COST-EFFECTIVENESS ANALYSIS OF ICDS PROGRAM ON ALLEVIATING STUNTING IN INDIAN CHILDREN

(Dated: 08 August, 2019)

INDIAN COUNCIL OF MEDICAL RESEARCH | NATIONAL INSTITUTE OF NUTRITION

NTC of Excellence in Public Health Nutrition
ICMR - National Institute of Nutrition
Ministry of Health & Family Welfare, GOI
Hyderabad - 500007, Telangana State.

COST-EFFECTIVENESS ANALYSIS OF ICDS PROGRAM ON ALLEVIATING STUNTING IN INDIAN CHILDREN

It is well known that stunting is affected by many immediate and underlying factors like maternal nutrition, availability of food, healthcare facilities, sanitation, infections, etc. However, in the present study we performed the analysis with the assumption that Integrated Child Development Services (ICDS) intervention, which addresses calorie and protein gap and also ensures nutrition and hygiene counselling, should reduce stunting in children. Therefore an exercise has been initiated to get an idea about the funds invested in ICDS program and the rates of reduction in stunting.

OBJECTIVES

- To analyse the cost-effectiveness of ICDS program during 2005-06 (NFHS-3) to 2015-16 (NFHS-4) by assessing the number of children saved from stunting and the number of cases of stunting prevented based on National Family Health Surveys (NFHS) of these two periods. Linear regression models were used to assess stunting and its associated factors.
- To estimate the financial cost incurred for each child saved from stunting and the cost per case of stunting averted through incremental cost-effectiveness ratio analysis.

PROGRAM COVERAGE

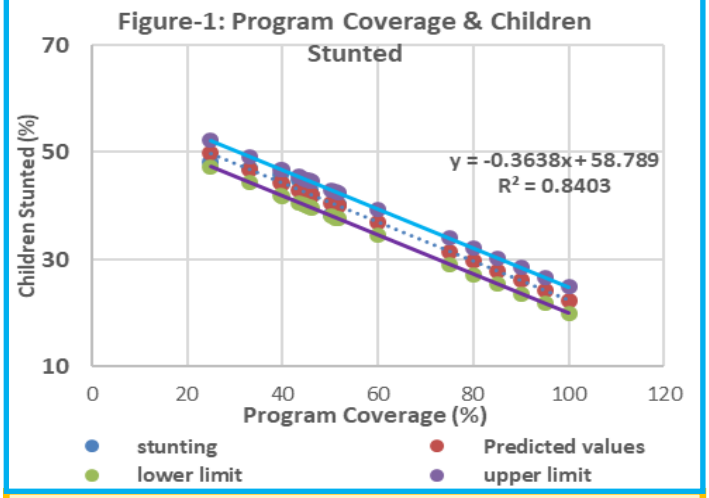
The programme covered over 1.93 crore expectant and nursing mothers and over 8.3 crore children under the age of six during 2015-16 across India. The number of the child beneficiaries of the food supplementation program increased from 4.1cr to 8.3cr during 2005-06 and 2015-16, while the number of pregnant women and lactating mothers increased from 91 lakhs to 1.93cr during the two periods.

COVERAGE AND CHILDREN STUNTED

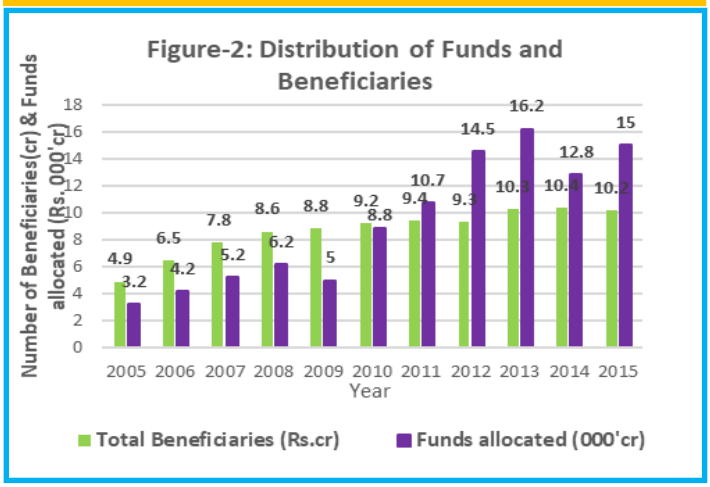
The program coverage of the child beneficiaries increased from 25% to nearly 50% of the total child population during 2005-06 and 2015-16 respectively, while pregnant women and lactating mothers benefitted by this nutrition program were nearly 18% of the total beneficiaries all through the decadal period. The number of children stunted had declined from 7.7 crores (48%)(NFHS-3) in 2005-06 to 6.2 crores (38.4%) in 2015-16. Regression model (Figure-1) shows that for every 1% increase in coverage there is decline in stunting among children by 0.36%, thus revealing that as coverage increases there would be decline in stunting.

FUNDS AND PROJECTIONS

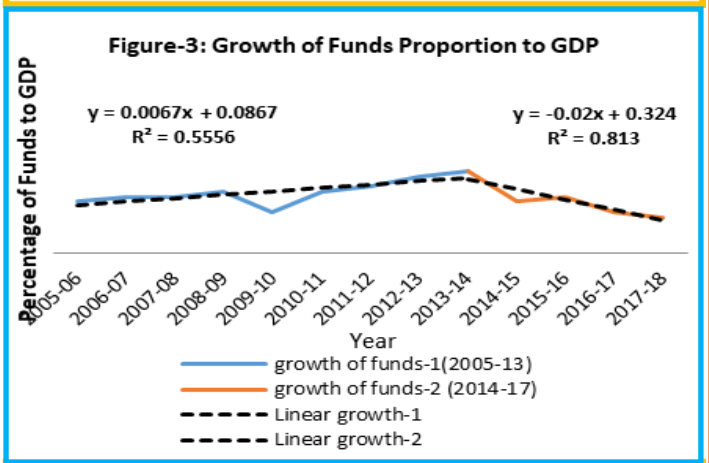
The funds allocated for the program have increased from 3.2 thousand crore to 15 thousand crore during 2005-06 and 2015-16 but reduced to 12.1 thousand crore by 2017-18 as per the latest reports (Figure-2). Regression analysis revealed that on an average funds of Rs.1000 crore was additionally allocated every year during the study period. The share of non-food cost to total cost has decreased from 70% (2005-06) to 54% (2015-16) while the share of food cost has increased from 30% to 45% during the same period. The per capita fund has increased from Rs.746 (2005-06) to Rs.1448 (2015-16) per annum during the period.



Source: NFHS-3&4 surveys, ICDS Annual Reports, Ministry of Women and Child Development, GoI.



Source: ICDS Annual Reports, Ministry of Women and Child Development, GoI.



Source: www.planningcommission.nic.in; https://data.gov.in/

ICDS FUNDS PROPORTION TO GDP

The proportion of ICDS funds to gross domestic product (GDP) ranged between 0.16% - 0.07% of the total GDP during the period. Regression analysis (Figure-3) showed that during the year 2005-06 and 2013-14 there is a marginal increase in ICDS funds allocation proportion to GDP by 0.007% per annum while during 2014-15 and 2017-18 the funds allocation decreased by 0.02% per annum, though funds increased marginally in 2015-16. Thus revealing the decline in funds allocation for ICDS program during the linear growth period-2 as a whole.

COST-EFFECTIVENESS ANALYSIS OF ICDS PROGRAM

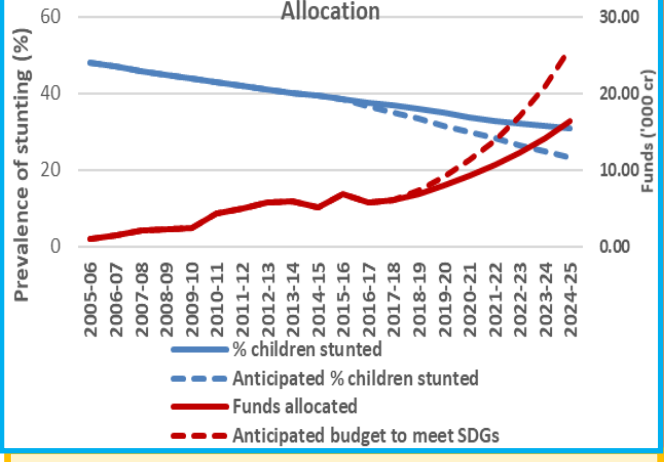
The cost-effectiveness estimates of the nutrition program are useful addition to the evidence base needed for an efficient use of resources to control stunting among children in India.

UNIT COSTS: The average annual cost per beneficiary is estimated to be Rs.3.03 per day or Rs.910 or US$ 13.9 per annum. The average food cost per child beneficiary is estimated to be Rs.1.88 per day or Rs.566 per annum or US$ 8.27 per annum after inflation-adjustment. The food cost per beneficiary has increased from Rs. 0.91 in 2005-06 to Rs.2.72 during 2015-16, while the total cost per beneficiary has increased from 2.49 to Rs.4.83 during the period.

COST-EFFECTIVENESS ANALYSIS: The number of children saved from stunting has been estimated as 7.5 crore for the period during 2005-15. Taking the current demographic population of children (2015-16), the number of cases of stunting prevented or cured during 2015-16 is estimated to be 15,16,102 children. The cost per child saved from stunting after inflation-adjustment is estimated to be Rs.11,601 or US$ 177.22.

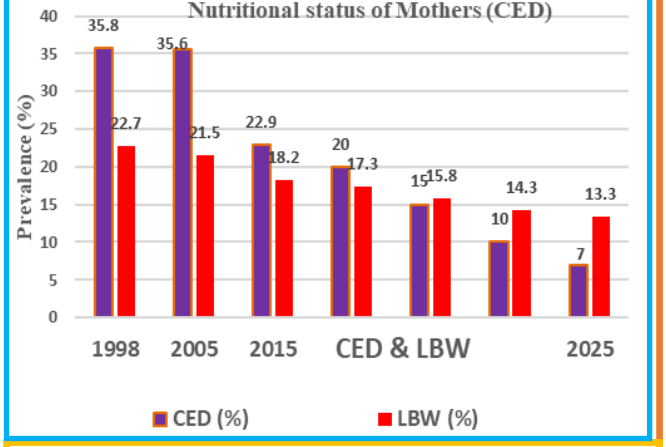
INCREMENTAL COST-EFFECTIVENESS RATIO ANALYSIS (ICER): The ICER per case of stunting averted during the two periods of intervention is Rs.7005 or US$ 107. The point estimates for the cost per stunting averted was much lower than the per capita GDP. Hence this program can be considered as cost-effective intervention program.

Figure-4: Projections of Children Stunted Vs Funds Allocation



Source: NFHS Reports; ICDS Annual Reports; Projections: 2018 to 2025

Figure-5: Projections of LBW based on Poor Nutritional status of Mothers (CED)



Source: NFHS-2,3 & 4 Reports

PROJECTIONS

STUNTING AND FUNDS ALLOCATION

As per the POSHAN Abhiyan goals (PAG) stunting needs to be reduced to 25% from the prevailing 38.4%, that is an overall 13.4% of reduction in stunting by 2022. However, this target is beyond reach at the current rate of decline in stunting which is 0.9% per annum. As per the regression analysis (Figure-4) we have estimated that there would be 0.09% (95% CI: -0.109 to -0.074) decline in stunting for every Rs.1000 crores of funds (food cost + non-food cost) spent through ICDS program.

To achieve global targets of WHO endorsed in 2012, through the World Health Assembly Resolution (65.6), stunting has to be declined to 23% by 2025. As per the global targets there should be 2.5crore (25million) fewer children stunted by 2025, but as per the current decline rate of 0.9% per annum there would be only 1.2 crore (12 million) fewer stunted children by 2025 in India if the required funds are not allocated. Alternatively, focusing on women's nutrition before pregnancy will yield more remunerations in terms of reduced LBW and stunting.

NUTRITION DURING PRE-CONCEPTION PERIOD

Low maternal preconception body mass index (BMI) is found to be associated with lower birthweight (LBW).[1] One of the goals of POSHAN Abhiyan is to reduce LBW by 2% per annum during 2018 to 2022. It is pertinent to note that children born with LBW face consequences including a higher risk of stunted growth[2,3], lower cognitive development[4] and chronic conditions like obesity, diabetes[5] and hypertension with the onset of adulthood. In India chronic energy deficiency (CED) of women of reproductive age declined from 35.8% to 22.9%. A study by Young MF, et al (2015) found that 1kg increase in prepregnancy weight was associated with 52.4gms increase in birthweight. As per the regression analysis (Figure-5) for every 1% decline in CED there would be 0.3% decline in LBW per annum. Hence programs aimed at improving birth outcomes will have the greatest impact if they address maternal nutrition before conception.

On the other hand, overweight increased from 10.6% to 20.7%, amounting to an increase by 95%; and some of the cohort studies[6,7,8,9] revealed that overweight/obesity have an increased risk of preterm birth and LBW, thus revealing the importance of maternal nutrition before pregnancy which not only affects the birth weight but is also associated with linear growth and stunting in the first 1000 days of life. Hence addressing prepregnancy nutrition appears to be equally / more important to achieve the targets such as reduction in LBW and stunting.

WAY FORWARD

- Interventions costing less than per capita GDP are considered highly cost-effective. In the current analysis it has been observed that the cost per case of stunting averted is Rs.7005 or US$107 in India, which is much less than the per capita GDP. Hence, this intervention can be considered as highly cost-effective program.
- This study emphasizes for more aggressive reduction in stunting through preconception counselling to young couples planning for pregnancy to obtain a healthy weight prior to pregnancy to improve birth outcomes.

- As per our analysis based on annual reports, the coverage is nearly 50% and regression model estimates show that increasing the nutrition intervention coverage will help in reducing the stunting levels among children to a great extent and would help in achieving the global targets on stunting.

Strengths:

- Estimated the cost per child saved from stunting and the ICER per case of stunting averted.
- Examined the effects of nutritional status of the mothers on birthweight of their children, which is one of the causes of stunting in children. Though there are other causes of stunting this analysis mainly focuses on maternal malnutrition /CED and ICDS program as the two major modifiable / intervention strategies to reduce stunting for achieving global targets and POSHAN Abhiyan goals.

Weaknesses:

- Due to lack of disaggregated data of the various costs involved for the ICDS program robust estimates could not be assessed or compared with any other studies.
- Our cost-effectiveness estimates hinge on a number of assumptions in an attempt to reduce stunting, though they compare favourably with other investments for which public funds compete.

REFERENCES:

1. *Black RE, Victora CG, Walker SP, et al.(2013): Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet;382(9890):427–51.*
2. *https://data.unicef.org/topic/nutrition/low-birthweight/*
3. *Christian P, et al. Black RE (2013): Risk of childhood undernutrition related to small-for-gestational age and pre term birth in low- and middle-income countries. International Journal of Epidemiology ;42:1340–55.*
4. *Gu H, Wang L, Liu L, et al. (2017): A gradient relationship between low birth weight and IQ: A meta -analysis. Sci Rep.;7(1):18035. Published 2017 Dec 21. doi:10.1038/s41598-017-18234-9*
5. *Jornayvaz FR, Vollenweider P, Bochud M, Mooser V, Waeber G, Marques-Vidal P(2016): Low birth weight leads to obesity, diabetes and increased leptin levels in adults: the CoLaus study,Cardiovasc Diabetol.;15: 73.*
6. *Sarah D McDonald, Zhen Han, Sohail Mulla, Joseph Beyene,(2010): Overweight and obesity in mothers and risk of preterm birth and low birth weight infants: systematic review and meta-analyses on behalf of the Knowledge Synthesis Group, BMJ 2010; 341:c3428 doi: https://doi.org/10.1136/bmj.c3428*
7. *Ronnenberg AG, Wang X, Xing H, et al (2003). Low preconception body mass index is associated with birth outcome in a prospective cohort of Chinese women. J Nutr 2003;133(11):3449–55.*
8. *Panaretto K, Lee H, Mitchell M, Larkins S, Manessis V, Buettner P.(2006): Risk factors for pre-term, low birth weight and small for gestational age birth in urban Aboriginal and Torres Strait Islander women in Townsville. Aust NZ J Public Health, 30:163-70.*
9. *Zhou W, Olsen J. (1997) Gestational weight gain as a predictor of birth and placenta weight according to pre-pregnancy body mass index. Acta Obstet Gynecol Scand;76:300-7.*
10. *Young, Melissa & Nguyen, Phuong & Gonzalez-Casanova, Ines & Addo, O.Yaw & Mai Tran, Lan & Sơn, Nguyễn & Martorell, Reynaldo & Ramakrishnan, Usha. (2018). Role of maternal preconception nutrition on offspring growth and risk of stunting across the first 1000 days in Vietnam: A prospective cohort study. PLOS ONE. 13. e0203201. 10.1371/journal.pone.0203201.*
11. *Young MF, Phuong Hong Nguyen, Hoa Pham, Reynaldo Martorell, Usha Ramakrishnan (2015) : The relative influ ence of maternal nutritional status before and during pregnancy on birth outcomes in Vietnam. Eur J Obstet Gynecol http://dx.doi.org/10.1016/j.ejogrb.2015.09.018*
12. *Hoddinott, Alderman, Behrman, Haddad, & Horton (2013). The economic rationale for investing in nutrition. Mater nal and Child Nutrition 9 (Suppl. 2): 69-82. Median estimate for a sample of 17 high burden countries used by the authors.*
13. *Horton S. and R. Steckel. (2013): "Global Economic Losses Attributable to Malnutrition 1900–2000 and Projections to 2050." In The Economics of Human Challenges, ed B. Lomborg. Cambridge, U.K.: Cambridge University Press. http://pubdocs.worldbank.org/en/460861439997767818/Stunting-Costing-and- Financing - Overview - Brief.pdf*
14. *ICDS Annual Reports (2005-06 to 2015-16), Ministry of Women and Child Development, Government of In dia. www.wcd.nic.in/annual-report*
15. *www.planningcommission.nic.in/data/datatable/data_2312/DatabookDec2014%2012.pdf*
16. *https://data.gov.in/major-indicator/gross-domestic-product-gdp-constant-price*
17. *Census data 2001, 2011. www.dataforall.org/dashboard/censusinfoindia_pca; http://www.dataforall.org/dashboard/censusinfoindia_pca/files/profiles/profiles/PDF/IND_India.pdf*
18. *NFHS -2,3 &4 Reports(1998-99, 2005-06, 2015-16) International Institute for Population Sciences, Govandi Station Road, Deonar, Mumbai-400088, India.*
19. *Jay Ross (1997): Cost-Effectiveness of the Nutrition Communication Project in Mali, The Academy for Educational Department, July, The SARA project funded by US Agency for International Development.*
20. *Emanuela Galasso, Adam Wagstaff, Sophie Naudeau and Meera Shekar (2016): The Economic Costs of Stunting and How to Reduce them, Development Bank, World Bank Group, Policy Research Note, 22nd September, pp1-57.*
21. *Reaching the Global Target to Reduce Stunting: How Much Will it Cost and How Can We Pay for it? Word Bank Group, Results for Development, Children's Investment Fund Foundation (CIFF), 1000 Days, Bill & Melinda Gates Foundation (BMGF); http://pubdocs.worldbank.org/en/460861439997767818/Stunting-Costing-and-Financing-Overview Brief.pdf*

For any further information contact: Director, ICMR-NIN; Email: rhemalathanin@gmail.com / dirnin_hyd@yahoo.co.in