Food Policy 61 (2016) 185–197

Contents lists available at ScienceDirect

Food Policy

journal homepage: www.elsevier.com/locate/foodpol

Child dietary quality in rural Nepal: Effectiveness of a community-level development intervention ☆

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ARTICLE INFO

Article history:
Received 18 June 2015
Received in revised form 22 March 2016
Accepted 31 March 2016

Keywords:
Child dietary diversity
Smallholder farms
Impact evaluation
Nepal
Animal source foods
Community based interventions

ABSTRACT

Nutrition-sensitive agricultural interventions have the potential to improve child dietary quality in rural households, as evidenced by a growing body of work which concurrently measures agricultural and nutrition indicators. Our objective was to investigate whether children in rural farming communities of Nepal participating in a community-level, nutrition-sensitive development intervention had improved dietary quality compared with children living in non-participating matched rural communities. Six rural communities of Nepal where livelihoods were predominantly agricultural were selected to participate in the phased implementation of a community-level development intervention by *Heifer International*. Households and children in each community were surveyed at baseline, and follow-up surveys were implemented every six months for twenty-four months. Detailed data on food consumption for children older than 6 months of age were collected using a 24 h recall for 17 foods and food groups; parents responded for children. A difference-in-differences model with household fixed-effects and an analysis of covariance model were used to analyze the resulting panel data. Results indicated that the impacts of the intervention varied by agro-ecological region and by season. In the Hills region, which is poorer on average and more conducive to livestock production, children who had received the intervention for two years were 2.2 times as likely to have consumed food from an additional food group, 1.27 times as likely to have achieved minimum dietary diversity and 1.38 times as likely to have consumed animal source foods as children who received the intervention for only one year. In the Terai region, which is more conducive to crop production, there was no significant change in dietary quality attributable to the intervention. These results provide evidence that particularly vulnerable families can take advantage of community-level development activities. Given that the effects of community-level development activities were disparate across communities within the same country, we conclude that tailoring development activities for particular locations is necessary for success.

Introduction and motivation

Adequate nutrition and is essential for child growth, development, labor productivity, and health throughout life (Strauss and Thomas, 2007; Black et al., 2013; Alderman et al., 2006). Dietary quality – often measured by dietary diversity – is a direct determinant of nutritional status, especially for key micronutrients such as vitamin A and iron, (Arimond et al., 2010; Arimond and Ruel, 2004), which are found predominantly in animal sourced foods. Although somewhat lost in myriad other goals, ending hunger and improving agricultural productivity are targets of the newly launched *Sustainable Development Goals* (SDGs), listed together under *Goal 2: Zero Hunger* (UN, 2015). Ensuring high-quality diets for rural children in low-income countries can be addressed by a number of strategies, including by stimulating economic growth, implementing nutrition-specific programming, or implementing nutrition-sensitive programming (Headey, 2013; Black et al., 2013; Ruel and Alderman, 2013). The intervention evaluated here

☆ This paper represents original work that has not been published previously, that is not currently being considered by another journal, and that if accepted for publication at *Food Policy*, it will not be published elsewhere in the same form. Each author has seen and approved of the contents of the manuscript.

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http://dx.doi.org/10.1016/j.foodpol.2016.03.007
0306-9192/

is a nutrition-sensitive program, which does not directly address the immediate determinants of nutritional status (Ruel and Alderman, 2013). Being forced to pick between any one of these three major strategies is – at best – a false choice, and the effectiveness of any one strategy will likely depend on specific local context. Regardless, it is important to assess whether and how different types of programs work for improving child diets, especially in vulnerable areas such as Nepal which experienced a devastating earthquake in April of 2015 severely affecting about 5.6 million people (Aguayo et al., 2015). Leveraging existing non-governmental organizations (NGOs) with diverse programming experience in Nepal will be important for supporting a suitable recovery and improving child dietary quality and nutritional status over the long-term. To this end, this paper assesses the effectiveness of a community-level, nutrition-sensitive development intervention in rural Nepal on improving child dietary quality using a matched-pair community-level randomized study design which estimates the *average treatment effect on the treated* (ATET).

Child diets in Nepal and nutrition-sensitive interventions

Inadequate child dietary quality is a problem of public health significance in Nepal. Findings from the 2011 Demographic and Health Survey (DHS) in Nepal indicated that, for children aged 6–24 months in the 24-h preceding the survey, only 28% of children were given foods from at least 4 different food groups, 46% of children consumed a food rich in vitamin A, and 24% of children consumed a food rich in iron (MOHP and ICF International, 2012). This study focuses on a wider age range of children than typically measured for the DHS (6 months to 8 years at baseline), but similar dietary concerns exist for older age groups as well. Agriculture is the predominant occupation (76%) in Nepal, and the majority of the population is rural (82%), so fluctuations in food availability across seasons may exacerbate dietary insults to child growth and development (MOHP and ICF International, 2012; World Bank, 2012; Maleta et al., 2003).

Nutrition-sensitive interventions with an agricultural focus may ameliorate the health and dietary effects of seasonal fluctuations in food availability (Ruel and Alderman, 2013). However, a systematic review of studies of the impact of agriculture interventions on nutrition noted an overall low quality of evidence for improvements in child dietary diversity and animal source food consumption (Girard et al., 2012), though recently Smale et al. (2015) found that smallholder farmer adoption of hybrid maize was positively associated with dietary diversity in Zambia. The impacts of community-level, nutrition-sensitive activities in farming regions on improving child diets are difficult to measure and inconsistently observed, and such interventions typically require a specific nutrition focus or goal to succeed (Berti et al., 2004; Bezner Kerr et al., 2011; Bhutta et al., 2008; Satzinger et al., 2009). A potential key link between agriculture and improved children's diets is women's status (Carletto et al., 2015). The mediating effects of women's empowerment or time allocation on the relationships between agriculture and children's diets or nutrition are complex, as demonstrated recently in Ghana by Malapit and Quisumbing (2015) and in Nepal by Malapit et al. (2015), who found that some indicators of infant and young child feeding and maternal nutrition were associated with indicators of women's empowerment, though others were not.

The Heifer International intervention

Heifer International (henceforth *Heifer*) is a globally active NGO with over 300 projects in thirty-two countries. The organization uses the introduction of livestock and related animal husbandry training as tools for poverty alleviation, citizen empowerment, and economic development. *Heifer* activities focus on the distribution of livestock and training to rural women's groups with an emphasis on income generation. These activities occur within the context of a strong focus on the development of social capital, specifically citizen empowerment, values training, social mobilization, group savings and micro-lending, and enterprise.

The nutritional effects of *Heifer* activities in agriculture and in women's empowerment have been formally evaluated recently; the promotion of livestock ownership by *Heifer* programs was an important mechanism leading to improvements in anthropometric measurements of children in Rwanda (Rawlins et al., 2014) and Nepal (Miller et al., 2014). However, impacts on child dietary quality have not been yet established, and nutrition is not directly a focus of *Heifer* programming. To this end, we evaluated the effect of a holistic community-level nutrition-sensitive intervention on child dietary diversity and animal source food consumption in rural Nepal.

Potential pathways of impact

There are four broad potential pathways through which agricultural activities can improve child diets and nutritional outcomes, as synthesized by Carletto et al. (2015): food prices, income from agriculture, consumption of own production, and gender-related issues. Three of these potential mechanisms stand out as especially important for the present study. First, household incomes could increase with improved agricultural production due to the animal husbandry training aspect of the intervention. Second, dietary intakes could be improved through increased consumption of own production, or through increased incomes. Third, the improvement of women's social standing could lead to more desirable child nutrition outcomes. The latter mechanism relates directly to the design of the *Heifer* intervention, which focused on developing and facilitating women's self-help groups. Therefore, for those women who had been exposed to the intervention for longer periods of time, we expected that they would be better able – whether through increased knowledge, increased household resources, or increased *power* over household resources – to improve their children's diets, when compared with women who had not been exposed to the intervention for as long a period of time. There is empirical evidence in Nepal that this is a plausible mechanism, as evidenced by Malapit et al. (2015), who estimated that women's empowerment was strongly associated with maternal and child nutrition there.

Under this theoretical framework displayed below in Fig. 1, increasing women's empowerment with a community-level development intervention could result in an outward shift of the demand curve for children's food, perhaps especially during the hungry seasons. For our current empirical purposes, we used a reduced-form difference-in-differences model to estimate these effects. Women's empowerment was not measured for the present study, and so it is not possible to test this mechanism directly. We focused on dietary quality as opposed to nutritional status for four reasons. First, the intervention was not specifically designed to address child nutritional status. The animal husbandry training and goat donation aspects of the intervention may have direct relationships with animal source food consumption, but not necessarily nutritional status. Second, the short-term effects of intervention activities may be more visible in diets than in anthropometrics. Third, there are other key factors such as sanitation which may interfere with the diet-nutrition relationship. Further work would be needed to make connections between dietary quality and nutritional status in this setting. Lastly, dietary diversity was found to be associated with child nutritional status, independent of associations with income and socioeconomic status in a wide range of settings (Arimond and Ruel, 2004).