



## An Invisible Epidemic:

Anemia in Rural China

REAP Brief #105



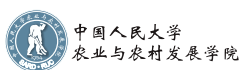
<http://reap.stanford.edu>

[www.reapchina.org](http://www.reapchina.org)

### Core Members



### Affiliates



FORD FOUNDATION





## Introduction to Anemia

Anemia caused by iron deficiency is a debilitating health condition that affects hundreds of millions of people worldwide. Children in developing countries are especially at risk. According to UNICEF, anemia stunts the cognitive and physical development of 40 to 60% of young children in the developing world.

The leading cause of anemia is lack of dietary iron caused by poor nutrition. Without iron, blood cells cannot carry sufficient oxygen to essential organs, most importantly, to the brain. Thus iron deficiency anemia is associated with poor cognitive, behavioral and physical development, for example anemic children can lag behind their healthy classmates by as much as 5 to 7 I.Q. points. However, even after iron status is restored, these cognitive impairments are often irreversible and afflicted children can never catch up.

If one reads the literature closely, there are hints that iron-deficiency (or anemia) in China is still a widespread problem, especially in poor rural areas. The Rural Education Action Project





has previously documented the disparity in urban and rural education outcomes in China. The question is:

**Are rural children falling behind their urban counterparts in education because they are negatively impacted by anemia?**

Despite the important implications for educational performance, there are few empirically based studies on anemia in China. Most people do not know the negative impacts of anemia. Why is this?

Anemia is often called the “invisible epidemic,” because the symptoms of anemia are subtle and hard to detect. Iron-deficient children tend to be pale, weak, have reduced appetite, tire easily, fall ill more easily, and fail to grow normally. Unfortunately, anemia is often overlooked because most rural Chinese simply do not know what anemia is.

To further understand anemia in rural China, the Rural Education Action Project surveyed over 4000 fourth grade students. These students were chosen from 66 randomly chosen elementary schools in 8 of the poorest counties in Shaanxi Province, a northwestern region. The goals of the study were to:

- 1). Assess the seriousness of iron-deficiency and measure the rate of anemia.
- 2). Understand what kind of children have anemia and which ones do not.
- 3). Measure the effects of supporting better nutrition such as providing multivitamins and information.



## Our Study Design

In order to address these issues, REAP designed the following in-the-field Cluster-Randomized Control Trial:

- 1). In 24 schools, all fourth grade students were given one multi-vitamin with iron (5 Mg) per day, including weekends;
- 2). In 12 schools, parents were sent a letter informing them of their child’s iron status and of things they could do at home to make sure their child received proper nutrition;
- 3). In 30 control schools there was no intervention.



## Timeline of the Randomized Control Trial and the Evaluation

**In early November**, we conducted a baseline survey. Nursing teams assessed each student’s hemoglobin level, height and weight. Research teams from REAP administered math and psychological tests and collected student grades. During interviews with principals, most believed very few of their students were anemic. Many had never even heard of anemia before! Later we discovered that contrary to their claims, a large share of the students in our sample schools were anemic (or had dangerously low hemoglobin counts). Anemia is truly invisible.

**Between mid-November and the following May**, we conducted the two interventions. For the Vitamin Treatment schools, bulk quantities of vitamins (21金维他) were purchased and distributed. REAP also provided disposable cups and equipment to boil clean drinking water. Homeroom teachers in each school were





trained to give each student one multi-vitamin tablet per day (and an extra two on Friday for the weekends). The goal was to ensure that students were receiving sufficient micronutrients and iron supplements.

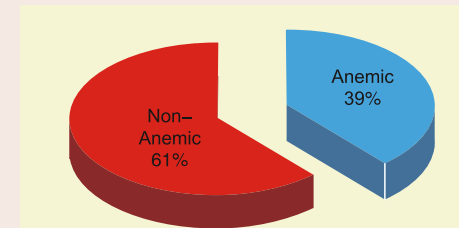
In Information Treatment schools, the goal was to increase understanding of anemia and nutrition among parents in rural areas. We wanted to know whether parents would take action to change their child's dietary habits if they knew their child was anemic. The letter that was given to each child's parents stated their child's anemia status. It also explained the common causes of anemia, the potential risks of anemia and how to prevent anemia. Additionally, the letter advised parents to take their child to a doctor and recommended that they provide their child with a balanced diet for children, one that included green vegetables, meat and fruit.

**In June 2009**, the final evaluation survey was conducted. This was a repeat of the baseline survey, with the same hemoglobin finger-prick blood sample test and similar psychological and standardized tests.

## Anemia in Shaanxi Province

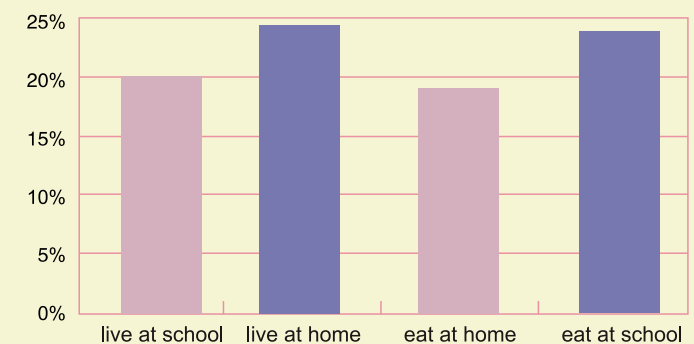
From the baseline, REAP demonstrated that anemia is present in epidemic proportions and confirmed the link between nutrition and rural educational performances. Our result shows that 39% of students in rural Shaanxi elementary schools were anemic! (Figure 1)

This means that in Shaanxi Province's poor county elementary schools, nearly 4 out of every 10 students are anemic. If this study is representative across poor areas of China, there are approximately 30 million anemic children in these areas.



**Figure 1.** Anemia in Rural China Elementary Schools

Which children are the most susceptible to anemia? Based on our baseline study, school environment is an important factor. Boarding students living away from their parents and students who eat lunch in school cafeterias are more likely to be anemic (Figure 2). Anemic children more often have the least educated parents. Many are from fractured homes or are children of single parents.



**Figure 2.** Anemia Rates for Different Groups of Students



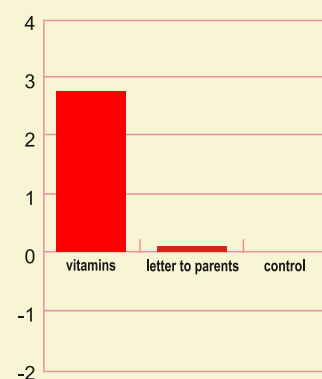
A recent report by the provincial Shaanxi Center for Disease Control concur with these numbers, and the Chinese Ministry of Health reported in 2002 that 1 in 4 children in rural areas are anemic.

What are the consequences of iron-deficiency? When we gave students standardized math tests and examined their math and Chinese language grades, we found that anemic kids scored significantly lower. Anemic students were shorter and more likely to have stunted growth as well.

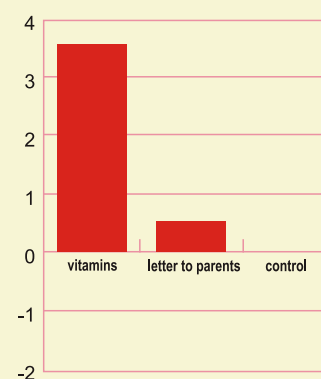
In the intervention treatment schools, the vitamin intervention was the most effective. When compared to students in the control schools, anemia rates in the vitamin schools, anemia rates in the vitamin schools fell and test scores rose (Figure 3). 65% of the anemic students increased their iron levels, and many students became non-anemic. Relative to the control schools, **June math test scores improved significantly for those who were severely anemic in November.**

However, there was little effect on anemia rates of children whose parents received letters on their children's anemia status. Anemia rates in information schools remained the same as those in control schools. This suggests that few parents took any action even after knowing that their children had anemia.

**Panel A.** Effect of Interventions on Hemoglobin Levels (mg/L)



**Panel B.** Effect of Interventions on Math Test Scores (in points, with max. testscore=100)



**Figure 3.** Effects of Interventions Among the Most Anemic Students

**Note:** All effects of the treatment interventions measured as differences between baseline and evaluation surveys relative to the control schools. The change in the control school is normalized to zero for ease of interpretation.

The results from the information treatment schools were puzzling-- why wouldn't parents take action if they knew their children were sick? In order to answer this question, we visited Shaanxi Province in July 2009 to conduct a series of post-evaluation interviews to understand why the letters were ineffective.

We discovered that few parents actively tried to change their children's diets. Some parents did not recall receiving the letter or had entirely forgotten about its contents. A number of parents were either illiterate or did not completely understand the letter. Still others lacked the financial means to change their family's diet on a regular basis. Anemia is truly a silent and invisible disease. As one mother stated in a matter-of-fact voice, "My child did not look sick, so I did not do anything."

## Our Next Steps

The issues of nutrition and health among children in rural China will significantly impact the future. These are obstacles to education in China, especially in poor areas that are already lagging behind. Reducing anemia will have numerous short-term and long-term health, education and social benefits.

More research is needed as there are still many pressing questions. Are there any other sources of anemia? Do intestinal worms cause anemia? How does anemia impact a child's self-esteem, psychological health and social behavior? What information do parents need before they take initiative to reduce their child's anemia? What types of interventions are most effective and sustainable in reducing anemia rates? How can information training be more effective for rural families and educators?

Beginning in fall of 2009, Year 2 of the Rural Education Action Project's nutrition study will seek to answer these questions and continue the search for solutions to the anemia problem in rural China. Stay tuned for the next phase of our research.

For a series of videos that can take you into the field with the students, their teachers and parents, see our website:

<http://www.reapchina.org> or <http://reap.stanford.edu>

*Contact us if you want to help ... REAP is always looking for volunteers and donors. We will only be able to make progress in the battle against China's Invisible Epidemic if we all help.*

#### **Special Acknowledgement:**

REAP gives special thanks to Eric Hemel and Barbara Morgen, whose generous support and thoughtful guidance was instrumental in launching this project.

*This brief was produced in collaboration between Elaine Yu, Tayler Cox, Max Kleiman-Weiner, and Michelle Lee.*



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

<http://reap.stanford.edu>  
[www.reapchina.org](http://www.reapchina.org)