

# **Women's Organisations, Maternal Knowledge, and Social Capital to Reduce Prevalence of Stunted Children - Evidence from Rural Nepal <sup>\*</sup>**

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## **Abstract**

This study analyses behaviour of women community-based organisations in rural Nepal in reducing prevalence of child malnutrition in member households drawing upon the survey data collected in 2000. The induced institutional innovation hypothesis is tested: are capabilities of women organisations reflecting 'structured social capital' positively associated with improved child nutritional status? Moreover tested is the effectiveness of outside interventions. 2SLS results confirm higher capabilities of the autonomous Mothers' Group associated with lower underweight. We also demonstrate that enhanced knowledge diffusion, combined with growth promotion, represents an effective instrument for empowering rural women in acting to reduce prevalence of chronic malnutrition.

**Key words:** *South Asia, Nepal, Poverty, Child malnutrition, Social capital, Women's Organisation.*

**JEL Classification:** C31, I12, I32, Z13

## Women's Organisations, Maternal Knowledge, and Social Capital to Reduce Prevalence of Stunted Children - Evidence from Rural Nepal<sup>\*</sup>

Regarding the adverse effects of stunting, Partha Dasgupta in his "An Inquiry into Well-being and Destitution" states that beyond efforts to provide emergency and food relief .....

"Much the harder problem, in intellectual design, political commitment, and administration, is to ensure that those who remain alive are healthy. It is also a problem whose solution brings no easily visible benefit. But the stunting of both cognitive and motor capacity is a prime hidden cost of energy deficiency and anaemia among children and, at one step removed, among mothers. It affects learning and skill formation, and thereby future productivity. The price is paid in later years, but it is paid."<sup>3</sup>

### I. Introduction

The literature on the theory and practice on induced institutional innovations seeks to explain the emergence of organisations to provide services of benefit to the community.<sup>4</sup> The induced institutional innovation hypothesis reflecting Hayami-Ruttan's contributions postulates that members in a community are induced to participate in collective action to ensure availability of relevant technology and related services.<sup>5</sup> Knowledge uptake is understood as an essential associated part of collective action. The latter serves to filter, "uncode" and disseminate the information received to generate useful knowledge for community members. Yet, this theory provides only an initial stepping stone for the current study.

The recent literature on social capital provides further context.<sup>6</sup> Social capital is broadly seen as the "institutions, relationships, attitudes, and values that govern interactions among people and contribute to economic and social development"<sup>7</sup> Interactions between social capital and poverty are pursued. Researchers ask, "Whether the investment that poor households make in social capital provides an adequate return and helps them to escape from poverty".<sup>8</sup> Structural as well as cognitive dimensions of social capital are explored.

The emergence of community-based institutions is seen as linked to the benefits that can be captured. "*The way local associations perform their useful role is centred on three mechanisms: the sharing of information among association members, the reduction of opportunistic behaviour and the facilitation of collective decision-making*".<sup>9</sup> A priori, this means that community based institutions may contribute to improved human welfare by providing members with more informed choice in their private resource allocations, as well as by ensuring an improved supply of local public goods.

For the purpose of statistical multifactorial analysis, researchers use an aggregated index (multiplicative or additive) that includes separate social capital dimensions.<sup>10</sup> Yet, the main drawback of using a single index for social capital is that it provides little guidance as to which included aspects of social capital generate the beneficial effect on household welfare.

Our further analysis of dimensions of social capital points especially to the critical importance of the nature of the learning and information exchange that is associated with, or triggers, members' participation in networks and associations.<sup>11</sup> Case studies have

emerged that analyse the relative importance of particular attributes of social capital. Social capital variables are positively associated with household welfare and mechanisms are pursued.<sup>12</sup> The contribution of schooling to human welfare is well known. Better access to formal education holds the keys to the ability of the next generation to escape from poverty, whilst adult members' participation in reinforced networks and associations may generate benefits from out-of-school learning. Recent studies suggest that at least some of the human capital effects, estimated in models that do not consider the social capital dimension, actually operate through the networks and associations captured in the social capital index.<sup>13</sup> This points to the benefits members derive from the informal, out-of-school learning that they may appropriate from information obtained by participating in networks and associations. Members' active participation in the decision-making process of an organisation increases their welfare. Indonesian data suggest that for those households that are already members of an association, their benefits from active participation in decision-making are particularly high.<sup>14</sup>

Further studies have explored the contributions of social capital to monetary as well as to non-monetary dimensions of household welfare. Emergence of indigenous institutions is seen as a rational response to risk associated with incomplete contracts and uncertain regulatory frameworks; i.e. *"in the absence of formal legal systems and well-developed markets, people solve problems of incomplete contracts, adverse selection and moral hazard, and risk-sharing through a variety of indigenous institutions"*.<sup>15</sup> A study of agricultural traders in Madagascar measured the extent of their networks and estimated the contribution of the latter to sales.<sup>16</sup> The study concluded that with reinforced networks, sales of traders would significantly rise.

Social capital may augment non-monetary dimensions of household welfare such as status of health and schooling. A study in Java, Indonesia, found social capital to have a positive effect on design, construction, and maintenance of village water supply systems; improved water supply being positively associated with better health.<sup>17</sup> In the realm of education, a study in Burkina Faso found that a higher involvement of community and parents in meetings with teachers could improve quality of schooling and reduce dropout rates.<sup>18</sup>

The rest of the paper is organised as follows. In Section II, a brief discussion of community ownership is made in association with nutrition intervention programmes. Section III provides the rationale for our study and our measure of social capital with a particular focus on community ownership and capability. In Section IV the basic features of programmes in two districts in Nepal are summarised. Section V then discusses the importance of knowledge diffusion for Women's Organisations. In Section VI, we present the data, econometric models and results. The final section offers some concluding observations.

## **II. Community Ownership of Nutrition Programmes**

Conversely, mere provision of economic and social services in the absence of community involvement has been shown as not effective in reducing endemic malnutrition. A study of nutrition intervention programmes in India, Tanzania, Thailand and Indonesia showed that programmes with community involvement and mobilisation were effective in

reducing malnutrition rates; but this was not the case for programmes without such involvement.<sup>19</sup>

The lesson learned is that programmes directed to reduce malnutrition have limited impact unless they actively involve communities. The early efforts in monitoring children's nutritional status by measuring their physical growth, their height and weight for age represent another illustration. These efforts on the whole were not designed to motivate parents, empower, and diffuse knowledge to them. Health agents rarely gave feed back, informing communities about their actual extent of malnutrition.<sup>20</sup> Growth promotion was rare.

Yet, mature networks and associations learn to demand or receive external scientific knowledge that they "uncode", adapt and apply. Social capital cannot be transformed exclusively from within the community.<sup>21</sup> Communities need to access external knowledge. Moreover, transparent regulatory frameworks that are enforced, generate trust, reduce transaction costs and induce social mobilisation. On the other hand, mere interactions between external agents and communities do not necessarily induce social mobilisation and knowledge uptake. Too little is still known of how participatory processes are triggered, community capabilities emerge and how relevant knowledge is obtained and used so as to raise human welfare.

Studies are warranted that assess the capabilities of informal and formal women groups and explore how their activities may reduce malnutrition. The vast potential is recognised not least of informal women's grass roots organisations in mobilising their resources for community development beyond providing social safety nets and protection from emergencies.<sup>22</sup> Yet, too little is known of strengths and weaknesses of such organisations in addressing malnutrition.

### **III. Study Orientation**

Our rationale for this study of women owned community institutions especially of indigenous women groups can be restated: In Nepal, widespread endemic poverty is combined with overextended national institutions with limited outreach of services, a harsh physical environment, conflict and violence. On average, each second child in Nepal remains chronically malnourished or stunted. Prevalence has declined annually over the last twenty years until the end of the 1990s by less than a percentage point. In spite of valuable formal sector programmes that have managed to extend the outreach of services to rural poor women, most rural women remain out of reach. In this context, the rationale for the existence and survival of indigenous women groups remains strong.

Our initial hypothesis remains that autonomous CBOs – the Mothers' Groups - emerge in response to felt need for joint organised action, driven by the need to raise food and nutrition security.<sup>23</sup> The study explores if social capital reflected by capabilities for collective empowerment, learning and decision making within and by women CBOs is positively associated with reduced malnutrition in the more deprived member households.<sup>24</sup> To this end, we have derived a composite (additive) maturity index.

We use this maturity index as a proxy for social capital in our econometric analysis. Our index of social capital mainly captures the structural elements of social capital, which are related to dynamic interactions among members, and regulations, which facilitate independent decision-making of the community (e.g., networks, roles, rules, and

precedents), rather than its cognitive elements (e.g., norms of behavior, shared values, reciprocity and trust).<sup>25</sup> Grootaert (2002) proposes an index for structural social capital on the basis of three dimensions: the density of membership, the diversity of membership, and the extent of participation in decision-making process.<sup>26</sup> Our measure focuses on the last dimension, but extends it by using a multi-faceted index of the CBO capability. The degree to which roles or rules play an important role in a community decision-making is captured for example, by the extent of democratic decision making (viz. members' right to appoint leaders by participating in general assembly meetings and their participation in need assessments for action/choice, and monitoring and evaluating performance) and the community's adherence to 'rules' by meting out sanctions. Indicators of collective action and outcomes are not directly measured, but a proxy is used, i.e. the performance of the CBO in the 'management' of activities and agents was rated.

Ownership reflects a high degree of social cohesion. It is related firstly to the inherent capabilities of the CBO members and chosen leaders. It increases, the more CBO decisions and activities reflect the articulated preferences of members, distilled through transparent processes and decision-making. In a normative setting, members in "general assembly meetings" articulate preferences for activities and then evaluate results. The more members share information and the more they accept and enforce collective norms governing their behaviour, the more transparent, ordered and accepted become the decision making processes. Trust generated ensures continued participation.

We expect that as CBO capabilities improve, this is associated with more informed choice for members'; the latter would contribute to raised efficiency (allocative and technical) in private resource allocation and in community or local public goods supply

Our study assesses the performance of the interviewed CBOs in eight dimensions. This framework for the analysis of community level capabilities in multiple dimensions was first developed for assessing progress towards ownership for community based primary health and nutrition care projects.<sup>27</sup> In the present study, we have adapted the original framework; we have extended it to serve for diagnosis beyond health and nutrition outreach programmes. Indicators used in the present study are: (i) needs assessment/action choice (whether the community itself assesses and sets priorities); (ii) organisation (whether the community is involved and controls management); (iii) leadership (whether the community initiatives well reflect members' interests and external agents controlled); (iv) training (whether community members receive relevant in-service training); (v) resource mobilisation (whether communities mobilise funds from internal and external sources and compensates facilitators); (vi) management (whether communities responsibly manage and supervise activities and agents); and (vii) sanctions (whether the community sets its own bylaws and regulations and ensure their enforcement); and (viii) monitoring and evaluation (whether communities themselves monitor performance and inform members about progress and shortfalls).

The present study has added a dimension not included in the original matrix; it relates to (vii) above; i.e. the community's need of enforcing the bylaws and regulations that govern members' conduct, rights and obligations. To reduce opportunistic behaviour, are sanctions imposed on those who want to benefit without contributing ("free riders")? This dimension, "regulations and sanctions" is essential for conflict resolution, reduction of opportunistic behaviour and sustainability of collective efforts.<sup>28</sup>

Ownership is related secondly to the degree of independence of the CBO vis-à-vis the element of “control” that may be imposed by external structures and agencies. When the CBO exercises its independence, external agents and facilitators no longer impose their decisions on members. Instead, CBO leaders increasingly guide the external agents.

In short, ownership cuts across the eight activities that reflect performance. For each activity (dimension), a single score is obtained that is a composite of capabilities and degree of ownership. With growing capabilities of the CBO, and with more independence in its decision making vis-à-vis external agents, the CBO becomes more “mature”. The more CBO leaders manage their activities to reflect members’ needs and priorities, the more they are accountable to members, the higher is the rank for “maturity”. In short, the more external institutions provide services in direct response to the articulated demand of communities, the higher is the score for “maturity”. Conversely, the more outside agents direct CBO decision-making and its resource use, the lower is the score for “maturity”.

Finally, our study tested if a statistical association can be established for each CBO between the ranked values of these attributes and households’ objectively measured nutrition status. Households were selected by wealth ranking to represent the most deprived (poorest) members of the CBO. The nutrition status of these households was measured by that of their children aged less than five. The primary anthropometric indicators used were height-for-age (stunting), and weight-for-age (underweight), the former reflecting chronic malnutrition and the latter more the seasonal dimension. A binary variable was used for recording exposure to the type of training received.

In this analysis, the distinction is vital between the autonomous organisations such as Mothers’ Groups and the CBOs supported by external programme interventions. Traditional Mothers’ Groups represent an institutional innovation. These groups have emerged in response to felt needs of rural women to organise themselves for mutual support, empowerment and betterment of their situation. They represent much more than is conveyed by the simple concept of a “control” group that may be used for purpose of statistical analysis.

#### **IV. Programmes Studied**

The study was conducted in two districts: Tanahun (Hill) and Sunsari (Terai). Three categories of CBOs were considered: (i) those supported by the two programmes targeted with intensive support to women and children: the Integrated Women and Child Development Program (IWCDP) and the Decentralised Planning for Child Programme (DPCP/LGP), both supported by UNICEF; (ii) CBOs supported through the Women's Development Division of the Ministry of Local Development (MLD) receiving moderate support (PCRW/WDD); and (iii) autonomous CBOs belonging to the Mothers' Groups.

In Tanahun, the IWCDP represented the intensive type of intervention; this programme started in 1998. It operates in two districts, in Tanahun and in Nawalparasi. In Sunsari, the DPCP represented the intensive intervention programme. It was started in 1997 and operates in 11 districts. DPCP is linked to the decentralisation programme for districts and village development (PDDP/VDP).<sup>29</sup>

The CBOs that had been or are assisted by the National Programme, the Production Credit for Rural Women (PCRW) represented the moderate intervention type. IFAD supported this programme from 1991 to 1997.<sup>30</sup> The autonomous Mothers’ Groups

represented the third set of CBOs studied; the latter had received no support from donor-funded programmes.

The two intensive programmes in many ways use a similar design concept.<sup>31</sup> Child growth monitoring is an essential part of both programmes. A corps of trained village level facilitators is supported to mobilise existing women and or mixed groups and provide services. First, they support the CBOs to become empowered, to gain confidence and capabilities. Second, the programmes ensure that physical growth is monitored of children less than three years of age.<sup>32</sup> Third, this periodic monitoring provides the context for activating the parents so that they receive information and training.

The IWCDP has only focused on WDD women groups. Under IWCDP, WDD staff provides intensive training, capacity building and monitoring. Traditionally, under WDD (previously under the PCRW) women groups have been supported with small grants for self-help community initiated activities such as constructing outlets for drinking water, sanitation facilities and trails.

In Sunsari, in contrast, the DPCP (PDDP/LGP) has focused on self-emerging women groups and also mixed groups of women with men. Moreover, DPCP intervenes through VDC as an integral part; also it has provided small grants for community initiation projects.

## V. Knowledge Diffusion

Relatively few programmes assist women CBOs in raising their level of organisational and management capabilities. Facilitation to make CBOs stronger and “mature” can be justified on several grounds. Most CBOs are weak, more in terms of the knowledge that they need - and cannot obtain – whilst members' financial support, savings and contributions often may be substantial. Foremost, CBOs need knowledge and the technical skills with which to manage their organisation and collective activities with which to address their needs.

Information about regulatory framework has improved for supported groups. Yet, there is very little, if any, training offered in Tanahun and Sunsari that is useful for women in villages in building up and managing an organisation, and for assisting them in driving self-help activities. Most training remains focused on skills for income generating activities and food production. Such training while important does not improve the understanding of how to observe and measure prevalence of malnutrition, nor does it address the set of other causes to malnutrition.<sup>33</sup>

Local government (VDC) leaders reported that the root cause to malnutrition is to be found in limited awareness or knowledge, and that this cause even transcends food security in its normal physical sense. Understanding better the process for transfer of knowledge assumes further urgency. Community members need to know:

- 1) Level and variations in malnutrition in their community,
- 2) Nature of benefits to children and adults when their nutritional status is satisfactory;
- 3) Primary set of causes to malnutrition; and
- 4) Solutions that can be brought about by action by the community itself.

Once communities acquire knowledge of causes and solutions; they may reassess present preferences and resource allocation in their livelihood systems: The delivery of

relevant knowledge, its adoption and its ultimate ownership by the CBO members is a vital dimension to pursue, easily missed.

## VI. Econometric Models and Results

The econometric analysis conducted in this study sets out to answer directly four questions:

- 1) Identify the demand at household level for interventions to raise nutritional status of children within member households that underlies the sample selection of CBOs;
- 2) Determine the effects of differential interventions in reducing stunting and underweight;
- 3) Determine the effects of training on child growth, feeding practices and health in reducing stunting and underweight, and.
- 4) Determine the effects of extent of CBO capabilities (social capital), interpreted as their degree of maturity, in reducing stunting and underweight.

In this section, we will test the induced-innovation hypothesis associated with the community-based intervention: whether or not the intervention at the community level affects the nutritional outcome in Nepal, focusing on the role of the outside intervention in determining the level of malnutrition.

Three models concerning the formation of community groups are tested: (i) Autonomous Model (the model for an independent autonomous groups, or 'Mothers Groups' based on common interests without any external support), (ii) Improved Model (the model for PCRW Groups under WDD, moderate interventions, which is called 'Intermediate Groups'), and (iii) Advanced Model (the model for DPCP & IWCDP Groups under UNICEF/ UNDP, intensive interventions, or 'Advanced Groups').<sup>34</sup>

We only have access to cross-section data and cannot track the nutritional outcomes of children over time *before* and *after* the intervention. We may compare the nutritional indicators of children for the above three categories. Yet, the possibility may exist that the communities with worse nutrition indicators of children are more likely to demand outside support. In this case, the simple comparison of nutrition indicators is misleading. To identify the role of the external interventions precisely in improving child malnutrition indicators, we need to consider the sample selection - in which the child nutritional outcome and its determinants (e.g., community and household characteristic) in turn affect the probability that the CBO receives an external intervention. Using the Two-Step Model for the entire sample, whether the CBO gets an external intervention will be made endogenous to the CBO and household characteristics.

One of the main purposes of outside interventions, in particular of intensive interventions, is to provide various types of training, such as training on health, nutrition, or child growth.<sup>35</sup> Our casual observation is that training plays an important role in improving child nutritional status. As training is available only to the Advanced Groups and/or Intermediate Groups, not to Mothers Group, we need to assess their effect only on the former. Given the aforementioned sample selection process on the interventions, an appropriate estimation method is Heckman Sample Selection Model whereby the effect of training on child nutrition can be evaluated for the households with interventions after

taking account of the endogeneity.<sup>36</sup> We will then assess the effect of maturity of the Mothers Groups on child nutrition using the same framework.

*(a) The Survey - CBOs and Households Selected*

This paper draws upon the cross-section data in Nepal obtained in March in 2000. An IFAD mission organized the survey and three interviewing team.<sup>37</sup> Each interviewing unit comprised one or two female enumerator(s), a mid-wife nurse and a leader. Local staff from IWCDP, DPCP or WDS supported each survey team. The survey team was trained well prior to actual administration of the questionnaires on survey participants. A M.D., member of the team, trained team members, calibrated equipment and supervised the recording of the anthropometric measurements. Regular review and feed back of data collected ensured uniformity of data collection by the three teams.

The data set comprises cross-sectional observations for 63 CBOs and 417 households in the Tanahun and Sunsari districts in Nepal. The survey team in March 2000 interviewed a total 63 CBOs: 31 in Tanahun and 32 in Sunsari. The UNICEF driven programmes supported almost half, or 36 CBOs; WDD (PCRW) supported 16, whilst 11 belonged to the traditional non-supported Mothers' Groups (Table 1).

*(Table 1 to be inserted around here)*

CBOs were selected randomly. The additional criterion pursued was that wards/CBOs situated further away from the road head should be fairly represented; this was to minimise the risk of bias, i.e. that merely CBOs would be studied that are located in the vicinity of the road. Especially in more distant villages, women organise themselves into Mothers' Groups without any external support.

Our sample of CBOs is considered representative of the mix of women organisations, supported and non-supported, operating at community level in the districts in terms of location or distance from district centres, and age of groups.

In total, 427 households (200 in Tanahun (in the hills) and 227 in Sunsari (Terai)) were surveyed. However, as one household may have more than a child, the total number of children measured is 520 (274 in Tanahun and 246 in Sunsari). Data collected from households comprised three anthropometric measurements: height, weight and arm circumference of children and mothers. We focus on the former two to calculate stunting and underweight measures. The surveys collected detailed information at both household and CBO levels covering a wide range of socio-economic characteristics, food security, training, health and sanitation, disease, empowerment, information on nutrition, community capabilities.

Table 2 summarises the nutrition indicators for these three groups. It shows that Z scores in the measures of stunting and underweight averaged over all the children of households for each group. Children in Mothers Group are slightly better off in terms of stunting and underweight prevalence. In contrast, when the analysis is restricted to the children who are severely stunted or underweight (i.e. with Z scores less than -2.0), it is observed that intermediate groups are slightly better off than the other two. However, Z scores have to be compared after controlling for various household or community characteristics as well as the sample selection process associated with interventions.

(Table 2 to be inserted around here)

**(b) Econometric Models and Household Level Determinants**

This subsection will first introduce econometric models to test the effectiveness of advanced and moderate interventions in improving nutritional status of children. The econometric results will be then reported. To take account of the endogeneity, we will apply the following two-step procedure in which the probabilities that each household belongs to either Advanced Group, Intermediate Group, or Mothers Group is estimated in the first step and in the second step Z score (stunting or underweight measure) is estimated by the household characteristics and other covariates after controlling for the probabilities estimated in the first stage.<sup>38</sup>

**First Step**

First, we try to identify the demand for nutritional interventions, which underlie the sample selection of the CBO.

$$\Pr(Y_i = j) = \frac{\exp D_{ij}}{\sum_{k=0}^2 \exp D_{ik}} = \frac{\exp X_i \beta_j}{\sum_{k=0}^2 \exp X_i \beta_k}, \quad j = 0, 1, \text{ and } 2$$

where  $i$  denotes a household and  $j$  is a CBO category on whether a household receives a particular type of intervention.  $Y_i$  takes either 1 (for a category of CBOs with an intermediate intervention), 2 (for those with an advanced intervention) or 0 (for Mother Group without any outside interventions, i.e., the control group). The probability that a household receives a particular type of intervention is estimated by multinomial logit model where the choice is not ordered.<sup>39 40</sup>  $D_{ij}$  represents a demand for  $j^{\text{th}}$  intervention for  $i^{\text{th}}$  household.  $X_i$  reflects the factors, which affect the demand for these interventions.  $\beta_j$  thus corresponds to the relationship between the demand for each intervention and its covariates.

The underlying demand function  $D$  of  $i^{\text{th}}$  household for  $j^{\text{th}}$  intervention can be written as:

$$D_{ij} = D_{ij}(E_{ij}, M_{ij}, B_{ij}, F_{ij}, L_{ij}, I_{ij}, H_{ij}) \\ = X_{ij} \beta_j \quad (1)$$

We estimate the probabilities that a CBO receives either an intensive intervention or an intermediate intervention. The reference category is Mothers Group.

The explanatory variables are the determinants of the demand for the interventions.  $E_i$  is the averaged level of educational level of group leaders (in terms of schooling years).  $M_i$  represents the initial size of the community, proxied by a number of active members in 1995 (the year before the interventions were implemented in the area).  $E_i$  and  $M_i$  are

the variables, which identify the /should be/ first step ?? equation, that is, affect the demand for interventions, but not nutritional status of children.  $B_i$  is the background of household, including a dummy variable on ethnicity (1 if Brahmins /Cheetri- highest status- and 0 otherwise) and a district dummy variable (1 if from Hills 0 if from Terai).  $F_i$  denotes a vector of household's financial situation consisting of savings (1 if a household managed to save in 1999 and 0 otherwise), borrowing (1 if a household ended up more borrowing in 1999 than in the previous year and 0 otherwise), and mother's income (1 if a mother has her own income source and 0 otherwise).  $L_i$  denotes the vector of variables on residential characteristics, which include: (i) latrine (1 if household owns covered latrine and 0 otherwise), (ii) water quality represented by source of drinking water (a dummy: whether household collects water from piped water taps with covered well, a dummy: whether from hand pump).  $I_i$  is the variable indicating information-processing source (on the availability of information on nutrition and child growth from radio).  $H_i$  is a vector of community health problems and situations, including (i) the trend of incidence of various disease (i.e., the average of perceived trends of (a) malaria, (b) acute respiratory diseases, (c) waterborne disease, (d) diarrhoea, and (e) other disease) and (ii) the trend of quality of health service (i.e., the average of perceived trends of (a) availability of doctor's advice, (b) proximity (walk hours) of hospital, (c) availability of drugs, (d) medical fee, (e) waiting time, (f) quality of health care, and (g) interruption of service provider).

### Second Step

In the second step, we assume that the degree of malnutrition takes the following functional form.

$$Z_i = Z_i(Y_i, B_i, F_i, L_i, I_i, H_i, P_{11}(E_{i1}, M_{i1}, B_i, F_i, L_i, I_i, H_{i1}), P_{12}(E_{i2}, M_{i2}, B_i, F_i, L_i, I_i, H_{i2}))$$

$$= Z_i(Y_i, B_i, F_i, L_i, I_i, H_i, P_{11}, P_{12})$$

$$= P_{11} \gamma_1 + P_{12} \gamma_2 + X_i \gamma_3 + e_i \quad (2)$$

where  $Z_i$ , the dependent variable, is a measure of malnutrition, namely, Z score (continuous variable) of either height for age or weight for age of children under five years old. Here  $P_{11}$  and  $P_{12}$  denote the probability corresponding to the demand for the intermediate intervention and the intensive intervention, respectively. They are expressed as the probability that each household receives a specific type of intervention. So  $\gamma_1$  and  $\gamma_2$  reflect the policy effectiveness, whilst  $e_i$  is an error term, which is independent, identically distributed.

$X_i^c$  corresponds to the covariates of Z score, which are specified as follows.  $Y_i$  indicates child characteristics: age in months and age squared  $B_i$  denotes the vector of variables on family background, which include: <sup>41</sup> (i) mother's BMI, (ii) mother's education (schooling years), (iii) a dummy variable on ethnicity, and (iv) a district dummy variable. For the vectors,  $F_i$ ,  $L_i$ ,  $I_i$ , and  $H_i$ , the same set of variables are used in the second step.

*(c) Estimation Results*

Table 3 reports the estimation results for the above two-step model. The first four columns show the results of multinomial logit model in the first step. Averaged schooling years of group leaders and the number of active members, both of which have little correlation with Z scores, are used as the variables identifying the first-step selection equation. Education of group leaders leads to the higher probability of receiving interventions: which variable is more significant for the Advanced Groups than for the Intermediate Groups. Also, the CBO, which initially had the smaller number of active members, is more likely to get the Advanced Interventions. The CBOs with better access to information on child growth and nutrition and better access to good quality of drinking water are more likely to receive both advanced and moderate interventions. It is confirmed from the coefficients on financial situations of households that: (i) households without mother's own income source are more likely to get moderate interventions; and (ii) households with saving or borrowing opportunities are more likely to receive outside interventions, implying that households without enough access to savings or borrowings are likely to belong to Mothers Groups. On the contrary, decreasing trend in disease or health service is associated with the higher probability of receiving interventions.

*(Table 3 to be inserted around here)*

The last four columns in Table 3 show the estimation results in the second step. We find that negative and significant coefficient for the estimated probability of receiving intensive interventions (for  $\beta(Y_i ? 2)$ ) and negative and insignificant coefficient for moderate interventions (for  $\beta(Y_i ? 1)$ ). So we cannot find any evidence for the positive effect of outside interventions in lowering stunting of children in comparison with Mothers Group. Because all the households belong to either Advanced Groups, Intermediate Groups, or Mothers Groups and  $\beta(Y_i ? 1)$  and  $\beta(Y_i ? 2)$  are jointly negative and significant,  $\beta(Y_i ? 0)$  for Mothers Group must have a positive and significant coefficient if this is included instead of, say,  $\beta(Y_i ? 2)$ , the estimated probability for Advanced Group. Indeed, if stunting is estimated by  $\beta(Y_i ? 0)$  and  $\beta(Y_i ? 1)$ , the coefficient for the former (i.e., Mothers Groups) is significant (t value: 1.97). The coefficient for the latter (i.e., Intermediate Groups) is positive and insignificant (t value: 0.55) without changing the rest of the results.<sup>42</sup> This suggests that Mothers Groups are efficient in lowering stunting in comparison with Advanced Groups.

However, we find some positive effect of intensive interventions on underweight in the last two columns. The interventions (or  $\beta(Y_i ? 2)$ ) now have positive effects on underweight, the seasonal indicator of child malnutrition. This is probably because the intensive interventions have not been operated long enough to have a positive impact for stunting, but have some positive effect on underweight. It is found that mother's BMI and mother's education are positively and significantly associated with lower stunting prevalence - suggesting the important role of mother's nutrition and education in determining the child nutrition. Information from radio is positive and significant for stunting. Another interesting finding is that the increasing trend in disease episodes

affects negatively and significantly stunting and that stunting is not lowered with better health service outreach. Most of these significant relationships are not found for underweight. One variable that is negative and significant is borrowing, which implies that debt has a negative effect on underweight, the short-term indicator of children's nutritional status.

We compare the relative effectiveness of these three sorts of CBOs by computing the elasticity defined as  $\log y / \log x$  in the second step.<sup>43</sup> For example, the elasticity of probability of belonging to Mothers Group on stunting is 0.053, while the corresponding elasticity of Intermediate Group is 0.015. The absolute value of the former is less than the elasticities of mother's BMI (0.233) and trend of disease (-0.06), but larger than those of mother's schooling (0.023), information from radio (0.044). The elasticities of the probability of receiving intensive intervention and moderate intervention on underweight are 0.054 and 0.03, respectively. The absolute value of the elasticity of the former is larger than that of borrowing (-0.014). These results suggest the policy effect of interventions or the effect of belonging to Mothers Group is non-negligible in absolute terms.

***(d) The Induced Institutional Innovation Hypothesis: Effects of Maturity of the CBO and Training on Nutritional Status***

We use the so-called maturity index to assess the performance of CBOs. The mere existence of an operational CBO reflects the existence of trust and bonding across members, i.e. social capital. Our maturity index can be seen as a proxy for social capital. The hypothesis tested is that malnutrition is lower for CBOs with higher degree of capabilities. Our composite index draws on Shrimpton's (1995) indicator that is based on a graded use of indicators for organisational effectiveness (see section 3 above for definition of maturity index).

An appropriate modelling strategy here is the Heckman Sample Selection Model (1979) where the probability of receiving an intervention is estimated in the first stage, and the effect of the maturity index, or training, on child nutrition indicator is assessed in the second stage *only for the selected sample*, i.e., for households with the intervention, taking account of the sample selection process.<sup>44</sup> If we run the OLS, say, only for the Advanced Groups, we will face the sample selection problem associated with the intervention.

In addition, we assess the effects of training only for Advanced Groups and for Intermediate and Advanced Groups. Training is not available for Mothers Group whilst only a limited range of training is available for the Intermediate Group. In both cases, the same previous set of explanatory variables is applied in addition to the maturity indice and training variables.

First, we estimate the selection mechanism using the probit model based on the exactly same set of variables, which can be written as

$$f_i = f_i(E_i, M, B, F_i, L_i, I_i, H_i) \quad (3)$$

However,  $f_i$  is a function of binary choice where the dependent variable takes either 1 (the CBO receives an intensive intervention) or 0 otherwise.

In the second step, we will apply the same linear specification to estimate child malnutrition except that the variable of training, or the maturity index is included.

$$Z_i = Z_i(T_i, Y_i, B_i, F_i, L_i, I_i, H_i) \quad (4)$$

where  $T_i$  indicates the training that the member household receives, arising from the external support that CBO receives. Training indicators are defined as either (i) the extent to which the CBO receives local pre-service training and regular in-service training by supportive local supervisors/trainers (which is one of the components of the maturity index) or (ii) whether the community receives a training on health or not. We replace  $T_i$  with the maturity index to assess its effect on child nutrition.

The selection mechanism of the probit model is as follows.

$$f_i^* = \beta Y_i + u_i$$

and  $f_i = 1$  if  $f_i^* > 0$  (with an intervention)

$f_i = 0$  otherwise (without an intervention)

where  $\text{Prob}(f_i = 1) = \Phi(\beta Y_i)$

$$\text{Prob}(f_i = 0) = 1 - \Phi(\beta Y_i)$$

The regression model for the nutrition indicator is

$$Z_i = \beta X_i + \epsilon_i \quad \text{observed only if } f_i = 1.$$

$(u_i, \epsilon_i) \sim \text{bivariate normal } [0, 0, 1, \rho, \sigma_u, \sigma_\epsilon]$

The above equation can be re-specified as a truncated regression conditional on  $f_i = 1$ .

$$E[Z_i | f_i = 1] = \beta X_i + \rho \sigma_\epsilon \sigma_u^{-1} \Phi(\beta Y_i)$$

To estimate the parameters of the sample selection model, Heckman's two-step procedure is applied. First, we estimate the probit model for the selection rule to produce the maximum likelihood estimates of  $\beta$ . Using this, we then compute  $\rho$ .

$$\hat{\rho} = \hat{\sigma}_\epsilon^{-1} \hat{\sigma}_u \hat{\beta}' \hat{\Sigma}^{-1} \hat{\beta}$$

Secondly, the Heckman sample-selection corrected income equation is

$$E[Z_i | f_i = 1] = \beta X_i + \rho \sigma_\epsilon \hat{\sigma}_u^{-1} \Phi(\beta Y_i)$$

where  $\hat{\sigma}_\epsilon = \sigma_\epsilon \Phi(\beta Y_i)$ .

### (e) Estimation Results for Heckman Sample Selection Model

Among various cases, we focus on three cases which are of empirical interest and with significant or nearly significant results for the variables concerned; Case 1- the effects of training indicator (*i.e.*, the degree of receiving pre-service training and regular in-service training) on stunting for Advanced Groups only for which intensive training is available; Case 2 the effects of a training dummy (*i.e.*, whether a household receives training on health) on underweight for advanced and Intermediate Groups only for which training on

health is available. Case 3 refers to the effects of maturity index on underweight for Mothers Group for which no training is available.

Table 4 reports the estimation results of Heckman Two-Step Model. The first step results for Cases 1, 2, and 3 in Table 4 are broadly consistent with the first step results of multinomial model in Table 3. Hence we focus on the second-step results only.

*(Table 4 to be inserted around here)*

Case 1 confirms the importance of knowledge transfers for a widened choice and possibility of raised human welfare. Receipt of training has a positive effect in reducing stunting for Advanced Groups. However, the significant result is not found for underweight. This means that among the households who receive intensive interventions, children in the households with training are generally better off than those without training (but with intensive interventions). This further suggests that intensive interventions should provide CBO members with regular in-service training to improve child malnutrition. Another interesting result is observed for the variable on drinking water that is positive and significant. The analysis of Advanced Groups demonstrates the important role of maternal nutrition knowledge in reducing stunting.

The similar conclusion is found in Case 2 for training of health on underweight for both Advanced and Intermediate Groups. In particular, the training on health is one of the major forms of training for the Intermediate Group for which only a limited range of training is available. Having covered latrine has a positive and significant coefficient as expected.<sup>45</sup>

In Case 3, we have a positive and significant effect of Maturity Index on underweight for Mothers Group. This is not observed for stunting. We have applied the same specifications for Advanced Group or Intermediate Group, but no significant coefficient is found for Maturity Index in the second step. Our results suggest that raised CBO capabilities are associated with reduced underweight. It is also notable that for Mothers Group, health and hygienic conditions (e.g., having good quality of water and covered latrine, decreasing trend of disease), and participating in savings activity are crucial in improving underweight.

These results imply that it is important to seek to find mechanisms with which to promote the capabilities for Mothers Group even though they so far do not receive support from external interventions. Yet, as reported above, it remains that household level variables such as mothers' formal schooling, her BMI and information received from radio operate to reduce the prevalence of stunting. Diffusion of knowledge via radio stands out as an important mechanism given difficult access to scattered villages across hills and mountains. Finally, it should be observed that an increasing trend in diseases reduces the Z scores of both stunting and underweight, implying a worsening of children's nutritional status.

## VII. Concluding Observations

### *(a) Context*

The study has tested the induced-innovation hypothesis associated with the community-based intervention. It has explored the role of programme interventions in Nepal that support groups of women and mothers to improve food and nutrition security. The role of outside programmes that provide support of women with child care in two districts in Nepal has been investigated to determine if interventions are associated with, and determine, the levels of malnutrition. The PCRW supported CBOs represented the moderate intervention level. This programme, earlier supported by IFAD, is targeted to resource poor women, but not exclusively to mothers with infants. The programme supports women with empowerment, savings mobilisation, credit, and training especially in production skills and funds for minor infrastructure (e.g. drinking water).

The two intensive programmes that operate in the two districts are the IWCDP in Tanahun and DPCP in Sunsari. They use female health volunteers (FHV) to *empower and interact* with mothers with young children. The FHVs ensure that children's nutritional status is monitored with anthropometry. For mothers, training –her knowledge acquired from information exchange- then becomes directly relevant. Mothers observe or learn the actual nutritional status of their own children, causes to malnutrition and location specific solutions. Programmes also provide minor funds for community development.

The study has surveyed in depth also the traditional Mothers' Groups (those that do not receive targeted formal sector or external support). These groups have sprung up in response to needs and validate the induced institutional innovation approach. The findings from our survey that relate to this group are noteworthy in their own right, not just as a "control" for analysing the differential impact of the programmes that provide direct support and interventions.

### *(b) Effects of CBO Capabilities (Maturity Indices) on Nutrition Status*

Support has been found for the induced institutional innovation hypotheses. For the Mothers' Groups there is a proof for that the more capable are the CBOs, the lower is the level of underweight of their members. Results differ for Advanced and Intermediate Groups. For the latter two groups, the maturity index does not have any significant effects associated with less malnutrition of children: the value predicted in the first step does not have any significant impact on the malnutrition estimated in the second step.

The Mothers' Groups generally play an important role in improving the child malnutrition – and perform even better than do Advanced or Intermediate Groups. However, not all the children of households in Mothers' Groups are better nourished. To reduce the prevalence of malnutrition, authorities should seek to design interventions that raise capabilities of the Mothers' Groups, especially their leadership, management, and savings and financial support activities.<sup>46</sup>

***(c) Effects of Training Combined with Child Growth Promotion***

Outside interventions can be designed so as to assist social capital formation that is associated with reduced poverty reflected in child malnutrition. When external interventions facilitate relevant context for members' learning and information exchange about child growth promotion, changes in behaviour and resource allocations take place that are associated with reduced chronic child malnutrition.

We found training on child growth or nutrition to be significant in reducing malnutrition. Outside interventions will be effective in reducing stunting when they are combined with training, especially the out-of-school learning that is associated with effective outside interventions.<sup>47</sup> *That is, in the context of endemic child stunting, without combining training on child growth or nutrition with external interventions, the latter will have little or no effect in reducing prevalence of stunting. The results imply that training mothers on child growth or nutrition that is combined with growth promotion/monitoring of children, aged less than five years, plays an important role in reducing prevalence of stunted children.*

This study represents a further addition to the few that demonstrate the positive role of out-of-school training on child growth and nutrition in reducing the level of malnutrition. The first such study known to us is a study for Morocco.<sup>48</sup> Findings from our study in Nepal are confirmed by more recent studies in Ethiopia and Indonesia.<sup>49 50</sup>

Our findings indirectly confirm the importance of using facilitators, or village voluntary (health) workers to empower mothers and provide them with relevant training. Finally, the results also suggest that availability of relevant information on nutrition and child growth from radio is an effective instrument with which to reinforce the training provided by facilitators.

***(d) Importance of Raised Maternal Nutrition Knowledge for Accelerated Poverty Reduction***

These findings have important policy implications. Mothers' uptake of external nutrition knowledge may transcend the importance of organisational platforms and their attributes in reducing malnutrition. Still, an organisational platform is an important (social capital) prerequisite, providing the interface for members to access the knowledge that is supplied. Members' interactions generate mutual empowerment, remove social barriers and promote opportunity for learning. *An organisational platform can be seen as a necessary but not sufficient condition for achieving impact in reducing stunting.* A further necessary condition is a relevant context, content and process that trigger the mother's motivation to acquire the knowledge with which to raise her child's nutritional status. Designing direct efforts to raise maternal nutrition knowledge would significantly accelerate progress in poverty alleviation, at little cost (see also footnote 49 Christiaensen & Alderman, Ethiopia). Impact would multiply with complementary services such as promoting capabilities associated with savings, credit for income generating activity, self-help community infrastructure, and relevant production technology.

***(e) Mothers' Nutritional Status***

Healthier mothers have healthier children: the connection is established between mothers' BMI and the nutritional status of their children. In the literature, references can be found

that demonstrate that energy deficient mothers in rural areas in Nepal have limited capacity *inter alia* for breastfeeding.<sup>51</sup> Our analysis validates this assertion. For Mothers' Groups, an inferior physiological condition or low Body Mass Index (BMI) is associated with a higher probability for the mother of having a child that is underweight (Table 3). For mothers who are members of the CBOs that receive external support, a low BMI is associated with a higher prevalence of stunted children.

This result is in line with other studies. For instance, results from Hyderabad in India showed that adults were more likely to suffer from chronic energy deficiency if they had been malnourished as children. The odds ratio for low birth weight (LBW) was found to be three times higher in severe chronic energy deficient groups compared to normal values of BMI for mothers.<sup>52</sup>

***(f) Barriers to Raised Nutrition Knowledge***

The crucial intervention factor associated with reduced stunting is the presence of training sessions on child health and child growth monitoring. But even when CBOs are more capable and more independent in their decision-making, this does not mean that they necessarily access relevant knowledge or receive such training. Such knowledge normally needs to be provided from, or facilitated by, exogenous sources.<sup>53 54</sup> Better-organised and well-managed women's groups may be able to attract external sources of funding (such as, for example, funds for community infrastructure). Yet, a "first" issue to address is that to a large extent, the CBO leaders outside of the sites that receive intensive programme support (IWCDP and DPCP) do not have the knowledge with which to request the knowledge that they need. Village leaders (VDC) leaders confirmed that they are aware of the need for programmes that are directed to support women's needs. They stated that training, creating awareness and mass communication is urgent to reduce the incidence of malnutrition of children.<sup>55</sup> Our econometric analysis validated their views.

In the final analysis, policy makers also at the "summit" and donors need to become more aware about levels of chronic malnutrition, its causes and solutions. They need to learn firstly that child malnutrition is a relevant easily measurable proxy for endemic poverty and for measuring the impact of cross-sectoral poverty reduction programmes. Secondly, they need to learn about the significance of enhanced maternal nutrition knowledge in accelerating poverty alleviation and for reaching the Millennium Development Goals. Professional divides have prevailed for too long. High costs are paid as long as reductionist views are permitted to dominate that see malnutrition as a minor issue of 'home economics', or simply relegated to food and micronutrient supplementation. Addressing chronic malnutrition with its associated longer term, or permanent, cognitive and motoric impairment through enhanced learning and skill uptake needs to become an integral part of mainstream poverty reduction strategies.

***(g) Relevant Indicators***

Official development administrations need to ensure that programmes are well designed, targeted and use relevant indicators in monitoring progress in poverty alleviation. Our Nepal study has defined a critical set of interventions that contributes to lower prevalence of stunting. In the final analysis, for programmes that are directed to reduce rural poverty, these results confirm the importance of monitoring underweight, stunting and mother's

BMI. These indicators are of much value for progress monitoring of programmes targeted to reduce deprivation, let alone those that seek to improve gender equality in intra household decision-making.<sup>56</sup> Stunting remains a superior indicator for monitoring final impact.

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**TABLE 1**  
**Distribution of Surveyed CBOs by Intervention Type**

<b>District</b>	<b>Intensive (IWCDP or DPCP) <i>No.</i></b>	<b>Moderate (PCRW) <i>No.</i></b>	<b>Mother s' Groups <i>No.</i></b>	<b>Overall <i>No.</i></b>
<b>Tanahun</b>	16	9	6	31
<b>Sunsari</b>	20	7	5	32
<b>TOTAL</b>	36	16	11	63

TABLE 2

Nutrition Indicators (Z-scores and stunting/ underweight rates) of children 0 to 60 Months in Nepal, April 2000

<u>Nutrition Indicators</u>	<u>Stunting (height-for-age)</u>		<u>Underweight (weight-for-age)</u>	
<u>Sub-sample</u>	Z score	% of those severely stunted (%)	Z score	% of those severely underweighted (%)
Advanced Group (with IWCDA/ DPCP, Obs.=354)	-1.63	40.4	-0.68	13.1
Intermediate Group (with PCRW, Obs.=109)	-1.65	31.2	-0.56	10.1
Mothers Group (Obs.=125)	-1.56	38.4	-0.48	12.8
Entire Sample (Obs.=479) (Obs. =479)	-1.62	37.8	-0.60	12.3

TABLE 3

Estimation Results of the Effects of the Interventions (IWCDA / DPCP or PCRW) on Child Nutrition Indicator s for the entire sample (Two-step Model)

Explanatory Variables	First Step Multinomial Logit Model				Second Step OLS			
	Whether with intensive interventions (Y <sub>i</sub> =1), with moderate interventions (Y <sub>i</sub> =2) or Mothers Group (reference group) (Y <sub>i</sub> =0)				Stunting (Z score)		Underweight (Z score)	
	Pr(Y <sub>i</sub> =1)		Pr(Y <sub>i</sub> =2)		Coef.	t value	Coef.	T value
Dependant Variable	Coef.	z value <sup>a</sup>	Coef.	z value	Coef.	t value	Coef.	T value
$P(Y_i = 1)$ The estimated probability for moderate interventions (PCRW)	-	-	-	-	<b>-1.220</b>	<b>(-1.15)</b>	<b>0.108</b>	<b>(0.11)</b>
$P(Y_i = 2)$ The estimated probability for intensive interventions (IWCDA/ DPCP)	-	-	-	-	<b>-1.763</b>	<b>(-1.97)*</b>	<b>0.989</b>	<b>(1.17)</b>
E (Schooling years of group leaders)	<b>0.127</b>	<b>(2.27)*</b>	<b>0.093</b>	<b>(1.49)</b>	-	-	-	-
M (Number of Active Members in CBO)	<b>-0.025</b>	<b>(-1.99)*</b>	<b>0.011</b>	<b>(1.10)</b>	-	-	-	-
B <sub>1</sub> (Dummy variable on ethnicity: 1 if Brahmins /Cheetri and 0 otherwise)	-1.619	(-3.03)**	-1.962	(-3.33)**	-0.086	(-0.29)	-0.069	(-0.29)
B <sub>2</sub> (District dummy variable: 1if from Hills 0 if from Terai)	-2.842	(-3.01)**	-0.650	(-0.66)	-0.653	(-1.35)	0.412	(0.98)
I (availability of information on nutrition and child growth from radio)	4.025	(6.21)**	4.518	(7.50)**	0.763	(1.78)†	-0.328	(-0.84)
L <sub>1</sub> (Latrine: 1 if household owns covered latrine and 0 otherwise)	0.939	(1.80)†	1.376	(2.73)**	-0.198	(-0.68)	0.234	(0.87)
L <sub>2</sub> (Water Quality: whether they collect drinking water from piped water tap with covered well)	0.963	(1.54)	0.594	(1.03)	0.079	(0.25)	-0.367	(-1.58)
L <sub>3</sub> (Water Quality: whether they collect drinking water from hand pump)	-2.597	(-2.76)**	-0.087	(-0.09)	0.051	(0.11)	-0.272	(-0.70)
F <sub>1</sub> (1 if a mother has her own income source, 0 otherwise)	0.260	(0.56)	-1.292	(-2.19)*	-0.080	(-0.22)	-0.212	(-0.74)
F <sub>2</sub> (1 if a household managed to save in 1999, 0 otherwise)	0.703	(1.62)	0.809	(1.82)†	0.019	(0.05)	0.300	(1.02)
F <sub>3</sub> (1 if a household ended up increasing borrowing in 1999, 0 otherwise)	1.503	(4.07)**	0.727	(1.85)†	0.137	(0.58)	-0.307	(-1.69)†
H <sub>1</sub> (trend of disease)	-3.239	(-6.57)**	-1.055	(-2.64)**	-1.011	(-2.21)*	0.145	(0.47)
H <sub>2</sub> (trend of health service)	-0.928	(-1.37)	-3.151	(-4.59)**	-0.569	(-1.22)	-0.189	(-0.47)
Y <sub>1</sub> (Age (in months) of a child)	-	-	-	-	-0.063	(-4.82)**	-0.010	(-0.76)
Y <sub>2</sub> (Square of Age of a child)	-	-	-	-	0.000	(1.95)†	0.000	(0.53)
B <sub>3</sub> (Mother's BMI)	-	-	-	-	0.095	(2.38)*	-0.017	(-0.48)
B <sub>4</sub> (Mother's Education)	-	-	-	-	0.081	(2.18)*	0.011	(0.32)
Constant	-0.294	(-0.33)	-1.324	(-1.36)	-1.810	(-1.76)	-0.380	(-0.49)
Joint Significant Tests	Wald Chi <sup>2</sup> (26)=150.71**				F(17, 405)=4.94**		F(17, 405)=2.19**	
R <sup>2</sup>	0.352				0.161		4.89	

Note: <sup>a</sup> \*\*, \*, and † indicate statistically significant parameter estimates at p=0.01, p=0.05 and p=0.10 respectively. Number of Observations =520

**TABLE 4**

**Estimation Results of the Effects of Training and Maturity Index on Child Nutrition Indicators (Heckman Two-step Model)**

	(Case 1) For Advanced Groups Effect of Training on Stunting				(Case 2) For Advanced & Moderate Groups Effect of Training on Underweight				(Case 3) For Mothers Group Effect of Maturity on Underweight			
	First Step Probit Model		Second Step		First Step Probit Model		Second Step		First Step Probit Model		Second Step	
	Dependant Variable Whether with Intensive Interventions or not		Stunting (Z score)		Whether with either Intensive/ Moderate		Underweight (Z score)		Whether Mother's Group or not		Underweight (Z score)	
	Coef.	z value <sup>a</sup>	Coef.	z value	Coef.	z value	Coef.	z value	Coef.	z value	Coef.	z value
<b>T<sub>1</sub> (Training Indicator)</b> the degree of receiving pre-service training and regular in-service training	-	-	<b>0.188</b>	<b>(1.59)</b>	-	-	-	-	-	-	-	-
<b>T<sub>2</sub> (Training Dummy): whether with training on health</b>	-	-	-	-	-	-	<b>0.279</b>	<b>(1.35)</b>	-	-	-	-
<b>T<sub>3</sub> (Maturity Index)</b>	-	-	-	-	-	-	-	-	-	-	<b>0.050</b>	<b>(1.88)†</b>
E (Schooling years of group leaders)	0.041	(1.83)†	-	-	0.031	(1.19)	-	-	-0.057	(-2.19)	-	-
M (Number of Active Members in CBO)	-0.015	(-2.80)**	-	-	0.000	(-0.08)	-	-	0.001	(0.20)	-	-
B <sub>1</sub> (Dummy variable on ethnicity: 1 if Brahmins /Cheetri and 0 otherwise)	-0.184	(-1.10)	-0.004	(-0.01)	-0.475	(-2.39)*	-0.275	(-1.03)	0.861	(3.37)**	-0.057	(-0.15)
B <sub>2</sub> (District dummy variable: 1 if from Hills 0 if from Terai)	-1.065	(-2.52)*	0.796	(1.71)†	-1.073	(-2.37)*	-0.004	(-0.01)	1.224	(2.88)**	1.821	(2.37)*
L <sub>1</sub> (Latrine: 1 if household owns covered latrine and 0 otherwise)	0.060	(0.31)	-0.061	(-0.16)	0.323	(1.59)	0.626	(2.64)*	-0.572	(-2.36)*	-1.116	(-2.70)**
L <sub>2</sub> (Water Quality: whether they collect drinking water from piped water tap with covered well)	0.210	(0.99)	-0.116	(-0.24)	0.043	(0.19)	-0.183	(-0.76)	-0.125	(-0.46)	0.244	(0.39)
L <sub>3</sub> (Water Quality: whether they collect drinking water from hand pump)	-1.076	(-2.54)*	0.852	(1.81)†	-0.878	(-1.94)†	-0.695	(-2.41)*	1.213	(2.94)**	2.238	(2.55)*
I (Availability of information on nutrition and child growth from radio)	0.730	(4.40)**	-0.415	(-1.05)	1.577	(8.10)**	-0.035	(-0.17)	-1.982	(-7.41)**	-0.489	(-0.40)
F <sub>1</sub> (1 if a mother has her own income source, 0 otherwise)	0.376	(1.95)†	-0.364	(-0.90)	-0.024	(-0.12)	0.161	(0.73)	-0.048	(-0.20)	-0.818	(-1.74)†
F <sub>2</sub> (1 if a household managed to save in 1999, 0 otherwise)	0.027	(0.16)	-0.097	(-0.24)	0.109	(0.60)	0.147	(0.66)	-0.369	(-1.53)	1.211	(2.64)*
F <sub>3</sub> (1 if a household ended up increasing borrowing in 1999, 0 otherwise)	0.485	(3.35)**	-0.491	(-1.43)	0.367	(2.46)*	-0.176	(-0.93)	-0.563	(-3.12)**	0.281	(0.67)
H <sub>1</sub> (trend of disease)	-1.385	(-6.64)**	0.029	(0.04)	-0.805	(-4.77)**	0.063	(0.26)	1.165	(6.27)**	-1.356	(-2.61)*
H <sub>2</sub> (trend of health service)	0.299	(1.17)	-0.214	(-0.39)	-0.875	(-3.24)**	0.230	(0.67)	0.823	(2.49)*	0.324	(0.50)
Y <sub>1</sub> (Age (in months) of a child)	-	-	-0.064	(-7.14)**	-	-	0.002	(0.22)	-	-	-0.049	(-1.40)
Y <sub>2</sub> (Square of Age of a child)	-	-	0.000	(1.95)†	-	-	0.000	(-0.62)	-	-	0.001	(1.21)
B <sub>3</sub> (Mother's BMI)	-	-	0.042	(0.85)	-	-	-0.056	(-1.45)	-	-	0.088	(1.45)
B <sub>4</sub> (Mother's Education)	-	-	0.084	(2.04)*	-	-	-0.033	(-1.15)	-	-	0.235	(2.50)*
Constant	-0.634	(-1.57)	-1.133	(-0.89)	0.356	(0.77)	0.858	(1.05)	0.520	(-1.22)	-5.633	(-2.55)
?	-	-	-0.557	(-2.71)**	-	-	-0.186	(-2.23)*	-	-	-0.012	(-0.06)
?	-	-	2.137	(8.09)**	-	-	1.607	(9.04)**	-	-	1.891	(7.03)**
?	-	-	-1.190	(-2.19)*	-	-	-0.298	(-2.11)*	-	-	-0.023	(-0.06)
No. of observation (censored obs.; uncensored obs.)	515 (166; 349)				518 (275; 243)				520 (395; 125)			
Joint Significant Tests	Wad Chi <sup>2</sup> (16) = 34.21**				Wad Chi <sup>2</sup> (16) = 84.85**				Wad Chi <sup>2</sup> (16) = 32.39**			

Note: <sup>a</sup> \*\*, \*, and † indicate statistically significant parameter estimates at p=0.01, p=0.05 and p=0.10 respectively.

## Notes

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\*This study was funded by the International Fund for Agricultural Development (IFAD). Study findings do not necessarily reflect the views of IFAD. Per Eklund, whilst with IFAD, designed and executed the study. Essential contributions to this study were provided by Abel Rajaratnam, Director of Community Health at RUHSA, Vellore, India; Bishnu Puri with Ministry of Local Development Staff, (Nepal, MLD), Ganesh Rauniyar, Massey University, New Zealand, Indira Koirala, (IIDS; Nepal), T. Shrestha and M. Ozaki. A team of professional women development officers from MLD were responsible for the interviewing. We owe Raghav Gaiha for his valuable suggestions on an earlier version. We are grateful for the support provided in Nepal by Gunga Datta Awasthi, Mohan Man Sainju and UNICEF. We thank first participants at IFAD's International Workshop in Fiuggi in 2001, "*Reducing Malnutrition in Developing Countries – Creating Effective Capabilities at Community Level*", and second participants at seminars at the Nutrition School, Tufts University, and at the universities of Oxford, Aarhus, Leuven and Lund. Any errors remaining are entirely due to omissions of the authors.

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<sup>3</sup> P. Dasgupta, *An Inquiry into Well-being and Destitution* (New York: Clarendon Press, 1996).

<sup>4</sup> M. Kikuchi and Y. Hayami, "Inducements to Institutional Innovations in and Agrarian Community", *Economic Development and Cultural Change* 29-1 (1980): 21-36.

<sup>5</sup> Regarding 'Induced Institutional Innovation', see Y. Hayami, *Development Economics – From the Poverty to the Wealth of Nations*, Second Edition, (New York: Oxford University Press, 2001). Hayami modelled induced technological innovation as an outcome of producers' cost-minimising behaviour in agrarian economies and extended the idea to institutional innovation as a more general case. The collective action to facilitate the innovation is assumed to be organised in both cases if aggregate social profit from the action exceeds its cost (pp.16-21). Hayami argues that the collective action through mutual 'trust as a social capital' in a community supports economic development by correcting the failures of the market and the state (pp.285-291).

<sup>6</sup> See M. Woolcock and D. Narayan, "Social Capital Implications for Development Theory, Research and Policy", *World Bank Observer* 15-2 (2000): 225-49 and P. Narayan, *Voices of the Poor, Poverty and Social Capital in Tanzania* (Washington D.C.: World Bank, 1997).

<sup>7</sup> C. Grootaert and T. van Bastelaer, *Understanding and Measuring Social Capital, A Multi-disciplinary Tool for Practitioners* (Washington D.C.: World Bank, 2002): p.11. Proxy indicators for social capital comprise membership in local associations and networks (structural social capital), indicators of trust and adherence to norms (cognitive social capital), and indicators of collective action (an output measure). See also C. Grootaert and T. van Bastelaer eds., *The Role*

of *Social Capital in Development An Empirical Assessment* (Cambridge: Cambridge University Press, 2002).

<sup>8</sup> Grootaert and van Bastelaer, *Understanding and Measuring Social Capital, A Multi-disciplinary Tool for Practitioners* (n.6 above): p.11.

<sup>9</sup> C. Grootaert, *Social Capital, Household Welfare and Poverty in Indonesia* (Washington D.C.: The World Bank, 1999): p.6.

<sup>10</sup> *Ibid.*, p. 60.

<sup>11</sup> See Section III and V for more details.

<sup>12</sup> *Ibid.*, p. 60.

<sup>13</sup> *Ibid.*, p. 61. Results obtained for study in Indonesia

<sup>14</sup> *Ibid.*, p. 63. Results from Indonesia suggest that a 15 percent increase in participation corresponds with a 2.5 percent higher expenditure level.

<sup>15</sup> R. Klitgaard, "Institutional Adjustment and Adjusting to Institutions" (World Bank Discussion Papers, Washington D.C., 1995): p.8.

<sup>16</sup> M. Fafchamps and B. Minten, "Social Capital and the Firm: Evidence from Agricultural Trade, Social Capital Initiative" (Working Paper 23, Washington D.C., World Bank, Soc. Dev. Dept., 1999), referred to in Grootaert, *Social Capital, Household Welfare and Poverty in Indonesia* (n. 8 above). Two most important dimensions of social capital were the number of traders known and the number of people the trader could count on in times of trouble.

<sup>17</sup> J. Isham and S. Kähkönen, "What Determines the Effectiveness of Community Based Water Projects? Evidence from Central Java, Indonesia, on demand responsiveness, Service Rules, and Social Capital", (Social Capital Initiative Working Paper 14, Washington D.C., World Bank, Social Development Dept., 1999), referred to in Grootaert and van Bastelaer, *Understanding and Measuring Social Capital, A Multi-disciplinary Tool for Practitioners* (n.6 above) p.65.

<sup>18</sup> C. Grootaert, G. T. Oh and A. Swamy, "Social Capital and Development Outcomes in Burkina Faso, Local Level Institutions" (Working Paper 7, World Bank, Social Development Dept., Washington D.C., 1999) found that parents' participation in PTA meetings was beneficial; referred to in Grootaert and van Bastelaer, *Understanding and Measuring Social Capital, A Multi-disciplinary Tool for Practitioners* (n.6 above): p. 66.

<sup>19</sup> See, R. Shrimpton, "Community Participation in Food and Nutrition Programme: An Analysis of Recent Governmental Experiences", Chapter 13 in P. Pinstrip-Andersen, D. Pelletier, and H. Alderman, *Child Growth and Nutrition in Developing Countries*, (New York: Cornell University Press, 1995).

<sup>20</sup> See J. Cervinska, N.M. Gerein, and S. George, "Growth Promotion for Child Development, Proceedings of a Colloquium", (Nyeri, Kenya May 1992, Ottawa, Canada, IDRC, 1992).

<sup>21</sup> Grootaert and van Bastelaer, *Understanding and Measuring Social Capital, A Multi-disciplinary Tool for Practitioners* (n.6 above): p.142.

<sup>22</sup> C. Reid and L. Salmen, "Qualitative Analysis of Social Capital: The Case of Agricultural Extensions in Mali, in Grootaert and van Bastelaer, *Understanding and Measuring Social Capital, A Multi-disciplinary Tool for Practitioners* (n.6 above). Reid and Salmen confirm the great potential of women organisations in supporting and taking a lead in village development.

<sup>23</sup> The study was initiated in year 2000, at a time when most efforts had just begun to analyse contributions of social capital measured in the structural dimensions to human welfare in the non-monetary dimension.

<sup>24</sup> The latter obtained through wealth ranking using community informants.

<sup>25</sup> See Grootaert and van Bastelaer, *Understanding and Measuring Social Capital, A Multi-disciplinary Tool for Practitioners* (n.6 above): p.3.

<sup>26</sup> C. Grootaert, “Quantitative Analysis of Social Capital Data”, Chap. 3 in Grootaert and van Bastelaer, *Understanding and Measuring Social Capital, A Multi-disciplinary Tool for Practitioners* (n.6 above).

<sup>27</sup> For details of the matrix, reference Shrimpton, “Community Participation in Food and Nutrition Programme: An Analysis of Recent Governmental Experiences” (n.18 above).

<sup>28</sup> This dimension reflects the extent to which CBOs are “recognised” by formal local bodies, by VDCs and Wards.

<sup>29</sup> The Participatory District Development Programme (PDDP) includes support for village development plans (VDP).

<sup>30</sup> IFAD’s Office of Evaluations and Studies evaluated this programme in 1996. The 1999 Country Programme Evaluation followed this evaluation.

<sup>31</sup> The DPCP uses the infrastructure created through the PDDP and LGP programmes. On the other hand, the IWCDP uses the infrastructure and support structure provided by the WDD/PCRW.

<sup>32</sup> The stunting syndrome occurs primarily during the first three years.

<sup>33</sup> Uptake of knowledge for producing and procuring food is different from knowledge uptake that relates to how women may empower each other and seek community level cooperative solutions to address issues associated with chronic nutrition security..

<sup>34</sup> Note that three categories are mutually exclusive and each household belongs to only one category.

<sup>35</sup> Mothers’ Groups receive no training with a few exceptions. Intermediate interventions are provided only with a limited range of trainings, such as, training on health.

<sup>36</sup> J. Heckman “Sample Selection Bias as a Specification Error”, *Econometrica* 47 (1979): 153-161.

<sup>37</sup> One of the authors designed and executed the survey.

<sup>38</sup> In the present analysis, we consider the case in which a dependent variable in the second step is the nutrition or health indicator of *all* children under the age of sixty months in the household and explanatory variables are at household level. The estimations in both first and second step are clustered at the household level in such a way that dependent variables within a household are dependent but those among households are independent.

<sup>39</sup> In both first and second steps, heteroscedasticity is adjusted by the Huber-White Sandwich estimator of variance, originally developed by P. J. Huber, “The behaviour of maximum likelihood estimates under non-standard conditions” in *Proceedings of the Fifth Berkeley Symposium in Mathematical Statistics and Probability*, Berkeley, CA. University of California Press, (1967): 231-233, and H. White, “A Heteroscedasticity-consistent Covariance Matrix Estimator and a Direct Test for Heteroscedasticity”, *Econometrica* 48 (1980): 817-830. This is applied for Heckman Sample Selection Model, which is described in the next subsection.

<sup>40</sup> Huber, “The behaviour of maximum likelihood estimates under non-standard conditions” (n.36 above).

<sup>41</sup> Age of parent was not used because of the missing variable problems.

<sup>42</sup> The result is not reported in Table 2, but will be furnished on request.

<sup>43</sup> Z scores are converted into positive values by adding 10 before taking their logs. Dummy variables are treated as continuous in calculating elasticities. Most of the explanatory variables are included in both first and second variables, but we are ignoring the indirect effects in the first-step regression on the elasticity in the second-step regression for simplicity.

<sup>44</sup> Note that all the samples are used in the second-step in the model described in the previous sub-section.

<sup>45</sup> Mother’s BMI has a wrong (negative) sign. It is arguable that mother’s nutrition status affects stunting, the long-term indicator of child malnutrition, but not underweight, the seasonal indicator.

<sup>46</sup> P. Collier, “Social Capital and Poverty” in Grootaert and van Bastelaer eds., *The Role of Social Capital in Development An Empirical Assessment* (see n.7 above) argues that the distributional consequences of social capital is mixed depending on the type of externality generated or the nature of social interaction. However, Collier suggests that if social capital generates knowledge externality through collective action, it is generally beneficial to the poor.

<sup>47</sup> However, these conclusions are based on cross-sectional data and thus to confirm these conclusions the data should be collected for the same households to create panel data.

<sup>48</sup> P. Glewwe, “Why Does Mother’s Schooling Raise Child Health in Developing Countries: Evidence from Morocco”, *Journal of Human Resources*, 34-1 (1999): 124-159 addresses this question with Moroccan data, considering three possible mechanisms: 1) the direct teaching of nutrition knowledge in school, 2) the facilitation of gaining nutrition knowledge that comes from the literacy and numeracy learned in school, and 3) exposure to modern society through school. He finds that maternal health knowledge stands alone among these possible mechanisms in contributing to child height (his proxy for health), and that such knowledge is gained largely outside the classroom.

<sup>49</sup> L. Christiaensen and H. Alderman, “Child Malnutrition in Ethiopia, Can Maternal Knowledge Augment the Role of Income”, (World Bank Africa Region Technical Paper No. 22, Washington D.C.: World Bank, October 2001) indicate that to reduce growth faltering in Ethiopia in a significant - and timely manner – targeted child growth monitoring together with maternal nutrition education will be needed in conjunction with programs to raise private income and formal schooling.

<sup>50</sup> S. Bloch and P. Webb, “Nutrition Knowledge Versus Schooling in the Demand for Child Micronutrient Status” (Fletcher School, Tufts University, July 2002) find that critical determinants include: child gender and age, the number of children in the household, household expenditure levels, access to water, and maternal nutrition knowledge. Maternal schooling contributes to child micronutrient status primarily through its effect on nutrition knowledge (for which schooling is not the primary source), and possibly through its effect on household expenditures.

<sup>51</sup> For instance, see IFAD, Nepal Country Programme Evaluation, Office of Evaluation & Studies, (A Report, Rome: IFAD, 1999).

<sup>52</sup> Naidu An, Rao Np., “Body mass index: a measure of the nutritional status in Indian populations”, *European Journal of Clinical Nutrition*, 48 S-3 (1994): S131-40. The influence of BMI on the incidence of low birth weight was evident despite the confounding factors of parity and maternal age.

<sup>53</sup> As suggested by Cristina Lopriore, Istituto Nazionale di Ricerca per gli Alimenti e la Nutrizione, (personal communication), it is often difficult to convince potential beneficiaries in deprived communities, of the necessity to reduce malnutrition unless regular growth monitoring sessions are organised.

<sup>54</sup> Practitioners of the so-called positive deviant methodology have reason to argue the even in deprived communities, households can be found that combine their resource use so that outcomes are superior relative to other households. Still, external facilitators may be required to identify practices with superior nutritional outcomes so as to diffuse them more widely.

<sup>55</sup> VDC chairpersons were asked about their perceptions regarding the role of community organisations in improving food and nutrition security. Almost all respondents agreed that lack of awareness is the root cause contributing to malnutrition, followed by scarce food availability, limited income generation and insufficient sanitation.

<sup>56</sup> Data are simultaneously collected for this set of indicators at little cost.