaigns with and without incentives, *British Medical Journal*, 340: c2220
- Barham T, Maluccio JA 2009. Eradicating diseases: The effect of conditional cash transfers on vaccination coverage in rural Nicaragua, *Journal of Health Economics*, 28: 611-621

- Chandira S 2010 et al. Effect of food coupon incentives on timely completion of DTP immunization series in children from a low-income area in Karachi, Pakistan: A longitudinal intervention study, *Vaccine*, 28: 3473-3478
- Crossland N 2014 et al. Incentives for breastfeeding and for smoking cessation in pregnancy: An exploration of types and meanings, *Social Science & Medicine* 128 (2015) 10e17
- Day C 2016 et al. Development of immunity following financial incentives for hepatitis B vaccination among people who inject drugs: A randomized controlled trial, *Journal of Clinical Virology*, 74: 66-72
- Fernald L C H, Gertler P J, Neufeld L M 2008. The Importance of Cash in Conditional Cash Transfer Programs for Child Health, Growth and Development, *Lancet*, 371(9615): 828-837
- Grant RW, Sugarman J 2004. Ethics in human subjects research: do incentives matter? *Journal of Medicine and Philosophy*, 29(6): 717-38
- Hippena B, Matasb A 2009. Incentives for organ donation in the United States: feasible alternative or forthcoming apocalypse? *Current Opinion in Organ Transplantation* 2009, 14:140-146
- Jackson T P, Mazumdar S, Mills A 2012. Financial incentives in health: New evidence from India's Janani Suraksha Yojana, *Journal of Health Economics*, 43: 154-169
- Jackson TP 2009 et al. The experiences of districts in implementing a national incentive programme to promote safe delivery in Nepal, *Bio Med Central Health Services Research*, 9:97
- Jochelson k, 2007. Kicking Bad Habits: How can the NHS help us become healthier? Kings fund
- Joshi S, Sivaram A 2014. Does it Pay to Deliver? An Evaluation of India's Safe Motherhood Program, *World Development*, 64: 434-447
- Kerpelman L C, Connell DB, Gunn WJ 2000. Effect of monetary sanction on immunization rates of recipients of Aid to Families with Dependent Children, *Journal of American Medical Association*, 284(1): 53-59
- Koetsenruijter J, Lieshout J V, Wensing M 2015. Higher monetary incentives led to a lowered response rate in ambulatory patients: a randomized trial, *Journal of Clinical Epidemiology*, 68: 1380-1382
- Lawrence GL 2004 et al. Effectiveness of the linkage of child care and maternity payments to childhood immunization, *Vaccine*, 22: 2345-2350
- Letter to the Editor Community-level incentives to increase the use of vaccination services in developing countries: An idea whose time has come? *Vaccine* 28 (2010) 6123-6124
- Lim SS 2010 et al. India's Janani Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities: an impact evaluation, *Lancet*, 375: 2009-23
- Mannion R 2014. Take the money and run: the challenges of designing and evaluating financial incentives in healthcare: Comment on "Paying for performance in healthcare organisations", *International Journal of Health Policy Manag* 2014; 2: 95-96
- Mantzari E 2015 et al. Personal financial incentives for changing habitual health-related behaviors: A systematic review and meta-analysis, *Preventive Medicine* 75 (2015) 75-85
- Mantzari E, Vogt F, Marteau TM 2015. Financial Incentives for Increasing Uptake of HPV Vaccinations: A Randomized Controlled Trial, *Health Psychology*, 34(2), 160-171
- McNaughton R J, Adams J, Shucksmith J 2016. Acceptability of financial incentives or quasi-mandatory schemes to increase uptake of immunisations in preschool children in the United Kingdom: Qualitative study with parents and service delivery staff, *Vaccine* 34 (2016) 2259-2266
- Morris SS 2004 et al. Monetary incentives in primary health care and effects on use and coverage of preventive health care interventions in rural Honduras: cluster randomised trial, *Lancet*, 364: 2030-37
- Murray S F 2014 et al. Effects of demand-side financing on utilisation, experiences and outcomes of maternity care in low- and middle-income countries: a systematic review, *BMC Pregnancy and Childbirth* 2014, 14:30
- Ranganathan M, Lagarde M 2012. Promoting healthy behaviours and improving health outcomes in low and middle income countries: A review of the impact of conditional cash transfer programmes, Elsevier Inc., *Preventive Medicine* 55 (2012) S95-S105
- Ridde V, Diarra A 2009. A process evaluation of user fees abolition for pregnant women and children under five years in two districts in Niger (West Africa), *Bio Med Central Health Services Research*, 9:89
- Robertson L 2013 et al. Effects of unconditional and conditional cash transfers on child health and development in Zimbabwe: a cluster-randomised trial, *Lancet*, 381: 1283-92
- Shefer A 1999 et al. Improving Immunization Coverage Rates: An Evidence-based Review of the Literature, Johns Hopkins University School of Hygiene and Public Health, Vol. 21, No. 1
- Shei A 2014 et al. The impact of Brazil's Bolsa Familia conditional cash transfer program on children's health care utilization and health outcomes, *BMC International Health and Human Rights*, 14: 10
- Soors W, Criel B 2000. Community health insurance in sub-Saharan Africa: Opportunities for improving access to emergency obstetric care? Research gate
- Walque D 2012 et al. Incentivising safe sex: a randomised trial of conditional cash transfers for HIV and sexually transmitted infection prevention in rural Tanzania. *British Medical Journal Open* 2012;2:e000747. doi:10.1136/bmjopen-2011-000747
- Weaver T 2014 et al. Use of contingency management incentives to improve completion of hepatitis B vaccination in people undergoing treatment for heroin dependence: a cluster randomised trial, *Lancet*, 384: 153-63
- Yip W C M 2010 et al. Realignment of incentives for health-care providers in China, *Lancet* 2010; 375: 1120-30