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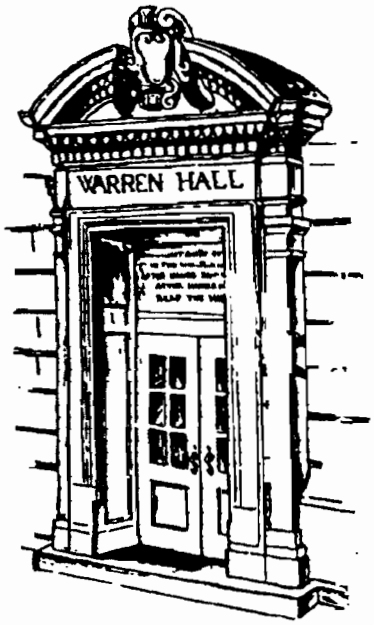

Working Paper

Department of Agricultural, Resource, and Managerial Economics
Cornell University, Ithaca, New York 14853-7801 USA

RECENT TRENDS IN FOOD AVAILABILITY AND NUTRITIONAL WELL-BEING

Thomas T. Poleman

ABSTRACT

Despite a more than doubling of the world's population, the past half century has witnessed marked improvements in per capita food availabilities and nutritional well-being in most parts of the globe. Aggregate diet quality has gone up in most developing countries and the incidence of child malnourishment and infant mortality has declined sharply. For the two groups falling outside of these generalizations--those living in Sub-Saharan Africa and the impoverished of the three countries of the Indian subcontinent--remedial action lies less with agriculture than in political reform (Africa) and more and better paying jobs (Asia).

Recent Trends in Food Availability and Nutritional Well-Being

by Thomas T. Poleman*

Despite our continuing inability to quantify the extent of global hunger, several points regarding postwar trends in food availability and nutritional well-being can be made with confidence:

- There is a global sufficiency of food and despite poverty the vast majority of people in developing countries behave as if they manage to eat adequate, if not especially tasty, diets.
- The "quality" of such diets in the aggregate, as measured by the starchy staple ratio, has improved since at least 1965 and most probably throughout the entire postwar period.
- Nutritional deprivation, where it exists, is likely to be most acute among the young, and the incidence of infant and child malnourishment has declined dramatically in most parts of the world.
- Where this decline is least evident, in South Asia and Sub-Saharan Africa, corrective action lies less with agriculture than in political reform (Africa) and more and better paying jobs (Asia).

As might be expected, this assessment is somewhat at odds with the picture the international food and nutrition bureaucracy would convey. According to the *Second Report on the World Nutrition Situation*, prepared jointly by FAO, the World Health Organization, and other United Nations agencies to coincide with the 1992 International Conference on Nutrition, not only was 20 percent of the population of developing countries still chronically undernourished; "growth failure [continues to affect] one third of children [and] at least one billion people worldwide are probably affected by one or more nutritional deficiency" (United Nations (ACC/SCN) 1992:I-1). Nonetheless, all the points listed above stand up to the test of rigorous scrutiny.

Behavioral Evidence of Perceived Dietary Adequacy

The use of dietary behavior as an indication of apparent nutritional adequacy has considerable appeal. As an alternative approach to world hunger quantification, it enables us to sidestep the question of food requirements and the arbitrary designation of minimal needs; and it also permits us to dodge somewhat the issues raised by our inability to distinguish between what the food balance sheet calculation indicates is available for human consumption and that which is actually purchased by households at various income levels. Yet the approach clearly has its limitations. It is idle to pretend that people consciously seek to maximize nutritional well-being when they sit down to eat--although in fact they may well do a fair job of it--and it would be an error to suppose that all members of a household share equally in budgetary decisions and the food which is purchased.

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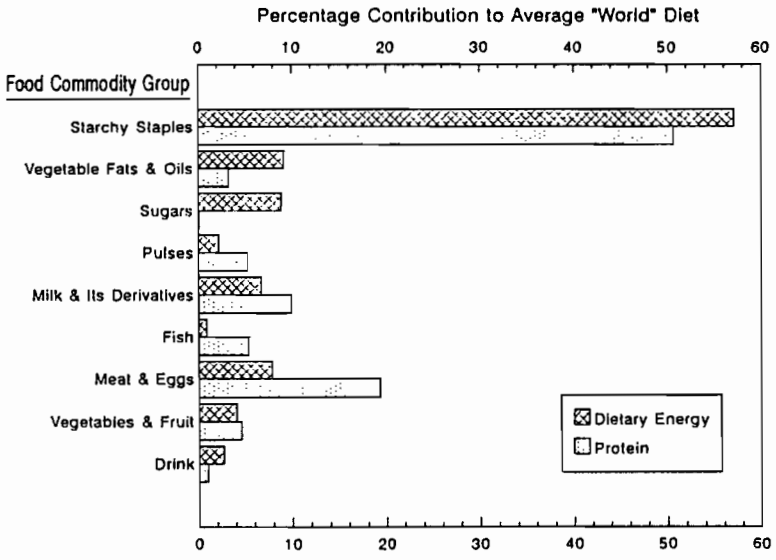
* Professor of International Food Economics, Cornell University. The figures were drawn by Lillian Thomas, to whom credit is also due for the paper's layout. The paper is the third chapter of a projected book on *The World's Food*.

Income and Dietary Change

Although in physical appearance they may differ markedly, the diets of poor people the world over have a number of things in common. One is that a high proportion of the dietary energy and a fair share of the protein will come from foods composed principally of starch. These "starchy staples" are the cereals and the starchy fruits, roots, and tubers. Depending on the staple, this dietary cornerstone will either be served steamed or boiled (as with rice and potatoes), as leavened (wheat) or unleavened (maize) bread, or as a doughy paste or stiff porridge (cassava, yams, and plantains). It will normally be accompanied by side dishes or sauces,which, in addition to adding flavor to an otherwise bland meal, will contribute considerable protein and the bulk of the fat, vitamins, and mineral content. A second characteristic of poor people's diets is that the protein in these sauces and side dishes will tend to be more vegetable than animal in origin.



Data from FAO. 1991. Food Balance Sheets, 1984-86 Average. Rome: 1. FAO equivalents of the food groups are: starchy staples--cereals ex-beer, starchy roots; vegetable fats and oils--vegetable oils, oil crops, tree nuts; sugars--sugar crops, sweeteners; pulses--pulses; milk and its derivatives--milk ex-butter, animal fats; fish--fish and seafood, other aquatic products; meat and eggs--meat, offal, eggs; vegetables and fruits--vegetables, fruit ex-wine; drink--stimulants, alcoholic beverages. The system ignores the FAO categories of spices and miscellaneous.

Figure 3.1. Food Commodity Groups and Their Percentage Contribution to Average "World" Diet, 1984-86

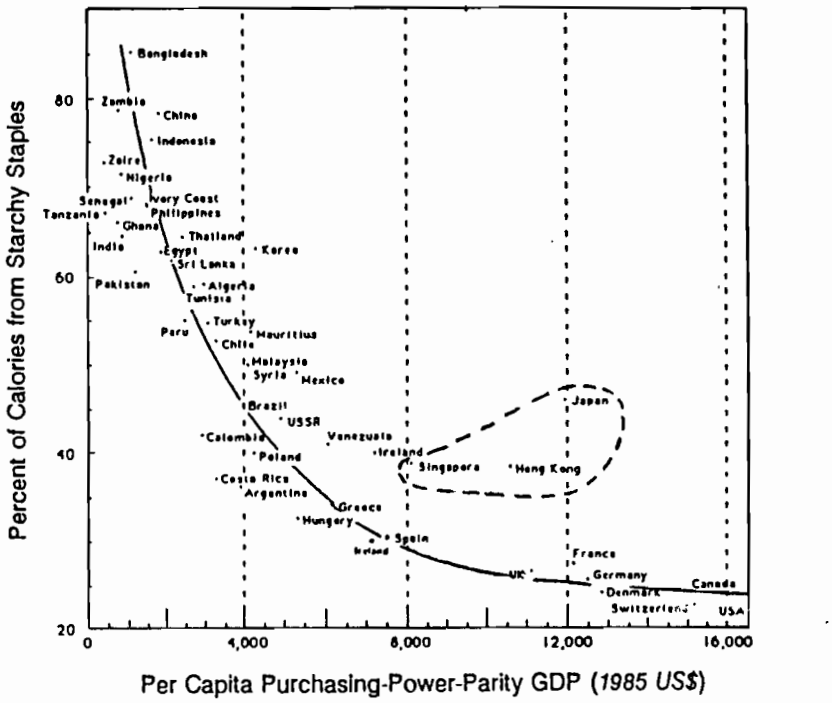
To quantify these facts and to show how diets evolve as individuals and countries become wealthier it is helpful to categorize the vast number of food items which may be consumed into a manageable number of groupings. FAO has a system for doing this (consisting of 21 food groups), as does the U.S. Department of Agriculture. The one shown in Figure 3.1 has the attraction of being relatively short and reflecting the food groups' contribution to the diet--whether dietary energy or protein--and its standing in the price hierarchy. The commodities at the top of the list are relatively cheap sources of energy; as one moves down the list costs generally rise, as does protein content. Also shown in the figure is the nutrient contribution of the various food groups in the average world diet as of 1984-86.

The starchy staples dominate this imaginary global diet--contributing over half the calories and protein--and the diets of the poor everywhere for a very simple reason: their cheapness, whether expressed in terms of market price or production cost. Far less land and far less labor are typically needed to produce a thousand calories of energy value in the form of the starchy staples than in the form of any other foodstuff. Meat and vegetables by comparison are inefficient converters: vegetables because their caloric content is low, meat because an animal must be fed between two and ten pounds of grain for it to produce a pound of edible product.

As wealth increases the contribution of the starchy foods falls and a still largely vegetarian diet becomes more diversified; this is Bennett's Law, observed in the 1930s by M. K. Bennett (1941; 1954:165-168), the

pioneering student of world food economics. Then products of animal origin--meat, eggs, and dairy products--begin to play an increasingly important role in the diet, supplementing or replacing the vegetable protein, and the consumption of sugars, fats and oils, and fruits and vegetables rises. This dietary evolution seems to be universal, although the exact modifications which take place will vary in accordance with local circumstances such as market availability and price and cultural considerations such as religious taboos.

Figure 3.2 illustrates how this course of dietary change is related to income and where the various countries of the world stood in the progression as of 1984-86. Average per capita incomes are expressed in terms of 1985 U.S. dollars and were calculated using purchasing-power-parity rather than exchange-rate conversions. Incomes of the order of $US 8,000, or about half that then prevailing in the United States, were sufficient to complete the dietary transition.



Starchy staple ratios are 1984-86 averages calculated from: FAO. 1991. Food Balance Sheets, 1984-86 Average. Rome.

Purchasing-power-parity GDP per capita figures are expressed in 1985 U.S. dollars and are from: Penn World Table (Mark 5.5). 1993. Annex to Summers, Robert and A. Heston. 1991. "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950-1988." Quarterly Journal of Economics. May.

Figure 3.2. Relationship Between Starchy Staple Ratio and Per Capita GDP, About 1985.

In the poorest countries, where incomes average $US 1,000 or less, the percentage contribution of the starchy staples to total energy availabilities--the starchy staple ratio--can approach or even exceed 80 percent. It then drops rapidly as countries attain middle-income status. With incomes in the $US 3,000-4,000 range, ratios of 50-60 percent are the rule. Thereafter, location and diet influence the extent to which the starchy staple ratio will fall. In East Asia, where rice is the staple and the cornerstone of almost every meal, 38 percent would appear to be the low point in even the wealthiest countries. Elsewhere the contribution of the starchy staples can drop to as little as 20 percent of total energy availabilities.

With products of animal origin the direction of change induced by income growth is, of course, in the opposite direction. At very low income levels even fewer than five percent of the calories in the diet will derive from such products, whereas in the wealthy countries of Europe and North America the range is from 30 to 40 percent (see Figure 4.).

Accompanying these changes in diet composition is an increase in total energy availabilities. In the poorest countries, the balance sheet calculation suggests this can be as low as 2,000 kcal. per person per day, although this may well understate reality. As incomes increase it rises rapidly to 3,500 kcal., where it levels out in all parts of the world except the Far East. There, the figure is more like 2,800 kcal., presumably a reflection

of the population's smaller body size and also probably reduced wastage, particularly of animal fats in the cooking process (see Figure 4.).

The impact of these dietary modifications on nutritional well-being are not all that clear cut. Presumably the rise in total energy and protein availabilities is desirable. Between 1955 and 1970 real per capita incomes in Japan increased from 1985 $US 2,125 to 7,500 (PWT 5.5 1993). During the same interval energy availabilities increased from 2,153 kcal. per person per day to 2,740 and protein from 64 grams to 83. The starchy staple ratio fell from 72 to 52 percent (Japan, Ministry of Agriculture and Forestry 1958:102-103; FAO 1991:174). That these changes, coupled with higher intakes of fruits and vegetables, represented a net nutritional gain is strongly implied by the weights and heights attained by Japanese teenagers. Male 15-year-olds born in 1948 weighed 7.3 kilograms more than those born in 1933 and were 10.9 centimeters taller. For females the comparable increases were 4.3 kilograms and 5.6 centimeters (Japan, Ministry of Health and Welfare 1965:20-22). On the minus side, the increased incidence of cardiovascular disease in wealthy countries has been linked to higher intakes of fat and sugar, and many nutritionists decry the lack of dietary bulk which is the direct consequence of a low starchy staple ratio.

It would be gratifying if one could identify some point along the continuum of adjustment in the dietary contribution of the various food groups--say, a particular starchy staple ratio--as being indicative of behavior reflecting the absence of perceived nutritional deprivation. However, the Sri Lankan findings noted in Figure 2.4 are probably suggestive of what obtains in most developing countries: that only in the higher income classes will changes in the relative importance of the various food groups begin to manifest themselves strongly. At lower levels of income the principal dietary adjustments are more reasonably to be expected to take place within specific food groups.

The sorts of quality adjustments that take place within the food groups as incomes rise are obvious. Less favored foodstuffs are replaced by those ranking higher in the preference hierarchy, and fancier cuts or grades replace the ordinary. In the developed countries these adjustments are most apparent among the meats. Traditionally beef has been the meat product most preferred by consumers in the United States. Apparent annual consumption of beef increased from 18 kg. per capita in 1930 to 38 kg. in 1970. But recently beef has fallen from favor. During the subsequent two decades apparent consumption fell to 31 kg., while the figure for chicken--cheaper and perceived as more healthful--grew by half again (USDA 1968:59; USDA 1992:33).

Over most of the income range in the poorer countries the most important quality adjustments occur among the starchy staples. In virtually all parts of the world there are well understood preference hierarchies among these foods. In West Africa, for instance, rice, wheat,and yams will be substituted for maize, millet, and cassava when the consumer has sufficient access to a choice and the income to express it. Rice, of course, is dominant in tropical Asia, and consumers there recognize what to the unsophisticated palate is a bewildering hierarchy of quality differentiations. Wheat and rice are substituted for maize in Mexico as incomes rise and the population becomes more urbanized. To a lesser extent quality adjustments will also occur among the pulses, which are the principal suppliers of vegetable protein, but otherwise income-induced changes are few. Consumers at the lower end of the income spectrum are still too poor to demand more than the cheapest commodities in the other food groups.

This behavior is consistent with what we know of the evolution of Western diets. One of the first changes evident in nineteenth century Europe was the replacement of rye bread and potatoes by wheat products (Bennett 1941), and a shift away from maize meal marked the onset of the transformation of the American diet (Bennett and Peirce 1961:103).

If one were to seek a behavioral threshold suggestive of perceived nutritional adequacy, then, a prima facie case can best be made for the income level at which substitution among the starchy staples sets in.

Identifying Perceived Dietary Adequacy

Only a small fraction of the household budget surveys which have been carried out in the poorer countries are suitable for the identification of such behavioral thresholds. This is because most surveys have been conducted for the purpose of determining the relative importance which should be ascribed to various commodities in computing cost-of-living indices. Usually they cover a brief period and are restricted to a limited segment of the population, most often urban workers. Further, because enumerators are assumed to have links with the tax collector, it is not uncommon for entire samples to report spending more than they earned, and information is usually collected not on quantities purchased, but on expenditures for them.

Unless one has detailed information on quality and prices, the latter failing can lead to nonsense conclusions about food behavior. For example, the government of Sudan carried out an extensive survey of household budgets in the northern two-thirds of the country in 1967-68 (Sudan, Ministry of Planning 1976). Information on food expenditures was collected, but not on quantities purchased. Standard commodity price data for the country applied to expenditures for the lowest (less than Sudan £200 per annum) and highest (more than Sudan £500) income classes yield the following apparent intakes of energy (Goodloe 1979):

	Apparent daily per capita energy availabilities (kcal.)	
	Lowest class	Highest class
Starchy staples	1,470	3,530
Vegetable fats and oils	115	273
Sugars	153	550
Pulses	27	180
Meat & eggs, milk & its derivatives	118	692
Others	20	152
TOTAL	1,903	5,377

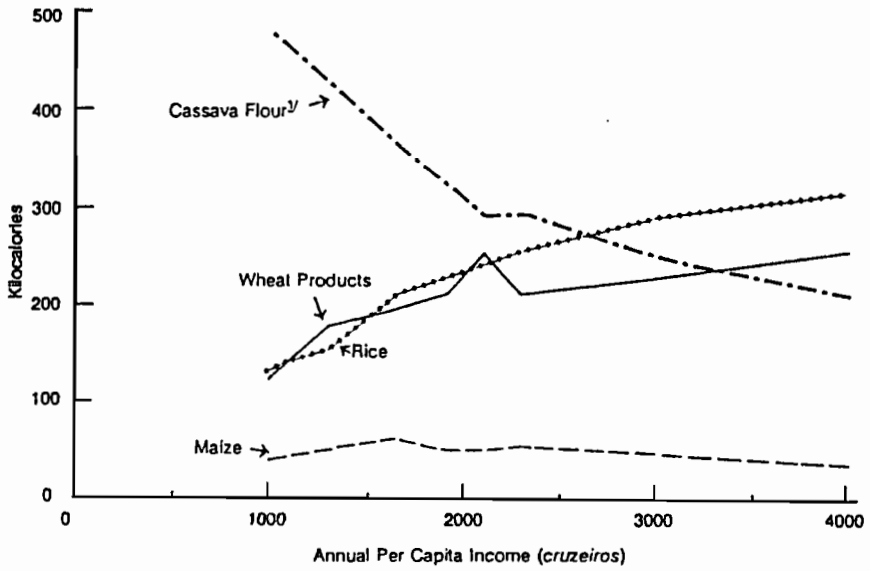
Availabilities of 1,903 calories are not unreasonable for the poorest class, but 5,377 for the wealthiest is impossibly high. Households in the latter category obviously purchased higher quality, more expensive items than their poorer neighbors, a tendency masked by the collection of expenditure data alone.

Fortunately, the organizers of a few relatively recent surveys have made determined attempts to avoid such failings. Coverage has been broadened to include samples representative of a city, region, or even an entire country, and data on actual quantities of food purchased have been collected. Problems remain with the accuracy of the income figures reported, but when sufficient background information on the respondents' socioeconomic status is also gathered, the result can be a data source well suited to identification of behavioral thresholds.

Five such surveys were evaluated during the early 1980s by graduate students and analysts in International Economics Division of the U.S. Department of Agriculture working under my guidance. The countries covered were Sri Lanka (Department of Census and Statistics 1972), Indonesia (Central Bureau of Statistics 1976), Brazil (Fundacao Instituto Brasileiro de Geographia e Estadistico 1977), Peru (ENCA n.d.), and Bangladesh (Goodloe and Tabor 1979).

Although differing in detail, the findings of these surveys were consistent in pointing to the existence of the expected behavioral thresholds; all also revealed that the substitution of quality for quantity among the starchy staples began at surprisingly low income levels and apparent energy intakes--in the range of between 1500 and 1950 kcal. per person per day. In Sri Lanka the initial income-induced substitutions occurred between quality rice purchased in the open market and low-quality rice received free from the state. Substitution of

quality for quantity was observed beginning from the bottom stratum of the lowest reported income class; the apparent mean per capita daily energy intake in this stratum was 1940 calories. Rice was also the preferred source of calories in Indonesia; less preferred were maize, cassava, and other roots and tubers. The most reliable threshold for Indonesia, observed in the rural areas of Java where the less-preferred staples were grown, indicated an apparent energy consumption level of around 1700 calories at the point where quality considerations significantly replaced those of quantity. In the Central and Southern Sierra of Peru the intake level indicative of perceived adequacy was approximately 1800 calories. In the Northeastern region of Brazil calories from cassava flour, the less-preferred starchy staple, began to be substituted away for calories from preferred cereals when apparent per capita consumption was 1530 calories (Edirisinghe and Poleman 1983).



Data from Edirisinghe, Neville and T. T. Poleman. 1983. Behavioral Thresholds as Indicators of Perceived Dietary Adequacy or Inadequacy. Cornell/Int'l. Agric. Econ. Study 18. Ithaca, N.Y.:28.

1/ Plus other roots and tubers (5 percent of total).

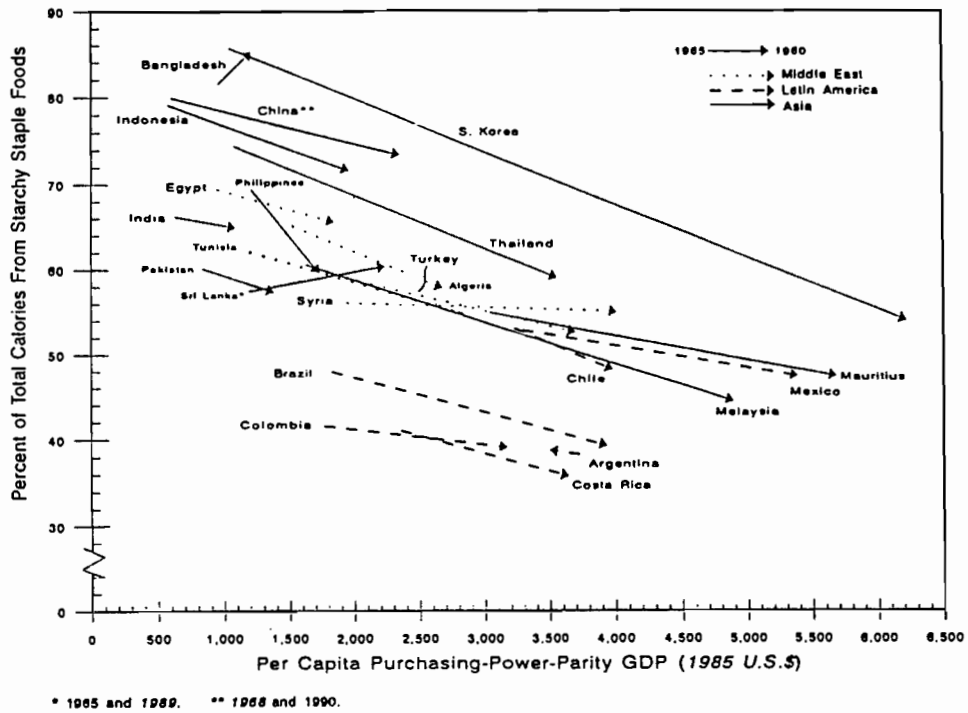
Figure 3.3. Northeast Brazil: Apparent Per Capita Daily Consumption of Major Starchy Staples Among Low-Income Classes, 1974-75

The findings for Northeast Brazil are summarized graphically in Figure 3.3. It is apparent that the diet at the lower end of the income range was that of poor people: the four starchy staples (cassava, maize, rice, and wheat) supplied over half of the total caloric availabilities. But it does not appear to have been the diet of people threatened by hunger. Additional calories were not purchased as income increased. Instead, apparent consumption of cassava--the least preferred staple--fell off sharply, its place taken by rice and wheat bread.

This type of behavior is less suggestive of widespread hunger in the developing countries than it is of the ability of the people there to shrewdly allocate their limited resources so as to get by on what by the standards of the industrialized world is very little. There are doubtless those so impoverished as to not get by, but the relatively low levels of income and apparent energy intake at which behavior suggestive of perceived dietary adequacy begins to manifest itself implies that it is unlikely that their numbers are of the magnitude set forth in the recent FAO or World Bank studies.

Changes in the Starchy-Staple Ratio

Although only a small number of the "new-type" household surveys have been subjected to a rigorous search for behavioral thresholds, other less sensitive evidence suggests that the behavior they reveal obtains throughout the developing world, and further that the quality of the average diet as monitored by the starchy staple ratio has improved throughout the postwar period. Figure 3.4 indicates that during the 25 years prior to 1990 even in the poorest countries the starchy staple ratio dropped, dramatically so in such rapidly developing countries as Thailand, South Korea, and Malaysia. The sole exceptions are in South Asia and Sub-Saharan Africa, and the quality of African data is such that for most countries meaningful starchy staple ratios cannot be calculated. Elsewhere perceived dietary quality has improved.



Data from: FAO. 1994. AGROSTAT-PC 3.0. (Computer data set.) Penn World Table (Mark 5.5). 1993. Annex to Summers, Robert and A. Heston. 1991. "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950-1988." Quarterly Journal of Economics. May.

Figure 3.4. Relationship Between Starchy Staple Ratio and Per Capita GDP, 1965 and 1990

The Nutritionally Vulnerable Within the Household

If we do not know how many among the poor in the developing countries suffer nutritional deprivation, there is agreement that the preschool child and the pregnant and lactating mother are those most likely to be adversely effected. There are several reasons for this. The early growth and reproduction phases are nutritionally the most demanding in the life cycle. Yet it is precisely the mother and young child whose needs can be reflected least in the choice of foods purchased by the household and who may be the residual claimants on that which has been prepared for all to eat.

The Impact of Protein-Calorie Malnutrition

During pregnancy and lactation a mother's food needs will be higher than normal and quite specific for certain nutrients. The total energy cost of a pregnancy is estimated to average between 50,000 and 80,000 kcal. The extra energy is required not just for the growth of the fetus and associated maternal tissues but for moving the heavier body around. In industrialized countries such movement tends to be curtailed during pregnancy, so that the increment in needs is probably nearer the 50,000 calorie figure. But in most developing countries the mother is expected to continue with her household chores almost to term; there the higher estimate may be more relevant. Average daily milk production during lactation will be of the order of 550-850 milliliters. To produce this, the mother's daily energy needs will average about 500 kcal. above normal (FAO/WHO/UNU Expert Consultation 1985:87-89).

Because they are growing so rapidly, the infant and preschool child have appreciably higher energy needs per kilogram of body weight than other age groups: more than twice that of adults and half again as much as adolescents (FAO/WHO *Ad Hoc* Expert Committee 1973:35).

Discrimination against mothers and the young in feeding habits reflects educational as well as income deficiencies. It is not just that undesirable food taboos relate particularly to the mother and her young; where households do not eat together, the father and elders will typically satisfy themselves first, and the women and children get what is left. Adult tastes, rather than those of the infant, will be the usual criteria of dietary excellence, with the result that much of the animal protein a meal contains can be impossible for the very young to swallow. The younger the child, moreover, the less well he is able to fend for himself at the table. And in times of shortage the mother is likely to defer to her children, not realizing that it is not only she, but her unborn child, who will suffer the consequences.

In its extreme form, protein-caloric malnutrition (PCM) among the young occurs either as kwashiorkor or marasmus or some combination of the two. Kwashiorkor is generally the result of an inadequate intake of protein relative to calories. It typically affects children who, after a period of breast feeding, are weaned onto starchy staples low in protein--such as the tropical roots and tubers--or sugary foods. It is most common in those parts of tropical Africa where roots, tubers, and bananas are the dominant starchy staples; indeed kwashiorkor comes from the Ga and means "disease that occurs when displaced from the breast by another child" (Caliendo 1979:13).

Marasmus, on the other hand, arises from an insufficiency of both energy intake and protein. The condition usually occurs in the first year of life and among the children of undernourished women. They are commonly of low birthweight and even in their first few months will show large weight-for-age deficits. Marasmus by definition is chronic, whereas kwashiorkor is an acute condition amenable to rapid reversal.

Cases of pure kwashiorkor or marasmus seem to be the exception rather than the rule. Instead, most severely malnourished children will present signs and symptoms of both conditions and perhaps even alternate between the two. In addition to low weight for age and other overt physical signs, symptoms are apathy, instability, and poorly developed motor skills (Pollitt 1980:22).

Although marasmic children may be at risk of outright starvation, the main danger to the severely malnourished lies in their diminished resistance to other disease. Should they survive these, they may well go through life permanently impaired, both mentally and in the height and weight they will ultimately attain. Although the linkages between severe PCM and brain growth and development are by no means understood, they give rise to particular concern.

Compared with its impact on pregnant and lactating mothers and the very young, the adverse effects of PCM on the other elements of a population, save the elderly, is likely to be moderate. This is because these elements are either not growing so rapidly or have stopped growing altogether and can adapt to reduced energy intake by either taking off body weight or by curtailing activity.

The human body is remarkably adaptive to reduced levels of food intake. Controlled studies among adults have shown that if caloric intake is cut to 50 percent of normal, body weight will drop within a few months by about a quarter. Thereafter a reduced level of activity can be maintained for many months before additional weight loss sets in and the incidence of nutrition-related disease rises (Keys *et al.* 1950). Thus the aftereffects among adults of war-induced privation in the Netherlands in 1944-45 and in Biafra in 1968-69 are not thought to have been lasting; and certain groups in Africa may experience with no apparent impairment significant changes in body weight in association with the preharvest hunger phenomenon. This is not to suggest that the lethargy often observed among the poor in developing countries is not an adjustment to inadequate dietaries; only that it is reversible and need only be temporary.

Estimating the Incidence of PCM Among the Young

Three approaches to quantifying the status of the nutritionally most vulnerable in a population suggest themselves: growth deficiencies among the young as monitored by anthropometry, the rates of infant or child mortality, and weight at birth. All are intuitively reasonable indicators and all seem sensitive to what we know of international disparities in levels of living. Thus the World Health Organization (WHO) estimated in the 1970s that about one-sixth of the babies born each year weighed less than 2,500 grams (about 5.5 pounds) and that 95 percent of them were born in developing countries (FAO 1977:43):

	Percent of babies weighing less than 2,500 grams at birth
North Europe	4
Western Europe	7
North America	7
Southwest Asia	10
North Africa	10
Caribbean	11
West and Central Africa	15
Tropical South America	20
Southern Asia	30

The problem is that the above tabulation is one of the few on the subject and is probably of questionable validity. Babies of the very poor in developing countries are rarely born in hospitals and even more rarely are their weights monitored by statistical services.

Nutritional anthropometry is still in its incipient stage and debate attends the standards for healthy children it should employ, the measurements it should involve--whether weight for age, weight for height, or height for age--and where the cut-off criteria should be established. Since 1983 WHO has adopted as its reference for children aged 0-60 months the median values of the standards established by the National Center for Health Statistics (NCHS) of the U.S. Department of Health and Human Services for well-nourished children in the United States, and defends this choice with the belief that children under five should follow the same growth path regardless of race. It defines as underweight those children whose weight for age falls below two standard deviations of this benchmark. In a normal distribution, 2.3 percent of preschoolers will fall below this cut-off (United Nations (ACC/SCN) 1993:II-94).

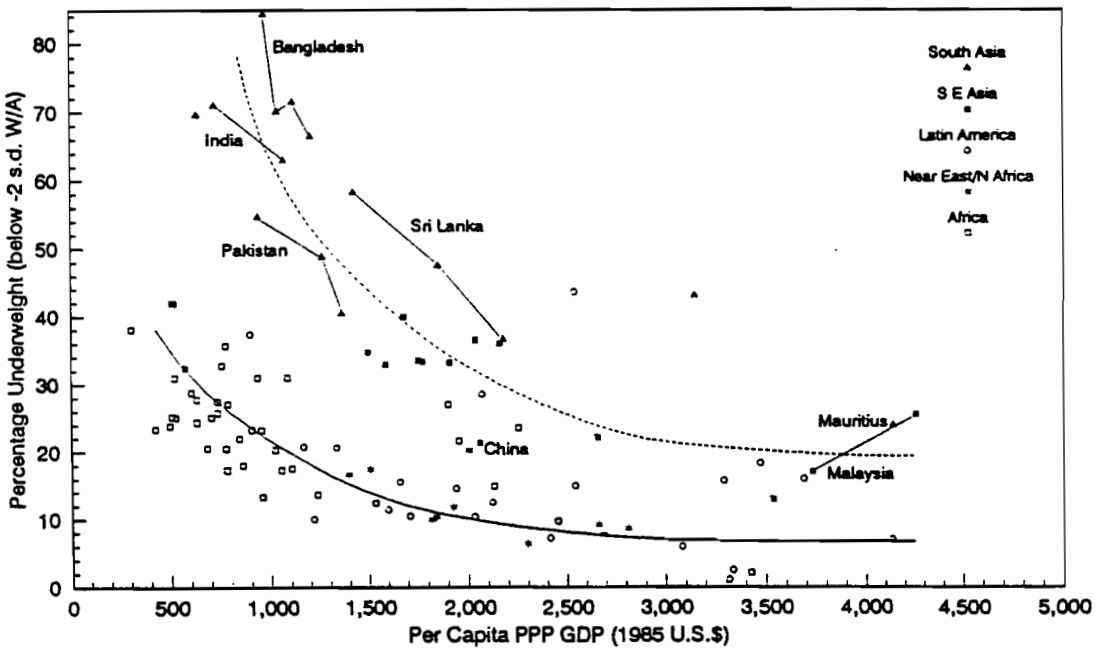
The Subcommittee on Nutrition of the United Nations Committee on Coordination (ACC/SCN) used this cut-off to evaluate the findings of 100 anthropometric studies carried out in 66 developing countries between 1975 and 1992, and concluded that while the percentage of underweight children declined from 42 to 34 percent during the period, their number rose from 168 million in 1975 to 184 million in 1990 (Table 3.1). Well over half the underweight children in both years were reported as living in South Asia.

The legitimacy of these findings is very much open to question. The relationship between the percentage of preschoolers classified as underweight and the countries' per capita income in the year in which the surveys were conducted is shown in Figure 3.5. That the percentages of underweight children is inversely correlated with income seems obvious, but the relationship would appear to be very different in South and Southeast Asia and China from that observed in other parts of the developing world. Much lower underweight percentages at given income levels were recorded in even the poorest African, Latin American, and Near Eastern countries than was the case in India, Bangladesh, Pakistan, or Sri Lanka. Indeed, the data imply that even in such prospering Asian countries as Malaysia and Mauritius,[1] children are no better off than in African countries having per capita incomes less than a fourth as high. The inference is inescapable that the NCHS standards are less applicable to southern and eastern Asia than other parts of the world and that a substantial share of the children classified as underweight there are merely--to use the phrase of one of the WHO's critics--"small but healthy" (Seckler 1982:127).

Table 3.1. Regional Prevalence and Numbers of Underweight Preschool Children, 1975-1990, as Calculated by the United Nations.

	Percent Underweight		Numbers Underweight (*millions*)	
Region	1975	1990	1975	1990
South Asia	67.7	58.5	90.6	101.2
China	26.1	21.8	20.8	23.6
SE Asia	43.6	31.3	24.3	19.9
SW Asia/N Africa	19.8	13.4	5.2	4.8
Sub-Saharan Africa	31.4	29.9	18.5	28.2
Latin America	18.4	10.5	8.8	5.8
TOTAL	41.6	34.3	168.2	183.5
Total preschoolers in developing countries			402.0	536.0

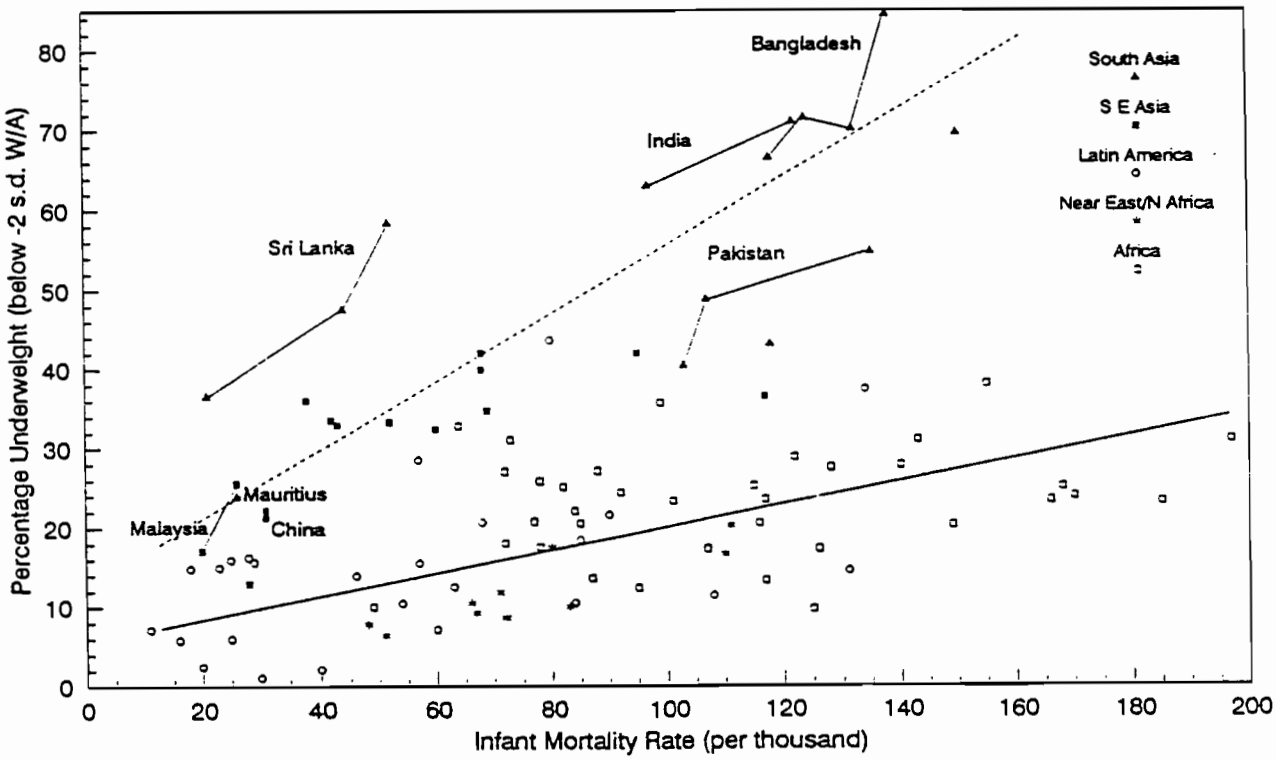
Data from United Nations (ACC/SCN). 1992. Second Report on the World Nutrition Situation. Geneva: Administrative Committee on Coordination–Subcommittee on Nutrition:I-10. Underweight children defined as those whose weight for age fell below two standard deviations of the median reference for healthy children aged 0-60 months in the United States.



Data from: United Nations (ACC/SCN). 1993. Second Report on the World Nutrition Situation. Geneva: Administrative Committee on Coordination–Subcommittee on Nutrition:II-92-94. Penn World Table (Mark 5.5). 1993. Annex to summers, Robert and A. Heston. 1991. "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950-1988." Quarterly Journal of Economics. May.

Figure 3.5. Relationship Between Underweight (Below -2 s.d., Weight-for-Age) Preschool Children and Per Capita GDP, 1975-1992

A further indication of the inapplicability of the international growth standards to eastern and southern Asia is shown in Figure 3.6, in which the percentage of children whose weight for age falls below two standard deviations of the NCHS median is plotted against the infant mortality rate reported for the year in which the anthropometric survey was carried out. That the two should be positively correlated makes intuitive sense--malnutrition is presumably implicated in a proportion of post-neonatal infant deaths--and the data suggest that the relationship is linear. But such linearity follows two very different paths. The percentage of preschoolers reported as underweight for any given infant mortality rate is two or three times higher in Asia than in other parts of the world. One can only conclude that the WHO's international growth standards exaggerate malnutrition in southern and eastern Asia by a similar factor, and that rather less than 100 million preschoolers--perhaps 15-18 percent of the global total--should actually be classified as underweight.

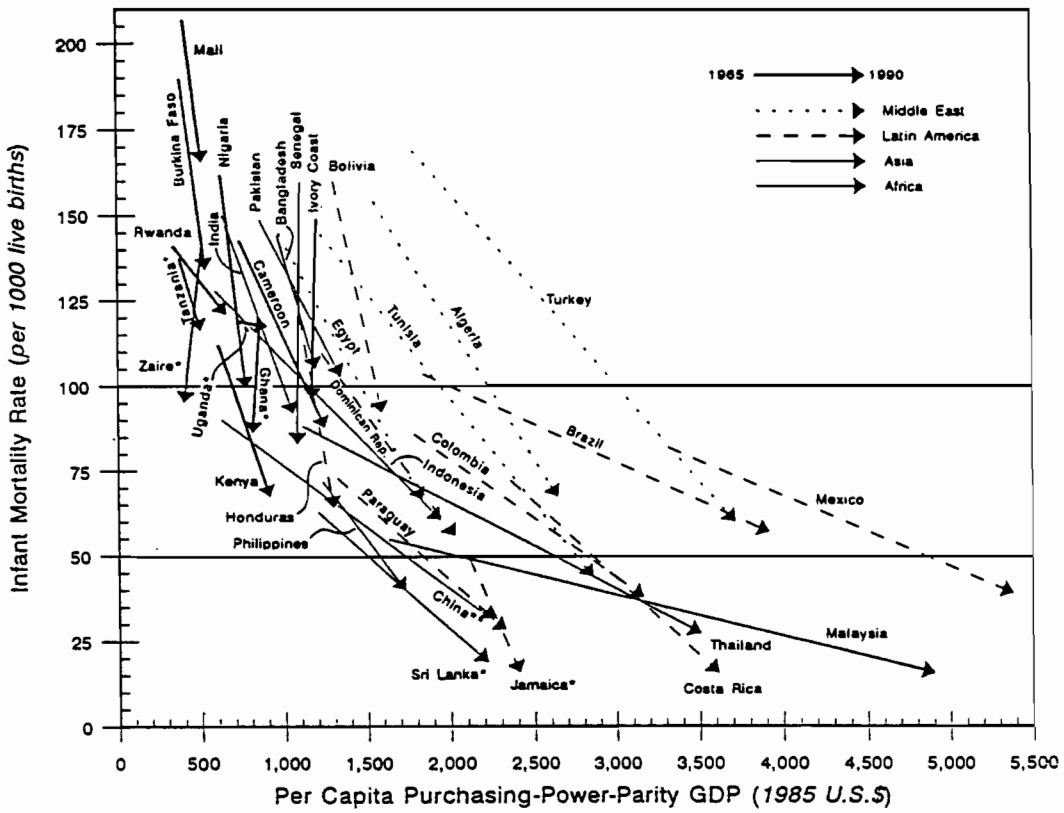


Data from: United Nations (ACC/SCN). 1993. Second Report on the World Nutrition Situation. Geneva: Administrative Committee on Coordination–Subcommittee on Nutrition:II-92-94.

Figure 3.6. Relationship Between Underweight (Below -2 s.d., Weight-for-Age) Preschool Children and Infant Mortality Rate, 1975-1992

As an indicator of changes in the nutritional status of mothers and their young, the infant mortality rate--the number of children who die before reaching one year of age per 1,000 live births--has both appeal and limitations. The limitation is that infant mortality is influenced by more than just nutritional status. The appeal is that reasonably trustworthy data of some duration are available for many countries.

It is clear from Figure 3.7, which includes countries containing over 75 percent of the population of the developing world, that infant mortality has fallen precipitously during he past quarter century. Rising incomes and improved access to food have presumably contributed to this, but it is impossible to say whether this has been of greater or lesser importance than the spread of education or enhanced public health and medical services. Whatever the case, much of Latin America is now in comparatively good shape, as are the more prosperous countries of Asia, including--impressively--China. The principal exceptions are India, Pakistan, and Bangladesh and virtually all of Sub-Saharan Africa. Here, despite declines, infant mortality in 1990 remained above or just slightly below 100/1,000.



* 1965 and *1989*. ** *1968* and 1990. + 1965 and *1988*.

Data from: World Bank. 1992. World Development Report 1992. New York: Oxford Univ. Press:272-273. Penn World Table (Mark 5.5). 1993. Annex to Summers, Robert and A. Heston. 1991. "The Penn World Table (Mark 5): An Expanded Set of International Comparisons, 1950-1988." Quarterly Journal of Economics. May.

Figure 3.7. Relationship Between Infant Mortality Rate and Per Capita GDP, 1965 and 1990.

The Special Problems of Africa and the Impoverished of South Africa

To the generalizations that overall diet quality and infant nutrition have improved in the developing world during the past half century of rapid population growth, two groups must be excepted: those living in that portion of Africa which lies south of the Sahara and north of South Africa, and the impoverished of the three countries of the Indian sub-continent.

The problem in India, Pakistan, and Bangladesh is not so much agricultural; it is largely one of poverty and insufficient effect demand. The sub-continent is one of the homes of the Green Revolution and food production in all three countries during the past several decades has increased rather faster than population growth. Were it equitably distributed, the supply of food would be adequate to feed all. But none of the countries has been able to implement a completely effective program to provide food to the poor, and continued high population growth has frustrated the incorporation of all within the process of economic growth. The outlook for those unfortunate enough to be left out is not encouraging.

Even less promising is the situation in Africa. Population growth continues there unabated and it is the only region for which the data in Figure 2.2 suggest per capita food availability has not increased in recent years, but actually declined. The extent to which this fall-off--of roughly 20 percent, if the data are to be believed--reflects reality and not merely the deterioration of the crop reporting system defies measurement. Data on food and agriculture in Africa abound with discrepancies. The reason data for Africa are not included in Figure 3.4 is that the food balance sheets for most countries show declines in both energy availabilities and starchy staple ratios--a course of dietary evolution inconsistent with any logical explanation.

The sorry story of agriculture in the newly independent states of Africa reflects many things, not the least of which has been the breakdown of law and order in a depressingly large number of countries. More important, however, has been the fact that almost every African government has for political reasons implemented measures which have acted to reduce incentives to commercial farming, including artificially low producer prices and overvalued exchange rates. A decade ago the World Bank concluded from a country-by-country study of Africa that the involvement of government in food-policy related matters was almost everywhere counterproductive and that new lending should be tied to a freeing up of the marketplace (World Bank 1984). The turnaround in the last couple of years in the food situation in Ghana is testimony to the efficacy of such steps.

But even with the right policies, there are reasons for believing that the rapid gains which characterized the Green Revolution in Asia would have been difficult to replicate in Africa. In Asia the rural population is concentrated in great alluvial floodplains; these lent themselves ideally to introduction of the package of new inputs, especially irrigation, associated with rapid technical change. Not so in Africa. The only floodplain of consequence south of the Sahara is the inland delta of the Niger, and Mali and Burkina Faso, within whose borders it falls, rank among the half dozen poorest countries in the world. Further, apart from the West African coast and the Congo basin, Sub-Saharan Africa is comparatively dry. So the fact that it has more than twice the amount of arable land per person as Asia is not too meaningful. Where rainfall is plentiful, moreover, the principal starchy staples are not the cereals, around which the Green Revolution elsewhere has been based, but roots and tubers, which have received comparatively little scientific attention. Finally, the expense and limited availability in Africa of the various components of the Green Revolution package have doubtless tempered their introduction. Transportation costs are very high. There are hardly any railroads and those that there are were located for the export of minerals, not the movement of agricultural inputs. Outside of the Congo and Niger, river transport is negligible. So transportation is heavily dependent on roads and trucks, the maintenance of which is difficult and expensive. My introduction to Africa 40 years ago was through a series of studies of how its cities were supplied with food. To me one of the saddest changes which has subsequently taken place has been the degree to which this system and the road network which supported it have broken down. Small wonder that such fertilizers and pesticides which find their way into the countryside fall far short of needs and are priced beyond the means of most farmers.

Even assuming political stability, then, the combination of very rapid population growth and slow agricultural progress does not augur well for Africa. Whether, as some suggest, the next several decades are likely to witness a rise in the death rate and perhaps even the local fulfillment of the Malthusian nightmare is an open question. Certainly without an improvement in the political scene it should not be ruled out. It is a blot on a picture which almost everywhere else is colored with accomplishment.

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Endnotes

1. Although geographically near Africa, the island of Mauritius is populated primarily by people of Indian origin.

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