



Unintended effects of a targeted maternal and child nutrition intervention on household expenditures, labor income, and the nutritional status of non-targeted siblings in Ghana



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ABSTRACT

It is common for health and nutrition interventions to target specific household members and for evaluations of their effects to focus exclusively on those members. However, if a targeted intervention changes a household's utility maximization problem or influences decision-making, households might respond to the intervention in unintended ways with the potential to affect the wellbeing of non-targeted members. Using panel data from a randomized controlled nutrition trial in Ghana, we evaluate household behavioral responses to the provision of small-quantity lipid-based nutrient supplements (SQ-LNS) to mothers and their infants to prevent undernutrition. We find that targeted supplementation with SQ-LNS had a positive effect on household expenditures on food, including some nutrient-rich food groups, as well as on non-food goods and services. We also find a positive impact on labor income, particularly among fathers. We then explore intrahousehold spillover effects on the nutritional status of non-targeted young children in the household. We find evidence that the targeted provision of SQ-LNS led to higher height-for-age z-scores among non-targeted children in the LNS group compared to the non-LNS group, though only among those with relatively taller mothers, which is an indicator of a child's growth potential. These findings support existing evidence and suggest that unintended behavioral responses and spillover are a real possibility in the context of nutrition interventions targeting nutritionally-vulnerable household members. Thoughtfully considering this possibility in the design, analyses, and evaluation of targeted nutrition interventions may provide a more complete picture of overall effects.

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1. Introduction

Nutrition in the earliest stages in the life-cycle – from conception through a child's second birthday – shapes a child's growth trajectory and developmental potential and, as such, has long-term consequences for human capital acquisition and economic productivity in adulthood (Black et al., 2013; Grantham-McGregor et al., 2007; Hodddinott et al., 2013; Victora, de Onis, Hallal, Blössner, & Shrimpton, 2010; World Bank, 2006). This early, pivotal period in the life-cycle has therefore become the focus of

many maternal and child nutrition interventions providing, e.g., conditional cash, health and nutrition information, or supplementation to mothers and/or young children (Ainsworth & Ambel, 2010; Bhutta et al., 2013). Evaluations of the efficacy or effectiveness of these interventions logically center around estimates of their effects on the nutrition, health, and development of the targeted household member(s). But household behavior is not static, and if a targeted intervention introduces changes to a household's utility maximization problem in the form of new information or changes in constraints or relative prices, or if it influences the household decision-making process, the intervention may induce behavioral responses outside the scope of those intended. The potential implications of such behavioral responses include intrahousehold spillovers that may affect the wellbeing – either positively or negatively – of non-targeted household members.

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This study explores household behavioral responses to and intrahousehold spillover effects associated with the targeted provision of small-quantity lipid-based-nutrient-supplements (SQ-LNS), which are food-based home fortificants designed to enhance the diets of women and young children by providing a wide range of micronutrients along with some key macronutrients (Arimond et al., 2015). SQ-LNS were provided to mothers during pregnancy and the first six months postpartum and to their infants from 6 to 18 months of age as part of a randomized controlled trial in Ghana designed to test their efficacy vis-à-vis maternal multiple micronutrient capsules and iron-folic acid capsules. Using socioeconomic data collected during the randomized trial, we find a positive effect of targeted supplementation with SQ-LNS on *per capita* household expenditures on food and non-food goods and services. We then consider whether the intervention had an effect on the labor income of SQ-LNS households, which could have permitted higher expenditures. Although we find no difference in the labor income of the target mothers who were participating in the trial, we find evidence suggesting a positive impact on total household labor income *per capita* as well as on the labor income of the husbands/partners of target mothers.

Depending on intrahousehold resource allocation, higher household expenditures on food induced by the targeted intervention had the potential to influence the nutritional status of non-targeted household members. We use anthropometric data, which were collected at several time-points during the trial, on the youngest sibling¹ under age five to explore this potential spillover effect. While we find no overall effect of the targeted provision of SQ-LNS on the siblings' z-scores of height-for-age, weight-for-age, or BMI-for-age, we do find evidence of a positive effect on height-for-age z-scores among siblings with relatively tall mothers when the mother-infant pair received SQ-LNS.

Together, these findings contribute to a small but growing body of literature evaluating spillover effects of targeted maternal and child health and nutrition interventions in developing countries (Adhvaryu & Nyshadham, 2014; Fitzsimons, Malde, Mesnard, & Vera-Hernández, 2016; Kazianga, de Walque, & Alderman, 2014). The results presented in this study, together with the previous findings in the literature, underscore the value of assessing not only the effects of an intervention on targeted household members but also in collecting data to facilitate an assessment of how households respond to such interventions and whether those responses generate intrahousehold spillovers.

The remainder of the paper is organized as follows: we begin with background information on SQ-LNS and the randomized controlled trial. We also present a brief review of relevant literature to set our study within the context of previous work on intrahousehold spillovers. This is followed by a description of the data used in the analyses, our empirical strategy, and the results. Finally, we posit several mechanisms through which the behavioral responses may have been generated, present limitations of our findings, and make concluding remarks.

2. Background

Ready-to-use therapeutic foods (RUTF) are fortified, lipid-based food products that are currently widely used in the treatment of children with severe acute malnutrition (World Health Organization, World Food Programme, United Nations System Standing Committee on Nutrition, & United Nations Children's Fund, 2007). The success of these therapeutic products, which are energy-dense and consumed in large quantities over a rela-

tively short period of time for rehabilitative purposes, has spurred the development of similar products, collectively called small-quantity lipid-based nutrient supplements (SQ-LNS), to prevent undernutrition. Compared to the therapeutic products, SQ-LNS are administered at a much lower daily ration (typically 20 g/day, ~118 kcal/day) but with a higher concentration of micronutrients (Arimond et al., 2015; Dewey & Arimond, 2012). SQ-LNS typically contain vegetable oil, dried skimmed milk, peanut paste, sugar, and a vitamin-mineral mix, and because the micronutrients in SQ-LNS are embedded in a food base, the supplements also provide some macronutrients (fats, protein, and carbohydrates). As described next, the efficacy of SQ-LNS was recently evaluated in a randomized controlled trial in Ghana.

2.1. Description of the randomized trial

From December 2009 through March 2014, the International Lipid-Based Nutrient Supplement (iLiNS) Project² administered a targeted randomized controlled trial in Ghana to evaluate the efficacy of a duo of SQ-LNS products designed for maternal consumption during pregnancy and the first six months postpartum and for consumption in early childhood to prevent undernutrition. The trial was approved by the ethics committees of the University of California, Davis, the Ghana Health Service, and the University of Ghana Noguchi Memorial Institute for Medical Research and was registered at clinicaltrials.gov as NCT00970866. All study participants provided informed consent.

The catchment area for recruitment of pregnant women into the trial was situated along a busy commercial corridor in the Lower Manya Krobo and Yilo Krobo districts in the Eastern Region of Ghana. Because of its proximity to the Volta River and Lake Volta, fish is a component of the staple diet in the area, along with maize, cassava, and, to a lesser extent, leafy vegetables (Adu-Afarwuah et al., 2015). The communities along the corridor are linked by a robust public transportation system, so households have reliable access to the large, twice-weekly market and other smaller markets in the area. Rates of maternal and early childhood undernutrition in this region of Ghana are, in general, comparable to national rates. In 2011 among all children under age five in the Eastern Region, the average height-for-age z-score (HAZ) was -0.9 and 21.3% were stunted (HAZ < -2 SD) (Ghana Statistical Service, 2011a). The average weight-for-age z-score (WAZ) among this population was -0.7 in 2011, with 10% classified as underweight (WAZ < -2 SD). Approximately 46.2% of children 6–59 months old in the Eastern Region were anemic in 2011 (Ghana Statistical Service, 2011b), and the rate of anemia in women of childbearing age was 58.3% in 2008 (Ghana Statistical Service, 2009).

Recruitment and enrollment of pregnant women into the trial was done on a rolling basis from December 2009 to December 2011. Women attending antenatal clinics at one of the four main health facilities in the area were approached for potential participation in the trial³ and interested women were then screened to determine eligibility.⁴ Eligible and willing women ($n = 1320$) were

² For more information on the iLiNS Project, see: <http://ilins.org/>.

³ Based on this recruitment mechanism, the women enrolled in the trial were not a random sample of pregnant women in this area of Ghana, which limits the generalizability of our results. We discuss this issue further when we address the limitation of the study.

⁴ Eligibility requirements were (1) at least 18 years of age, (2) not more than 20 weeks of gestation (determined by dating ultrasound), (3) possession of an antenatal card issued by the Ghana Health Service, (4) complete preliminary antenatal examination, (5) HIV negative or unknown status, (6) no chronic diseases requiring frequent medical attention, (7) residence in the Manya Krobo or Yilo Krobo districts throughout the intervention, and (8) prepared to sign an informed consent and receive home visitors. Women with known peanut or milk allergies, women participating in concurrent trials, and women with severe illnesses warranting hospital referrals were also excluded from the study.

¹ "Sibling" refers to the older brother or sister closest in age to the target infant participating in the randomized trial.

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