



## Poor vision among China's rural primary school students: Prevalence, correlates and consequences



Hongmei YI <sup>a,\*</sup>, Linxiu ZHANG <sup>a</sup>, Xiaochen MA <sup>b</sup>, Nathan CONGDON <sup>c,d</sup>, Yaojiang SHI <sup>e</sup>, Xiaopeng PANG <sup>f</sup>, Junxia ZENG <sup>f</sup>, Lei WANG <sup>g</sup>, Matthew BOSWELL <sup>h</sup>, Scott ROZELLE <sup>h</sup>

<sup>a</sup> Center for Chinese Agricultural Policy, Institute of Geographical Sciences and Natural Resources Research, Chinese Academy of Sciences, Beijing 100101, China

<sup>b</sup> Department of Agricultural and Resource Economics, University of CA, Davis 95616, USA

<sup>c</sup> State Key Laboratory and Division of Preventive Ophthalmology, Zhongshan Ophthalmic Center, Sun Yat-sen University, Guangzhou 510275, China

<sup>d</sup> ORBIS International, NY 10018, USA

<sup>e</sup> School of Economic Management, Xibei University, Xi'an 710127, China

<sup>f</sup> School of Agricultural Economics and Rural Development, Renmin University of China, Beijing 100872, China

<sup>g</sup> International Business School, Shaanxi Normal University, Xi'an 710062, China

<sup>h</sup> Stanford University, Stanford 94305, USA

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### ABSTRACT

Using a survey of 19,977 children in two provinces, this paper explores the prevalence, correlates and potential consequences of poor vision among children in China's vast but understudied rural areas. We find that 24% of sample students suffer from reduced uncorrected visual acuity in either eye and 16% in both eyes. Poor vision is significantly correlated with individual, parental and family characteristics, with modest magnitudes for all correlates but home province and grade level. The results also suggest a possible adverse impact of poor vision on academic performance and mental health, particularly among students with severe poor vision.

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### 1. Introduction

A series of World Health Organization-supported studies suggest that approximately 10 to 15% of school-aged children in the developing world have common vision problems (He, Huang, Zheng, Huang, & Ellwein, 2007; Maul, Barroso, Munoz, Sperduto, & Ellwein, 2000; Murthy et al., 2002). Research demonstrates that an even higher share of children (up to 20%) has vision problems (Pi et al., 2012). In most settings, about 90% of these vision problems are caused by refractive error (largely myopia, but also hyperopia and astigmatism). The remaining 10% are caused by amblyopia, pediatric cataract and other less common vision disorders.

\* Corresponding author at: No. Jia 11, Datun Road, Chaoyang, Beijing 100101, China. Tel.: +86 10 64888985; fax: +86 10 64856533.

E-mail addresses: yihm.ccap@igsnr.ac.cn (H. Yi), lxzhang.ccap@igsnr.ac.cn (L. Zhang), mxc4068@gmail.com (X. Ma), ncongdon1@gmail.com (N. Congdon), syj8882002@yahoo.com.cn (Y. Shi), pangxp@ruc.edu.cn (X. Pang), zengjunxia@ruc.edu.cn (J. Zeng), wangleiml@snnu.edu.cn (L. Wang), kefka@stanford.edu (M. Boswell), rozelle@stanford.edu (S. Rozelle).

In most cases children's vision problems can be easily detected by simple vision tests (such as visual acuity screenings) and corrected by timely and proper fitting of quality eyeglasses (World Health Organization, 2006). Unfortunately, studies in a variety of developing countries document that 35 to 85% of individuals with refractive error do not have eyeglasses, and that many of them have never been screened or examined (Bourne, Dineen, Huq, Ali, & Johnson, 2004; Fotouhi, Hashemi, Raissi, & Mohammad, 2006; Ramke, Du Toit, Palagyi, Brian, & Naduvilath, 2007).

In rural areas of China, the prevalence of children with vision problems appears to be higher than in other countries. One study has shown that nearly half of all vision problems among children in the world occur in China (Resnikoff, Pascolini, Mariotti, & Pokharel, 2008). In a study of junior high school children in Guangdong Province, He et al. (2007) showed that 37% of 13-year-old children were myopic. Among 17-year-olds, this rate increased to 54%. In another study conducted in urban Guangdong, He et al. (2004) demonstrated that nearly half of children between the ages of five and 15 had refractive error. In 2004 Glewee, Park, and Zhao (2011) conducted a study in one of the poorest areas of China—two ethnically Tibetan populated counties in Gansu Province—and found that 13% of fourth to sixth grade children had poor vision.

Despite the relative ease of correcting the large majority of these vision problems, a significant share of children in China's rural areas who would benefit from refractive correction (by way of properly prescribed eyeglasses) does not appear to be getting care (Congdon et al., 2008). In their studies in rural Guangdong researchers from Zhongshan Ophthalmic Center, Sun Yat-sen University found that, of the junior high school students that were myopic, only 40% were wearing glasses (He et al., 2007). In another study in rural Guangdong, Li et al. (2010) found that two thirds of children who were informed of their need to wear glasses on the basis of a high quality screening examination failed to obtain them. Glewee et al. (2011) showed that for every 100 children that were myopic, less than three of them were wearing glasses.

While consistently finding uncorrected vision to be a problem in China, research to date has tended to rely upon small regional samples and data that are either dated or whose sampling methodology is not fully made clear. For example, the studies of He et al. (2004, 2007), while using high quality optometric approaches, were carried out in a single area in one of China's fastest growing coastal provinces. The study of Li et al. (2010) was also located in a relatively developed area of China. The work by Glewee et al. (2011), while looking at one of China's poorest areas, is somewhat dated, using data from 2004. China's economy has more than doubled in size since that time and incomes—even in poor rural areas—have risen by nearly 100%, on average (China National Bureau of Statistics, 2012). The exact refraction protocol used in the Glewee et al. (2011) study is also not made clear. The most recent work focused on China's poor western region, Pi et al. (2012), only relies on the data collected from one district of Chongqing municipality.

If up-to-date empirical evidence from large samples on the prevalence of vision problems in rural China is scarce, there is even less information on *who* has vision problems. There are several studies that report on the correlates of vision problems for children (Congdon et al., 2008; Pi et al., 2012). These studies, however, mostly examine only the correlates of gender and age. Some document myopia-related behavior factors (such as reading, doing homework, and using a computer) without controlling for important environmental factors such as parental characteristics and family background. Importantly studies performed in China have not fully addressed the potential impacts of living environment (living at home versus boarding at school—boarding is a very common phenomenon in rural China) and family circumstances (such as parental education and migration status as well as family wealth) on children's vision. If research could shed more light on those characteristics correlated with poor vision, policy makers might be able to tailor their policies to most efficiently address poor vision among young people in rural areas.

One reason for the relative inattention to the prevalence and correlates of vision problems in China may be the fact that there is not much evidence available on the adverse consequences of poor vision among children. It is well known that if vision problems in adults are left uncorrected, there can be serious consequences. A WHO study estimates that the potential global lost productivity from uncorrected refractive error may be more than one hundred billion dollars annually (Smith, Frick, Holden, Fricke, & Naidoo, 2009). There are only a handful of studies that examine the potential negative impacts of children's vision problems (Congdon et al., 2008; Estes et al., 2007; Nilsson, 2007). For example, a study of three to 16 year old children in the UK shows that visual impairment has negative effects on quality of life (Chadha & Subramanian, 2011). Glewee et al. (2011) document that the grades of students suffer when they need glasses but do not have them.

The goal of this paper is to explore the prevalence, correlates and potential consequences of poor vision among elementary school children in China's rural areas. To meet this goal, we have three specific objectives. First, we document the prevalence of children's vision problems. Second, we identify their correlates. Are certain types of children more prone to poor vision or is it a problem that arises indiscriminately? Finally, we seek to document if there are any adverse academic consequences associated with poor vision. A strength of the current analysis is that we examine the association between vision and academic performance as well as mental health in the context of a large study (both in terms of sample size and area covered). Unfortunately, however, due to the cross sectional nature of the data, we will only be able to establish correlations and not causation.

To achieve these objectives, the rest of the paper is organized as follows. In Section 2 we describe the data. In Section 3 we provide estimates for the prevalence of vision problems in our sample of nearly 20,000 elementary children from more than 250 schools in northwest China. In Section 4 we study the correlates of poor vision problems. In Section 5 we examine the potential consequences of poor vision problems on student academic performance (as measured by a standardized test of math). In Section 6 we examine the potential impact of poor vision on mental health (measured by MHT test). Section 7 summarizes and concludes.

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