

# Text Messaging and its Impacts on the Health and Education of the Poor: Evidence from a Field Experiment in Rural China

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**Summary.** — There is little evidence showing whether health information transmitted via text messages can change health and educational outcomes. We conducted a randomized field experiment involving 900 primary students in rural China to study whether a health education campaign conducted via text message could affect caregiver knowledge or student outcomes. When caregivers received both weekly health messages and monthly quiz questions (testing retention of the information conveyed in the weekly messages), caregiver knowledge improved and students experienced gains in both health and academic performance. When caregivers received weekly health messages only, there was no impact on caregiver knowledge or student outcomes.

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**Key words** — health education, text messaging, caregiver knowledge, student health, academic performance

## 1. INTRODUCTION

Despite China's achievement in poverty reduction in recent decades (Huang & Rozelle, 2008), millions of children in poor areas of rural China still suffer from undernutrition, a condition that can adversely affect their future development (Zhang *et al.*, 2013). Studies using government data have reported high anemia rates among children in rural areas in China (Chen *et al.*, 2005). Recent research by Luo *et al.* (2011), conducted among 12,768 students aged 8–12 years, shows that the prevalence of anemia across six provinces in rural China ranges from 25% to 51%. To the extent that these data are representative of anemia in China's poor provinces, this means that more than twenty million children in China's poor, rural areas are severely undernourished. Many studies have shown that anemia adversely affects the cognitive development and academic performance of children at school (Lozoff, Jimenez, Hagen, Mollen, & Wolf, 2000; Luo, Shi, Zhang, Liu, *et al.*, 2012). Anemic children are also more likely to have lower incomes (and lower quality of life) when they grow up (Bobonis, Miguel, & Puri-Sharma, 2006; Halterman, Kaczorowski, Aligne, Auinger, & Szilagyi, 2001).

Despite this high prevalence and the proven consequences of childhood anemia, the problem is often misunderstood and/or neglected by educators and parents (Luo *et al.*, 2011). Luo *et al.* (2010) demonstrate that over 90% of rural primary school principals—almost certainly among the most educated persons in China's rural communities—either had no knowledge of anemia or did not think anemia was a problem among their students. Back in students' homes (in rural villages), parents have also been reported to lack knowledge about anemia (Shi *et al.*, 2012). Learning about anemia (or being aware of it), absent formal health education, or in-hospital blood testing, is difficult, given the lack of specific symptoms, the difficulty of observing the micronutrient content of individual diets, and the lagged relationship between dietary change

and symptoms (Luo, Shi, Zhang, Zhang, *et al.*, 2012). It is therefore unsurprising that schools and households fail to take action to fight anemia.

Although there may be a role for the government to play in solving the problem, attempts to do so have run into implementation problems in the past. One example is to address anemia at school by improving school meals. In rural China, a large proportion of students eat at least some of their meals at school (Kim, Haines, Siega-Riz, & Popkin, 2003). Because school meals are mainly starch-based, with little meat, vegetables or fruit, iron deficiency anemia among students is common (FAO, 1999; Luo, Shi, Zhang, Liu, Rozelle, & Sharbono, 2009). In order to improve the nutritional content of student diets, in 2012 China's central government allocated 16 billion yuan (2.5 billion USD) to launch the Healthy Lunch Program, which is supposed to provide healthy school lunches to poor rural students (NBC, 2012). According to the plan, the government provides three RMB per student per day to fund a healthy lunch, which is supposed to contain sufficient meat, eggs, and milk to give each child a balanced meal. However, it has been reported that the meals provided by the schools are insufficient either in calories or in micronutrients (China Youth Daily, 2012). Our research team conducted a survey among 300 rural primary schools in three provinces in

\* We would like to thank the Ford Foundation and the Stanford University Global Underdevelopment Action Fund for their generous support of this project. We would also like to extend a thank you to Paul Cavey for his financial assistance and other kind support. We are appreciative of the careful and diligent research assistance provided by Rong Li, whose efforts proved essential in the initial design and launch stages of this project. Finally, we are especially grateful to Madhouse, a mobile advertising firm headquartered in Shanghai, for their invaluable help in providing technical and logistical support for all of the text messages sent in this project. Final revision accepted: July 15, 2014.

northwest China and found that only 26% of the schools regularly included meat, eggs, or milk in school meals (Sylvia, Luo, Zhang, Shi, Medina, & Rozelle, 2013).

Other studies in developing countries suggest that nutrition problems may also be attacked at home (Zlotkin, Christofides, Hyder, Schauer, Tondeur, & Sharieff, 2004). Families are likely to be more motivated than schools to improve child nutrition. Hence, in theory, health education that targets caregivers has the potential to increase health/nutrition knowledge and to instill healthy behaviors that can help improve children's nutritional intake (Black *et al.*, 2004; Rivera *et al.*, 2001).

If health education programs targeting caregivers could be shown to be effective, there would be considerable scope for such programs to help address China's anemia problem. Around 85% of the school-age children in rural China live at home with parents or grandparents (Luo *et al.*, 2009). Moreover, although rural households in Western China are still poor, most households have access to sufficient financial resources (from government subsidy programs, rising wages from off-farm income, and rising agricultural prices) to provide their child with a balanced diet. The primary obstacle therefore seems to be ignorance: studies show that many rural caregivers are unaware that feeding their child a more nutritious diet would have a positive effect on future educational attainment and other outcomes (Chen & Li, 2000; Du, Mroz, Zhai, & Popkin, 2004; Popkin, Conde, Hou, & Monteiro, 2006).

Unfortunately, previous attempts to persuade parents in rural China to address anemia have been unsuccessful. Luo, Shi, Zhang, Zhang, *et al.* (2012) field-tested three different approaches to conducting health education campaigns in rural primary schools in China. In one experiment, the authors sent a letter home to parents explaining anemia, revealing each child's anemia status, and outlining anemia prevention and treatment strategies. In a second experiment, the research team invited parents to a face-to-face meeting at their child's school to deliver essentially the same information as was contained in the letter home, this time incorporating the use of multimedia materials such as colorful pamphlets and an educational video. In a third experiment, multiple face-to-face meetings were held at the school—one meeting per academic semester. Unfortunately, across all three experiments, there was no impact of the educational campaigns on student anemia status.

In light of the failure of more traditional educational/training campaigns, the use of mobile technology to educate households becomes an attractive option. Over the past decade, mobile technology has been promoted as a potentially powerful health promotion tool in developing countries (Cole-Lewis & Kershaw, 2010). Mobile technology is now more widely available than ever before; up to two-thirds of the world's population own mobile phones and use them in daily communication (Union IT, 2010). In China, it has also been shown that a large percentage of households (around 90%) have mobile phones, even in rural areas (China Internet Network Information Center, 2012). Compared with traditional ways of delivering information, text messaging—defined as sending an electronic message over cellular phone networks—has been promoted as being both more accessible and more efficient (Fjeldsoe, Marshall, & Miller, 2009). It is already being used to address a myriad of health issues in the developing world, ranging from malaria (Zurovac, Sudoi, Akhwale, Ndiritu, Harner, & Rowe, 2011), to HIV (Pop-Eleches, Thirumurthy, Habyarimana, Zivin, Goldstein, & de Walque, 2011), to tuberculosis (Denkinger, Grenier, Stratis, Akkihal, Pant-Pai, & Pai, 2013).

Despite the recent popularity of health interventions using text messaging, there is little rigorous evidence showing whether health information transmitted via text messages is enough to change health behaviors and outcomes (Cole-Lewis & Kershaw, 2010). Of the handful of studies that aim to provide evidence on the effectiveness of text messaging, many of them fail to include a control group (Fjeldsoe *et al.*, 2009). Even among the more rigorous evaluations, the intervention is often bundled with other inputs, such as web-based information, assistance hotlines, office visits, or free/subsidized medicine (Franklin, Waller, Pagliari, & Greene, 2006; Hurling *et al.*, 2007; Ostojic, Cvorisec, Ostojic, Reznikoff, Stipic-Markovic, & Tujman, 2005; Rodgers *et al.*, 2005). Only a few studies have attempted to isolate the impact of text messaging on health behavior or other outcomes (Free *et al.*, 2013). Almost all of the existing evaluations have been “reminder” studies that used text messages as reminders for disease control or health management. For example, text messages were sent as reminders to regulate weight (Haapala, Barengo, Biggs, Surakka, & Manninen, 2009), to take insulin to manage diabetes (Franklin *et al.*, 2006), to wear condoms (Delamere *et al.*, 2006) or to stick to an exercise plan (Prestwich, Perugini, & Hurling, 2009). To our knowledge, no rigorous evaluation has ever attempted to investigate the impact of a health education campaign that uses text messaging on the health and education of project participants (especially when the participants are known to have zero or minimal health/nutrition knowledge).

The overall goal of this study is to test whether a health education campaign that uses text messaging to transmit information is effective at raising parental awareness and understanding of child nutrition, promoting child health, and improving children's educational outcomes. To meet this overall goal, we have four specific objectives. First, we report on the ability of the text messages to reach the caregivers of children in poor rural areas. Second, we conduct econometric analyses to examine the impacts of two different text messaging strategies on a set of health and educational outcomes, including parental health/nutrition knowledge, student hemoglobin levels (an indicator of anemia status), overall child health, and children's in-school behavior and standardized math test scores. Third, in order to better understand *how* text messaging may impact health and educational outcomes, we conduct econometric analyses to examine whether text messaging has any impact on household purchases of food and/or nutritional supplements. Finally, we test the heterogeneous effects of text messaging by type of message recipient in order to answer the question of whether the impact of the text messaging program varies if the child's mother receives the messages versus others in the same household.

#### (a) *Text messaging in health education*

In theory, health campaigns that use text messaging have a number of advantages over traditional campaigns. Text messaging makes information delivery convenient and efficient (Fjeldsoe *et al.*, 2009). Messages can be accessed wherever the recipient is located and the messages can be read whenever it is personally convenient to the recipient (Lim, Hocking, Hellard, & Aitken, 2008). Messages can be easily repeated to reinforce the information (Fry & Neff, 2009). Repetition of the information can also act indirectly as a reminder for behavioral change (Malow, Kershaw, Sipsma, Rosenberg, & Dévieux, 2007).

Another advantage of health campaigns that use text messaging is that mobile technologies allow for more

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