



Malnutrition in China's Rural Boarding Schools:

The Case of Primary Schools in Shaanxi Province

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Childhood nutrition is on the forefront of international development, with nearly half of the Millennium Development Goals (MDGs) directly related to child health or nutritional status. According to international literature, investment in the human capital of children, including improving nutrition, is not only likely to improve current welfare, but also to enhance opportunities over the life cycles of individuals. Yet worldwide, recent estimates indicate that 162 million children and almost a billion people of all ages are malnourished. And in fact, China's own statistics show a large number of children to be underweight and stunted.

The current boarding school system has its roots in China's recent population crash due to the One Child Policy. In response to falling enrollment, the Merger Program began to close down smaller schools in more remote villages and merge them with larger "central" schools. Nationwide, the number of primary schools in rural China fell by nearly 25%, from 416,000 in 2001 to 317,000 in 2005 (National Bureau of Statistics, 2006), and the number of boarding students increased rapidly. Moreover, the average age of these students has fallen, meaning that **more than 30 million boarding students are living and eating away from home.**





Because of this trend, home is now not the best place to address malnutrition among school-aged children. Since 2004, the central government has allocated about 10 billion yuan for construction of boarding school facilities. Surprisingly, however, there is little literature published evaluating these government programs and the effect of recent changes on children and childhood nutrition.

Despite the lack of literature, there are reasons to believe that the rise of primary boarding schools has not been contributing to the elimination of malnutrition, but instead exacerbating the problem. In most dormitory rooms in boarding schools, students bring their own food from home to eat the entire week (or fortnight). Bags of steamed buns, boxes of biscuits and canisters of pickled vegetables are stored under tightly packed bunk beds at the beginning of the week. By the end of the week the buns are stale, hard and sometimes moldy. Not to mention, these foods lack protein and many other essential vitamins and micronutrients. Not surprisingly, such poor dietary habits contribute to widespread malnourishment.

There are few studies about the health and nutrition status of boarding students in primary schools, even in the international literature. The overall goal of this brief is to provide a detailed, empirically based description of boarding schools in China and the health and nutritional status of the students that live in them. To achieve this goal we have three specific objectives:

- 1). Document the nature of boarding schools, especially the student dormitory and canteen facilities and services.
- 2). Compare differences between the food and nutrition intake of boarding and non-boarding students attending the schools.
- 3). Identify differences in health and development between the boarding and non-boarding students.

Because of the cross-sectional nature of our data, we are unable to infer causality from our findings. However, **this brief's detailed description of the health and nutrition status of boarding school students should still be valuable information to those interested in designing strategies for reducing the level of malnutrition in China.**



The Data

In this brief, we use two sets of data on boarding schools and students in Shaanxi Province, both of which we collected ourselves since we could not find any recent systematic information on rural primary schools (especially boarding schools) that was publically available. The first data set includes school-level information on 144 primary schools that was collected in October 2007. Of the 144 schools that we surveyed, 65 of them were boarding schools. Henceforth, we call this survey the Shaanxi Primary School Canvas Survey (or the Canvas Survey, for short).

While the Canvas Survey was conducted across a large set of schools and relied mostly on information provided by the principal, we also collected a more intensive set of data based on information provided by the students themselves—especially those living in boarding facilities. We call this the Shaanxi Intensive Boarding School Student Survey (or the Boarding Student Survey). In total the sample of students included 2014 observations (about 200 students per school). The Boarding Student Survey included three main sections. In the first section, the enumerators asked the students to provide basic information about their family and the characteristics of their parents. The second section focuses on the food consumption of students and includes questions on nutrition and energy intake from different sources. The third section collected basic anthropomorphic data on each of the students in the survey.

Rise of Boarding Schools in Rural China

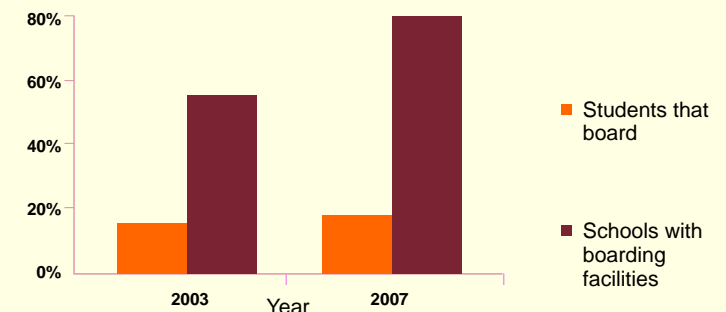


Figure 1: Both the number of schools that have boarding facilities and the number of students that choose to board are on the rise in rural China.

Our data show that the share of boarders in primary schools has increased from 13% in 2003 to 15% in 2007. Between 2003 and 2007, the share of schools with boarding facilities rose from 45% to 65% (refer to Figure 1). And in all 65 sample boarding schools the share of students residing in boarding schools has reached more than 41%. More than two of five students live and eat most of their meals in school.



Student Dormitory and Canteen Facilities and Services

The most prominent results from our data show how rural China's boarding school facilities are poor and frequently fall far short of meeting the needs of boarding students. Dormitory space is far from adequate and frequently detrimental to the health of boarding students. 23% of dorms do not have towel racks on which students can hang wet towels and only 62% of boarding schools have clothesline facilities that can be used to air out and clean bedding. **Although the winters in all parts of Shaanxi are cold, with average nighttime temperature in December and January being minus 10 degrees Celcius, 39% of dormitories do not have any heating equipment.** And when they do, heaters are frequently dangerous to students' health. More than 50% of the heating equipment in boarding schools consists of coal stoves (which can let off dangerous monoxide gases during the night). In fact, in all of the dormitories, only 9% have heating systems that meet basic safety regulations. During the summer months, only 6% of dorms have any fan units for ventilation.



China's rural boarding school dormitories are perhaps most under-equipped in the area of sanitation. Only 60% have toilet facilities inside the dormitory facility and only 49% of restrooms have light at night. Possibly as a result of these missing facilities, there is a high incidence of bedwetting in dormitories, a behavior that can feel shameful for the bedwetter and uncomfortable and unhealthy for his/her dorm-mates (especially, the bed-mates). Almost no boarding schools have washrooms or bathing facilities in the dorm. Therefore, even if boarding school students were trained to practice basic sanitation, it is often difficult or impossible to do so.

Finally, the safety of students is at risk. Only 28% of boarding schools have fire extinguishers. Even fewer, 6%, have fire hydrant facilities. And, related to the inadequate heating systems, another danger for boarding students comes from the complete absence of carbon monoxide and smoke detectors. None (zero) of the boarding schools with dormitories are fitted with these alarm



systems, even those that use coal stoves for heating. In 2008 the seriousness of this absence was born out when 11 students in a dormitory in northern Shaanxi died from carbon monoxide poisoning.

In total, of the 144 sample schools, 70 have canteens. While most boarding schools have canteens (62 of 65), there are three of them (about 5% of the total) that have no facilities to provide any dining services. Of the three boarding schools without canteens, two of them ask students to find local farm households to provide meals. In one boarding school, students have to rely completely on the food provisions they bring from home. Only one third of student canteens have tables and chairs, but many do not have enough to seat all the students, and as a consequence, students often end up eating outside in dirty and inconvenient settings. **Almost no schools have ultraviolet disinfection equipment, refrigeration or even hot water in many cases for washing dishes.** Most principals told us the problem was less the cost of the equipment than it was the cost of operating them. Schools are given limited budgets to pay for electricity and other energy sources.

Only about 79% of the student canteens provide meals, and only 27% of these served foods with any protein at all. On average, only 1.8 days per week can students supplement their diet by buying meat, fish or eggs. In the case of all 70 school canteens, none serve fresh fruit. In fact, 15% of canteens did not even provide boiled water as drinking water for students (refer to Figure 2).

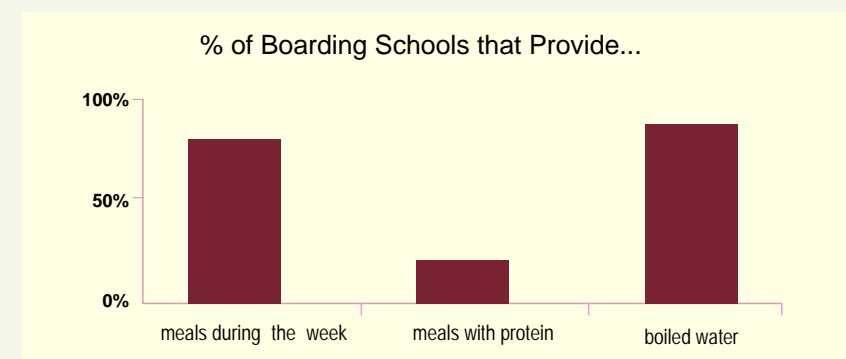


Figure 2: Canteen facilities are far from adequate at elementary schools. Some schools do not provide basic amenities such as boiled water to drink. Basic nutrition is often lacking and not even boiled water is always available.

The source of the nutritional problems in boarding schools, according to our survey, may extend beyond the lack of financial resources available to the schools. The survey found that knowledge of basic nutrition and a familiarity with fundamental principles of management of the canteen cooking staff is very poor. **Only 24% of the canteen managers could name the basic components of the nutrition pyramid. In more than 20% of the canteens, despite national regulations, there had never been a sanitation certificate issued.**



Nutritional Intake of Boarding Students vs. Non-Boarding Students

The Boarding Student Survey data indicate that protein intake of boarders consistently falls short of basic nutritional requirements. Students' main source of protein is tofu. Unfortunately nutrition literature has shown that the absorbable proteins in soy products are only available to the human body when eaten with sufficient amounts of micronutrients (which in many cases, the students are almost certainly not getting). **57% of boarding school students self-report that they sometimes or often feel hungry in class; 53% of students report feeling hungry at night to the point that it keeps them awake** (refer to Figure 3). Without knowledge of protein intake before entering boarding school (or without knowledge of their intake in the previous years), it is difficult to know if boarding schools are contributing to China's nutrition problem. However, **what is clear is that the investments into boarding and canteen facilities and provision of dining services have not been adequate in preventing malnutrition among boarding school students in rural China so far.**

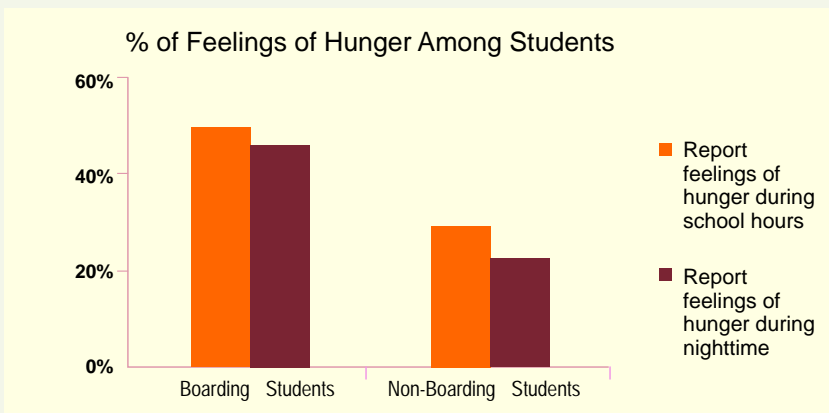
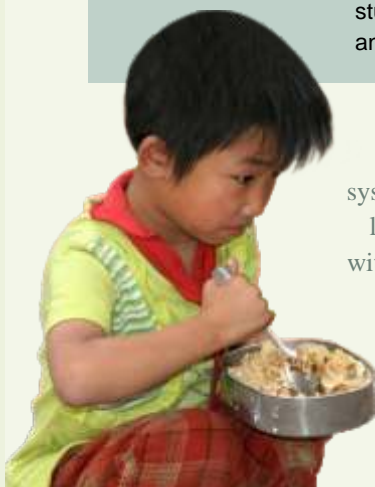


Figure 3: Many boarding and some non-boarding students report “feeling hungry” throughout the day and as they are going to sleep.



The problem isn't only in the boarding school system though, but rather is part of a larger trend of a lack of education and resources to provide students with a healthy lifestyle. **An analysis of the nutrition intake of non-boarding students (comparison group) shows some similar problems.** Parents in these areas are also not providing their children with a fully balanced diet, meaning the problem extends beyond the dormitory.

Health and Development of Boarding versus Non-Boarding Students

The basic principle of anthropometry is that prolonged or severe nutrient depletion eventually leads to retardation of linear (skeletal) growth in children. A comparison of height-for-age of our sample (boarding and non-boarding) students with that of a reference group of children and adolescents worldwide suggests nutrient depletion may be at work in rural China. According to our survey data, most of the students in sample schools (both boarding students and non-boarding students) are under the median of WHO reference; many sample students fall below the line that is drawn two standard deviations below the median, which is commonly considered as being stunted (or malnourished). The survey data shows that about 15% of male students in our sample schools are stunted (or suffering from malnutrition) according to the height for age Z-score. A full 85% are below their respective WHO median. According to our data, 86% of female students in sample schools are below the median height for the same age and sex in the WHO reference population. In total 16% of female students in the sample schools are stunted. (Figure 4)

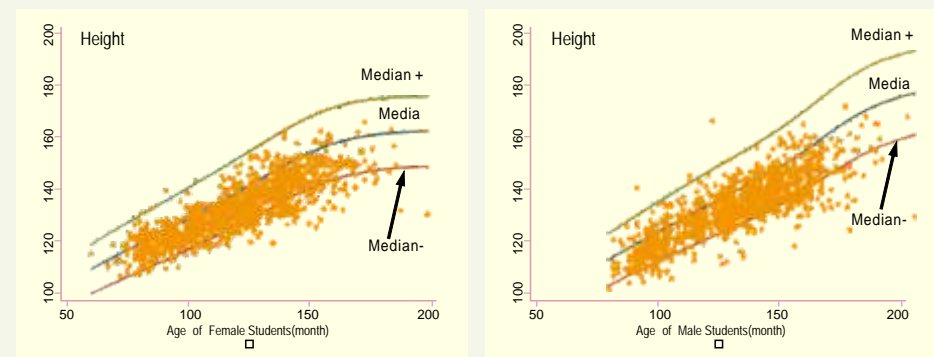


Figure 4: Stunting rates differed between female and male students at boarding schools. 15% of female students (left) and 16% of male students (right) are so far below the WHO reference line of height-for-age that they must be classified as stunted.

One important (albeit difficult to interpret) characteristic of our findings is that the rate of stunting of our sample students becomes worse for those in the older cohorts. In fact, nearly one quarter (24%) of female students above the age of 125 months are stunted. The data demonstrate that boarding students are much

worse than that of non-boarding students. Fully 23% of all boarding students (in grades one to five) are stunted. The rate of stunting of non-boarding students is much lower (11%). Interestingly, the rate of stunting grows by grade for boarding (from grade one to grade five) but not for non-boarding students. It also is greater in female students than male students as well as higher in students in grade four and five than those in grades one and two.

The estimated multivariate relationship between health and boarding status is similar to the finding of the descriptive analysis.

Conclusions

First, and perhaps above all, it does appear as if malnutrition (or at least the consequences of earlier malnutrition) is present in the population of boarding students at much higher rates than in the population of non-boarding students in our sample. We do not know from this analysis if their residence in the boarding schools is leading to more severe malnutrition, but at the very least, we know that the current set of initiatives for boarding schools is not eliminating the problem.

What on the surface seems to be a problem can also be viewed as an opportunity for positive change. Boarding schools may have poor facilities, but they also centralize the most at risk students and put their wellbeing in the hands of the government. If policymakers are serious about reducing malnutrition, constructive and well-thought-out reforms to boarding school living conditions may not only improve the lives of students, but also serve as an important investment in China's future workforce, while setting the foundation for a sustainable education and lifestyle model.



For more information about the Rural Education Action Project's work in the areas of Boarding Schools and Nutrition and Education, and to learn about our many other projects to address rural education problems, please visit:

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