perspective paper

HUNGER AND MALNUTRITION

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Perspective Paper on Hunger and Malnutrition

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Introduction

The Challenge paper on Hunger and Nutrition is novel both in the nutrition literature as well as in Copenhagen Consensus series in that it looks beyond the traditional nutritional interventions for solutions to the problem of hunger and malnutrition. It focuses on agricultural interventions, most notably on increasing crop yields and agricultural market innovations (e.g., use of cell phone technologies for better price information), as a means of reducing hunger. (Separately, the paper also considers traditional micronutrient and nutritional supplementation interventions to reduce the prevalence of stunting.) As I argue in this Perspective paper, while the focus on agriculture is a refreshing and important change, it comes with some risks of its own.

One of the main tools used by the Challenge paper is a partial equilibrium model (called the IMPACT model) to generate long-term projections of food supply, demand, trade and prices based on a number of different factors. The model is disaggregated across 46 crops, with growth in crop production in each country being determined by crop and input prices, exogenous rates of productivity growth and area expansion, investment in irrigation, and water availability. The demand for agricultural commodities is modeled as a function of prices, income, and population growth. Rates of hunger and child underweight are also modeled as functions of food and calorie consumption. Using this model, the Challenge paper calculates the impact of alternative agricultural (and micronutrient supplementation) interventions on both the number of hungry persons and the rate of child malnutrition. It also computes the benefit-cost ratios of the agricultural and nutritional interventions.

There are three problems in particular I wish to focus on in this perspective paper. First, considering interventions outside a particular sector (e.g., nutrition) as a means of influencing outcomes in that sector (e.g., hunger and malnutrition) opens up a Pandora’s box. This is particularly true of such broad goals as enhancing agricultural productivity and making agricultural markets more efficient. I would consider these to be over-arching system goals, not really narrowly-defined interventions. In this case, why stop at improving productivity in agriculture and making it more efficient? Why not also consider the effects on hunger and malnutrition of other system changes, such as better transport infrastructure, more education (for women), higher-quality and more accessible health care services, universal health coverage for children, and the like. Perhaps, the cost-benefit ratios of these system developments could be even larger than those of the agricultural interventions considered by the Challenge paper.

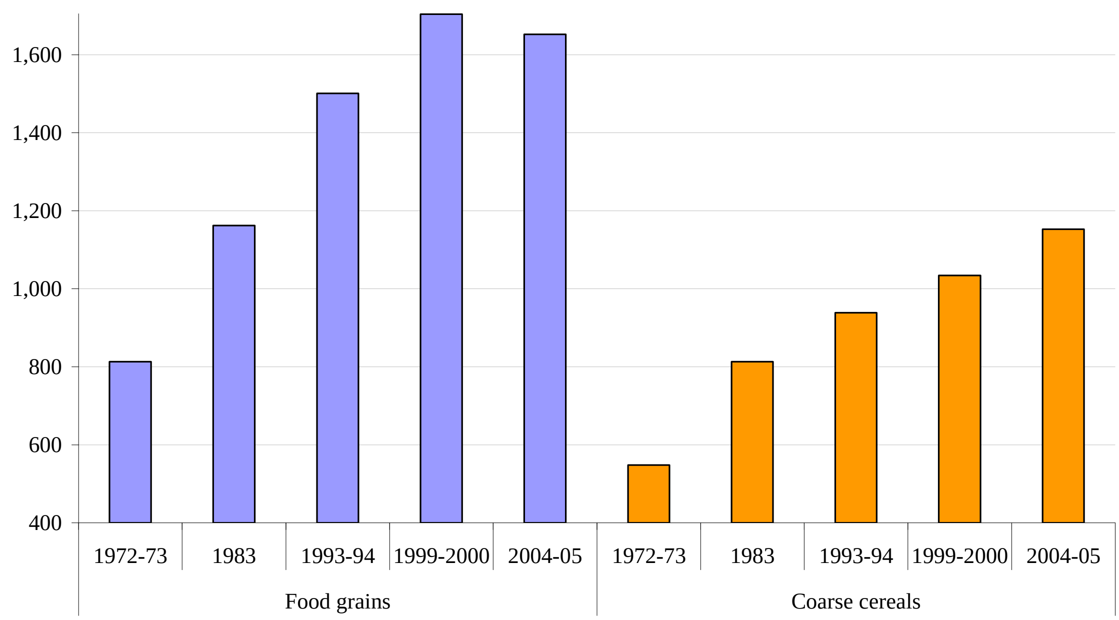
Second, the problem with broad system interventions is that these often have multiple outputs, and it is extremely difficult to calculate benefit-cost ratios for interventions that have multiple outputs and outcomes. Reducing hunger and malnutrition is only one of several goals of agricultural development; as the five-decade-old literature on economic development has argued, agricultural productivity growth has numerous other broad-based benefits. Indeed, productivity growth in agriculture is a *sine qua non* of sustained industrialization and of economic development itself (Southworth and Johnston 1967, Timmer 1988). How does one value all of these other benefits of agricultural productivity growth? Surely, the benefit-cost ratios (BCRs) of agricultural interventions calculated by the authors are probably underestimated relative to the BCRs of the micronutrient supplementation interventions. In fact, the two sets of estimates are really not comparable, since most micronutrient interventions typically only have one output/outcome while agricultural development has numerous outputs and outcomes. This is not a shortcoming of the paper, but of the BCR methodology itself.

The third problem is more specific. Improvements in agricultural productivity are likely to affect hunger and malnutrition in two ways: by reducing food prices and by increasing household incomes in the rural areas. But the evidence linking agricultural productivity growth to reductions in hunger and malnutrition is elusive and ambiguous at best. Indeed, there is a strong disconnect between agricultural productivity growth and reductions in hunger and child malnutrition throughout the world, but particularly in South Asia, which has the largest number of underweight and stunted children of any region in the world. Even as agricultural productivity and rural incomes have increased sharply in countries such as India, mean calorie intake has actually fallen and the proportion of children who are underweight and stunted has remained stubbornly high. Across Indian states, there appears to be very little, if any, correlation between agricultural productivity growth and reduction of child malnutrition. This casts considerable doubt on the assertion that agricultural productivity growth will significantly reduce hunger and malnutrition rates around the world.

Agricultural Productivity and Calorie Intake in India

India provides an interesting example of the disconnect between agricultural productivity growth and reduction of hunger. As Figure 1 below shows, crop yields in India increased dramatically over the 32 years between 1972-73 and 2004-05. For food grains as a whole, crop yields almost exactly doubled over the period and they more-than-doubled in the case of "coarse cereals" (viz., maize, sorghum and pearl millet), which are traditionally the main components of the food basket of the poor in India. Because these rates of productivity growth, averaging about 2.5% per year over 32 years, would have significantly increased rural incomes and lowered food prices, the IMPACT model used in the Challenge paper would likely have predicted that mean calorie intake would have increased – and both hunger and child underweight rates would have fallen –

Figure 1: Average crop yields (kgs./hectare) of all food grains and coarse cereals, India, 1972-73 to 2004-05

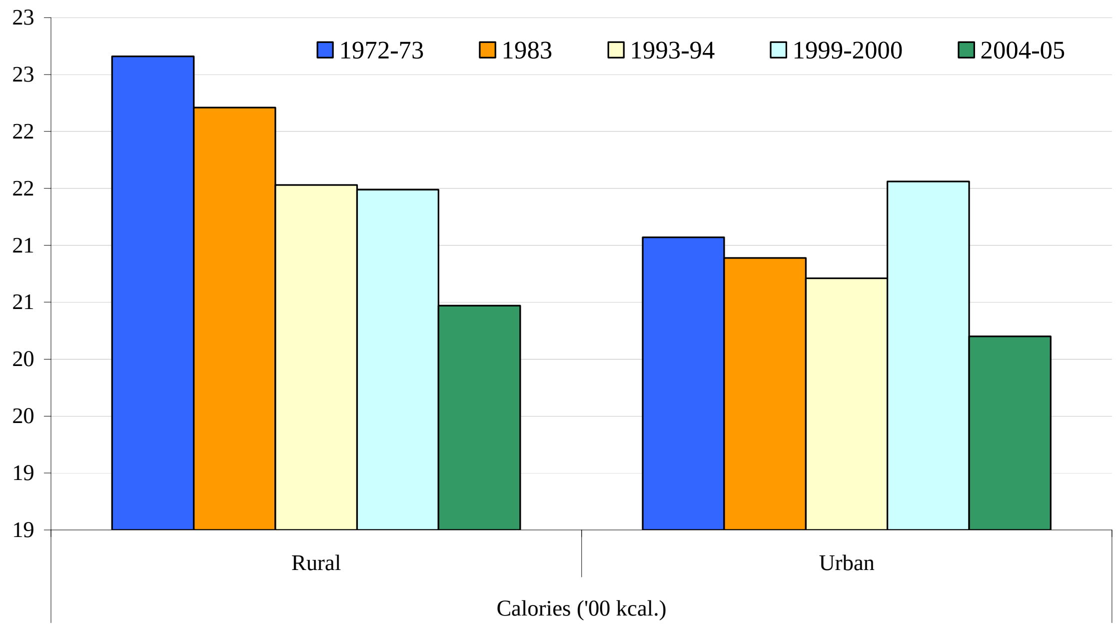


<u>Source</u>: Indiastat.com

over this period.

But Figure 2 shows exactly the opposite. In fact, over this time period, mean calorie intake actually fell – by about 10% in the rural areas and 4% in the urban areas. If calorie requirements were unchanged over the period, the proportion of individuals considered hungry would have increased. Certainly, prima facie, there appears to be a weak link between agricultural productivity growth and calorie consumption in India.

Figure 2: Calorie intake per person per day, by rural/urban residence, India, 1972-73 to 2004-05 (in '00 calories)

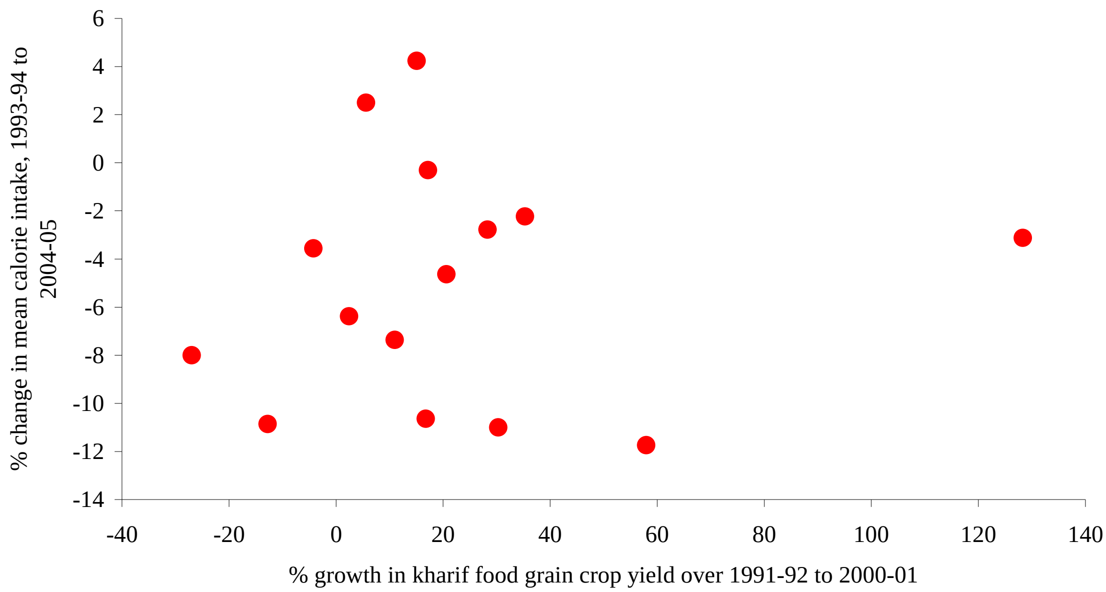


Source: Author's calculations from NSS unit record data

Deaton and Dreze (2009) have also noted the near-secular in calorie consumption in India over the last few decades. They, too, regard it as a puzzle, especially given that incomes have increased significantly – and relative food prices have fallen – over this period. A possible explanation they offer for this drift is that calorie requirements have declined due to better health conditions (e.g., greater availability of safe drinking water and higher vaccination rates) and lower physical activity levels (arising in turn due to changes in the occupational structure as well as expanded ownership of various effort-saving durables). However, there is really no strong evidence for this hypothesis, and the assertion is speculative at best.

Figure 3 plots changes in mean calorie consumption between 1993-94 and 2004-05 against percent changes in *kharif* (summer) crop yields between 1991-92 and 2000-01 across 15 major Indian states. There does not seem to be any association between the two variables. Similar results are obtained for the *rabi* (winter) crop yields. Thus, the connection between crop yield growth and improvements in calorie intake appears weak to non-existent across states in India.

Figure 3: Percent change in mean calorie intake from 1993-94 to 2004-05, in comparison to crop yield growth (*kharif* food grains) over 1991-92 to 2000-01, across Indian states



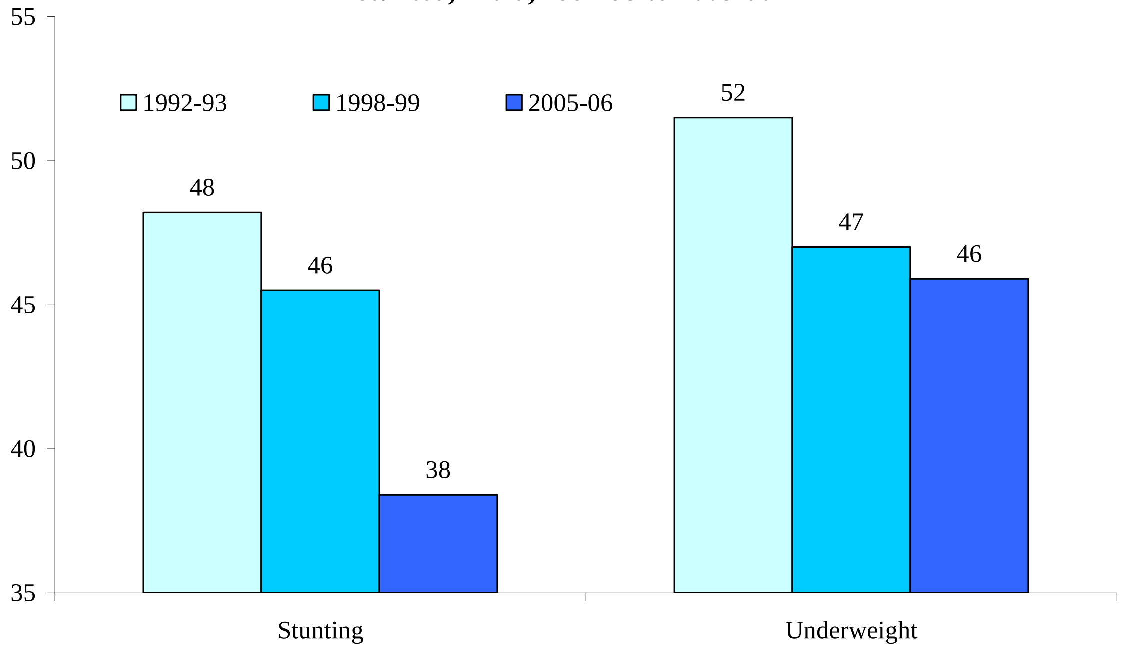
Source: NSS unit record data and indiastat.com

The Asian Enigma

The "Asian Enigma" is a term that is often used to denote the failure, especially in the South Asian countries, of high rates of economic growth and poverty reduction translating into sharply-falling rates of child malnutrition. The region fares much worse than any other world region, including sub-Saharan Africa, in terms of child malnutrition.

India has one of the highest rates of child malnutrition in the world, with nearly one-half of all children under 3 years of age being either underweight or stunted. Further, the incidence of child malnutrition has remained stubbornly high even after nearly two decades of economic and agricultural productivity growth in the country (Figure 4).

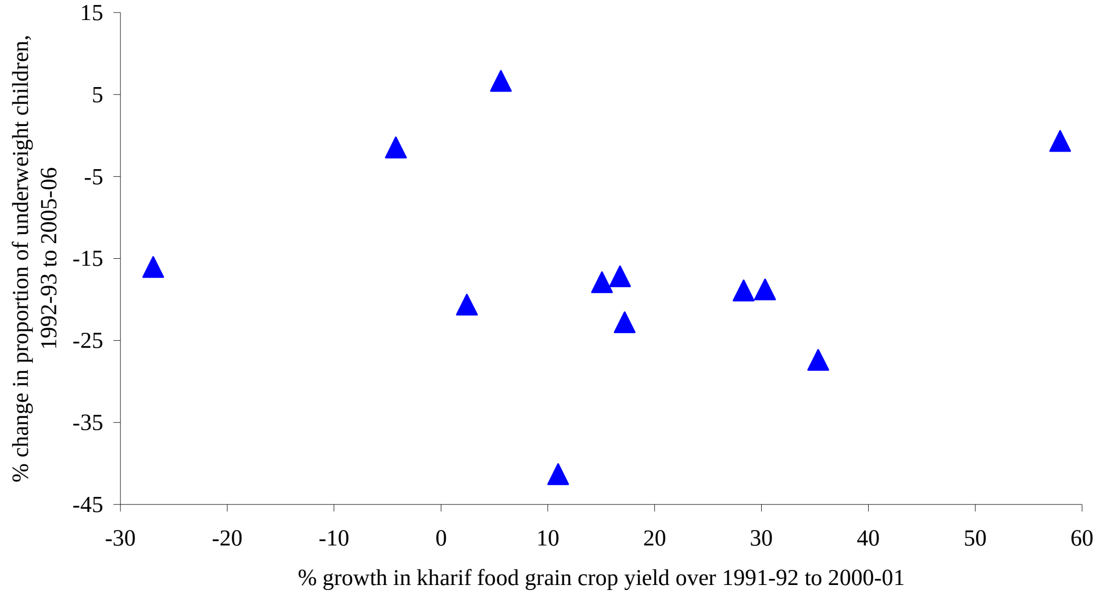
Figure 4: Percent of children under 3 years who are underweight or stunted, India, 1992-93 to 2005-06



Source: nfhsindia.org

Figure 5 below plots the changes in child underweight rates against changes in *kharif* crop yields across the major 12 Indian states for which data are available. Again, as with per capita calorie consumption, no association is observed between the two variables. For instance, the child malnutrition rate in Rajasthan, which saw the most rapid growth of crop yields during the 1990s, barely budged between 1992-93 and 2005-06. In contrast, West Bengal, which saw virtually no growth in *kharif* crop yields over the period, experienced a decline of about 21% in the proportion of underweight children. The results are largely unchanged if one uses *rabi* crop yields (instead of kharif) or the rate of stunting (instead of the rate of underweight children).

Figure 5: Percent change in the proportion of underweight children under 3 years of age from 1992-93 to 2005-06, in comparison to crop yield growth (kharif food grains) over 1991-92 to 2000-01, across Indian states



Source: nfhsindia.org and indiastat.com

That child malnutrition is weakly correlated with income is additionally borne out by the findings (from the third round of the National Family Health Survey) that a quarter of Indian children of mothers with 10 or more years of schooling – and an equivalent proportion of children from the top income quintile – were underweight in India in 2005-06. These children are very unlikely to have faced food insecurity. Even in a relatively prosperous and dynamic state like Gujarat, child malnutrition rates have been stagnant over the past decade.

The Asian enigma throws up many interesting questions – is it culture and dietary habits (e.g., extensive vegetarianism) that account for high rates of child malnutrition in South Asia? Is it the poor nutritional status of mothers and their low weight gain during pregnancy that lead to low birth-weight babies who grow on to become malnourished children? Is it poor breast-feeding practices in infancy that set children on the path of malnutrition very early in life?

Reasons for the Agriculture-Nutrition Disconnect

The point of the above discussion is that the connection between agricultural productivity growth and nutritional improvements is by no means established. If anything, there is a lot of evidence to suggest that improvements in agriculture do not always translate into better nutritional intake, less hunger, and less child malnutrition. By using a simulation model in which changes in agricultural productivity deterministically improve nutrition (via food price and household income effects), the Challenge paper over-simplifies the problem of combating malnutrition.

It is not that the existing literature has completely ignored the possible disconnect between agriculture and nutrition. But the Challenge paper does not refer to this literature. For instance, on pages 3-8, the Challenge paper presents a discussion of the conceptual framework, as well as a discussion of what constitutes hunger, without citing any prior studies in this area. There is a rather large literature that has analyzed the socioeconomic determinants of nutrient intake and nutritional status in developing countries. These studies have often found that the relationship between nutrient intake/outcomes and household-level factors, such as household income and assets, is not straightforward.

The fact is that researchers do not have a good handle of on how households make food and nutritional choices. The old adage of whether people eat to live or live to eat is very relevant here. Food is a fuel for the human body, and therefore its demand is partly based on caloric needs and requirements of the human body. But it does not typically take very much to satisfy these basic caloric demands of the body, even in a poor country. A very large portion of the demand for food is thus based on the non-nutritive attributes of food, such as taste, aroma, variety, and status. This means that increases in household income do not always translate into improvements in calorie consumption. Behrman and Deolalikar (1987) noted this 25 years ago; they found that even in one of the poorest regions of India (semi-arid villages of Andhra Pradesh and Maharashtra), the income gradient of calorie intake was essentially flat, even after controlling for unobserved heterogeneity. This did not mean that household food consumption was not elastic with respect to household income; indeed, expenditure on food was highly responsive to income changes. What was occurring was that as incomes increased, households – even very poor households that were presumably (according to most external observers' standards) "hungry" and under-nourished – changed the composition of their food consumption away from energy-efficient (i.e., low price per calorie) staples, such as sorghum and millet, to less energy-efficient (higher price per calorie) foods, such as rice, vegetables and sugar. In some cases, the shift was even more subtle, such as the shift from short-grain, broken rice to long-grain rice. This shift in consumption accounted for the larger expenditures on food, but unchanged energy intakes, with increasing income.

In another paper, Behrman and Deolalikar (1989) found, in a cross-section of developing and developed countries, that the demand for food variety was very strongly responsive to rising incomes and food budgets. Interestingly, one implication of their results is that "… if the food-nutrient choices of individuals are informed choices, the low income elasticities of calories and the relatively high income elasticities of food variety … suggest that, even in relatively poor populations, individuals do not perceive inadequate calorie intakes to be as high a priority problem as many outside observers have suggested."

In their recent book, Banerjee and Duflo (2011) make essentially the same point. They write: "… In Udaipur, India, for example, we find that the typical poor household could spend up to 30 percent more on food, if it completely cut expenditures on alcohol, tobacco, and festivals. The poor seem to have many choices, and they don't choose to spend as much as they can on food. Equally remarkable is that even the money that people do spend on food is not spent to maximize the intake of calories or micronutrients. Studies have shown that when very poor people get a chance to spend a little bit more on food, they don't put everything into getting more calories. Instead, they buy better-tasting, more expensive calories." They go on to conclude that "… all told, many poor people might eat fewer calories than we – or the FAO – think is appropriate. But this does not seem to be because they have no other choice; rather, they are not hungry enough to seize every opportunity to eat more. So perhaps there aren't a billion "hungry" people in the world after all."

Concluding Remarks

The Challenge paper is novel in that it goes beyond traditional nutritional interventions and focuses on agricultural interventions as a means of combating the global challenge of hunger and malnutrition. But such an approach relies too much on an assumed connection between increases in agricultural productivity and calorie consumption. It is not clear from the Challenge paper what coefficients of calorie responsiveness to income and food prices are used in the simulation model. Naturally, these coefficients are critical to the simulated impacts of agricultural interventions on the number of hungry people and the extent of child malnutrition. Given the considerable uncertainty about how calorie consumption and child malnutrition actually responds to household income and food prices, one should be wary of simulation models that assume this relationship. Indeed, it could be argued that the concept of hungry people is in itself somewhat problematic.

Perhaps, it is best to end with a quote from Deaton and Dreze (2009): "… The limitations of intake-focused nutritional assessments reinforce the case for supplementing intake data with outcome-focused indicators, such as anthropometric measurements. However, anthropometric data have some limitations too. For one thing, there are unresolved puzzles about anthropometric indicators in India, such as the high prevalence of stunting among privileged children (which is seemingly at variance with the premises of accepted "growth standards"). For another, there are inconsistencies between different sources of anthropometric data, as well as puzzling contrasts between nutrition trends based on different anthropometric indicators, such as height-for-age and weight-for-height. While broad, long-term trends are reasonably clear, there is some confusion about recent changes… the nutrition situation in India is full of puzzles." Why should so much weight be given to India? Given that India accounts for the majority of "hungry" people and underweight children in the world, the Indian situation is very pertinent to a general.

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