



what is the real nutritional status of pregnant women in India?

This Research Brief summarizes and presents policy recommendations based on research in “**Prepregnancy body mass and weight gain during pregnancy in India and sub-Saharan Africa**,” a research paper by Diane Coffey that was published in PNAS. Read the full paper online at riceinstitute.org.

Because India, home to one-fifth of all births – has no monitoring system for maternal health, basic facts about maternal nutrition are unknown. Using econometric techniques and nationally representative survey data, this research estimates of prepregnancy body mass and weight gain during pregnancy. It finds that maternal nutrition in India is much worse than in sub-Saharan Africa.

key findings:

- the nutrition of women of reproductive age is an overestimate for the nutrition of pregnant women in India: it’s actually worse than previously understood
- the average pregnant woman in India much worse off than her counterpart in sub-Saharan Africa: Indian women *end* pregnancy weighing even less, on average, than women in sub-Saharan Africa do when they *begin* pregnancy

action step:

- a national monitoring system to track women throughout pregnancy would allow policy makers to see how maternal health changes over time, and to see whether programs are having a positive impact on health before and during pregnancy

background

why is maternal health so important?

India has one of the highest rates of childhood malnutrition in the world. In India, poor maternal health and nutrition are important causes of child malnutrition, which leads to poor adult health, poor cognition, and poor economic productivity.

Despite the importance of maternal health for population health, and despite the fact that one-fifth of all births worldwide occur in India, India has no national system to monitor women's health. This means that there is no regularly collected data to assess average prepregnancy body mass, the fraction of women who are underweight at the beginning of pregnancy, and average weight gained during pregnancy. **These are important indicators to measure because poor maternal nutrition has negative consequences for neonatal survival, birth weight, and for long term outcomes such as child and adult health and height, as well as cognition and productivity.**

India has a much higher level of neonatal mortality than is predicted by its income. One important reason for such high rates of mortality in the days and weeks just after birth is because of the low birth weights (2500 grams or less) of newborns. Although we do not have reliable estimates of birth weight in India -- very few hospitals record it and many births take place at home -- the 2005 Demographic and Health Survey (DHS) found that among the 33% of infants that were weighed at birth, 22% were low birth weight. This is an underestimate for the country as a whole because only the best off babies are weighed at birth. A r.i.c.e. study of birth weights in a government hospital in Uttar Pradesh found that 45% of babies born vaginally in that hospital in 2013 were low birth weight.

Poor maternal nutrition before and during pregnancy is a leading cause of low birth weight. Reliable estimates of nutrition in pregnancy would facilitate more effective policy solutions to improve the health of prepregnant and pregnant women, and tackle the challenge of child malnutrition.

key findings

weight and weight gain in pregnancy

The goal of this research is to make accurate and representative estimates of nutrition in pregnancy. Doctors and epidemiologists focus on two measures that are strongly predictive of birth weight and other birth outcomes. The first is prepregnancy body mass index, or BMI. The second important measure of nutrition in pregnancy is weight gain during pregnancy.

A woman's body mass before pregnancy interacts with the amount of weight she gains during pregnancy to shape her baby's birth weight: women with higher body mass need to gain less weight during pregnancy to give birth to a baby of the same size as a woman with lower prepregnancy body mass. This is why doctors recommend that underweight women, who have BMI scores of less than 18.5, gain more weight during pregnancy than normal and overweight women.

Maternal health research commonly averages over the weights of all non-pregnant women of reproductive age (ages 15-49) to calculate the fraction of prepregnant women who are underweight. This would give us an accurate picture if women who get pregnant are similar to those who do not. But, if women who get pregnant are different from those who do not, on characteristics that are correlated with body mass, then simple averages of BMI and fraction underweight among all women of childbearing age will give biased estimates of prepregnancy nutrition. By understanding whether Indian women who become pregnant are different from those who do not, in ways that are related to nutrition, we can make a better estimate of nutrition in pregnancy than would be given by simple averages over all women.

pre-pregnancy in India and sub-Saharan Africa

India is often compared to sub-Saharan Africa (SSA), a region that is much poorer than India, but with much higher fertility rates. Figures 1 and 2 below show that although women in SSA (blue curves) are

more likely to be pregnant at every age than Indian women (red curves), maternal health is far better: non-pregnant women at every age are less likely to be underweight in SSA than in India.

figure 1: fraction pregnant in India and SSA, by age (red = India, blue = SSA)

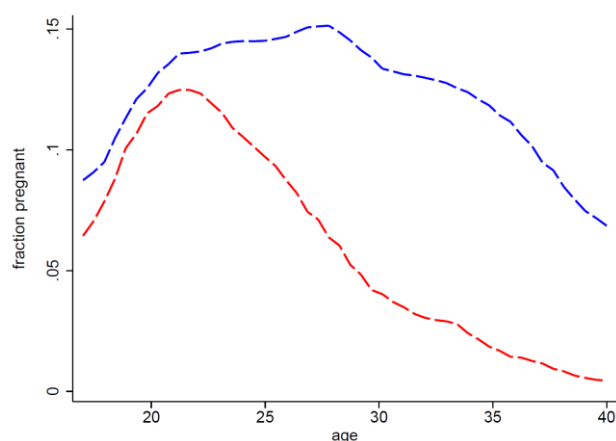
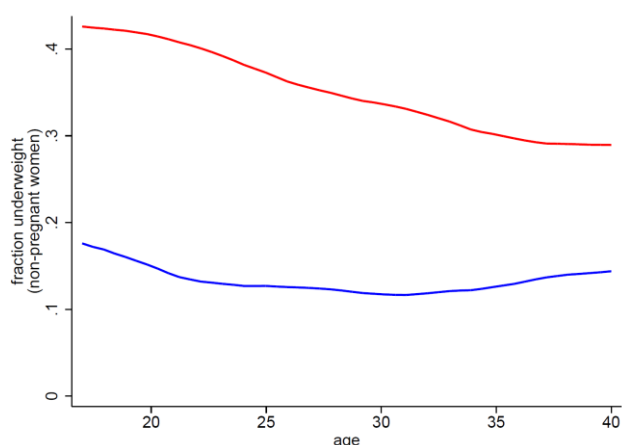


figure 2: fraction underweight in India and SSA, by age (red = India, blue = SSA)



One important characteristic, which is correlated both with weight and the likelihood of being pregnant, on which pregnant women in India differ from other women, is their age: pregnancy in India is concentrated between the ages of 18 and 25. These are also the ages at which women are most likely to be underweight. Econometric techniques that adjust age differences between pregnant and non-pregnant women of reproductive age demonstrate that **simply looking at average nutrition of all women of reproductive age overestimates nutrition in pregnancy: it's actually worse than previously understood.**

Adjusting for age, as well as other factors, shows that the proportion of prepregnant women who are underweight is significantly higher than the proportion of all women of reproductive age who are underweight in India. The average BMI of prepregnant women in India is 19.5 and the fraction of prepregnant women who are underweight is 42.2%. Table 1 shows that if we had simply looked at all women between the ages of 15 and 49, we would have estimated both a lower fraction of underweight women and a higher average BMI. These adjustments are thus important if we are to accurately assess the extent of undernutrition in prepregnancy and pregnancy in India.

table 1: BMI and fraction underweight in India, all women versus prepregnant women

	All women (15-49)	Prepregnant women
% underweight	35.5%	42.2%
Average BMI	20.5	19.5

Indian women are getting pregnant when they are young, which is also when they are thinnest. In SSA, this relationship is not present, and a much smaller fraction of women are underweight: only 16.5% of women in SSA are underweight before pregnancy (compared to 42.2% in India), and the average prepregnancy BMI in SSA is 21.5 (compared to 19.5 in India).

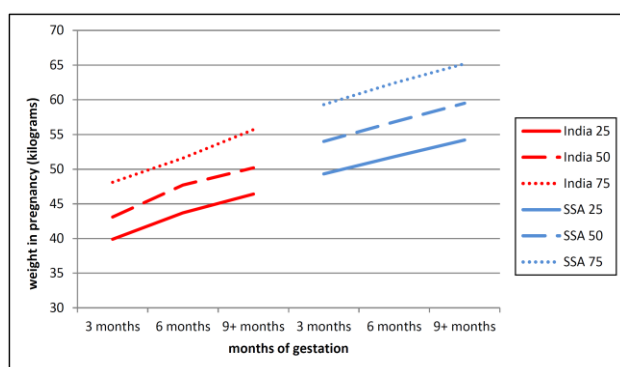
weight gain during pregnancy in India and SSA

To get a more complete picture of health during pregnancy, we have to think about weight gain as well as prepregnancy body mass. It is possible that Indian women compensate for prepregnancy deficits by gaining adequate weight during pregnancy. Although there are no guidelines for weight gain in pregnancy in India, the U.S. Institute of Medicine recommends that women who begin pregnancy underweight gain between 12.5 and 18 kilograms during pregnancy, and that women who begin pregnancy at a normal weight gain between 11.5 and 16 kilograms, regardless of height.

Using two econometric methods, this research finds that women in both India and SSA gain about 7 kilograms on average throughout their pregnancies, which is only about half of what is recommended in the U.S. The figures below show that although women in both regions gain similarly small amounts of weight during pregnancy, **severe prepregnancy nutrition deficits in India mean that Indian women end pregnancy weighing even less, on average, than women in sub-Saharan Africa do when they begin pregnancy.**

Figure 3 below shows the weights in kilograms of pregnant women in India (red lines) and SSA (blue lines) at 3, 6, and 9 or more months of gestation. The solid lines are women in the 25th weight percentile of all women at the same stage of pregnancy, the large dashed lines are women in the 50th percentile, and the dotted lines are women in the 75th percentile. The contrast is stark: the weight of women at 9 months of pregnancy in India is discernibly lower than the weight of women at just 3 months of pregnancy in SSA.

figure 3: weight in pregnancy at 3, 6, and 9+ months, by percentile (red = India, blue = SSA)



It is clear that women in India are not, in fact, compensating for prepregnancy weight deficits by gaining adequate weight during the course of their pregnancies. This lack of nutrition both before and during pregnancy means that Indian women are giving birth to babies with very low average birth weights, putting them at risk for many health complications both at birth and later in life.

policy implications

causes of poor maternal health in India

Why is maternal health and nutrition in India so poor?

One likely reason is the low social status of women in India. Women in India fare worse than women in SSA on a number of indicators of gender equality. Sex ratios in sub-Saharan Africa are more balanced, and sex gaps in education, work outside the home, and child mortality are not as large. In India, young, newly married women are at the bottom of household hierarchies, and have much lower social status than older women. At the same time that Indian women become pregnant, they are often expected to keep quiet, work hard and eat little. **Rather than investing in pregnant women, household decision makers in India often discriminate against them.**

Additionally, mothers also suffer from an exceptionally poor disease environment. Infectious diseases, spread by widespread open defecation, make it difficult to use the energy and nutrients women get from food, contributing further to India's prepregnancy underweight problem.

In the face of such deep systemic challenges, what can be done to improve the nutritional health of mothers, ensure neonatal survival, and improve the long term health of Indian children?

need for a national monitoring system for health in pregnancy

An important first step to improving pregnancy outcomes would be for the government to monitor maternal health by tracking women throughout their pregnancies. Rather than being forced to rely on out-dated cross-sectional surveys to estimate these important indicators of maternal health, a national monitoring system would allow policy makers to see how maternal health changes over time, and to see whether new programs are having a positive impact on important health indicators.