Jeffrey Shotland

Extent of Malnourishment Among the Rural Poor

The rural poor experience a broad array of nutritional deficiencies. They tend especially to eat too little of fruits and vegetables rich in vitamins A and C. The rural poor consumed less of these foods than the urban poor, indicating a "rural effect," which exacerbates the nutritional problems of all the poor.

It is well documented that poverty is closely linked to high rates of nutrition-related health problems. Numerous studies have examined the nutrition and nutrition-related health status of America's urban poor, yet few have evaluated the conditions among the rural poor. As a result, a common misperception is that this less visible, dispersed population has access to an abundance of cheap food.

Jeffrey Shotland is the director of nutrition at Public Voice for Food and Health Policy, in Washington, DC. The research reported here was supported by the Rural Economic Policy Program of the Aspen Institute and by the Ford Foundation.

My examination of food consumption data from the U.S. Department of Health and Human Services' Second Health and Nutrition Examination Survey (NHANES II) revealed that the rural poor consumed lower levels of eight of nine key nutrients examined (vitamins A and C, iron, calcium, phosphorus, protein, riboflavin, and niacin) than the rural nonpoor or the Nation's nonpoor (see "About the Survey"). Only for thiamin was intake similar (table 1).

With the exception of thiamin, the differences between the rural poor and the other groups were all statistically significant (95-percent confidence level). The nutrients for which the rural poor were least likely to meet the recommended daily allowance (RDA) were vitamins A and C, iron, and calcium.

A wealth of research has shown that poor nutrition most severely affects the young. Studies focusing on the functional effects of marginal malnourishment among children have demonstrated its serious impact upon their learning, their cognitive development, and their ability to concentrate. Further, poorly nourished children miss school more often because of lower resistance to infections, and are generally less motivated learners. The effects are similar among adults: lower resistance to infection, lower work productivity, diminished capacity for prolonged physical work, and reduced worker motivation. Poor nutrition is also directly linked to increased rates of abnormally low-birthweight infants and birth defects, as well as increased rates of infant mortality.

Poverty and Rural Residence

To better understand the causes of the apparent underconsumption among the rural poor of vitamins A and C, I examined the frequency of consumption of their most significant food sources. I excluded iron consumption from this analysis because iron is widely distributed across food groups, making analysis of its consumption impractical. I compared consumption of the important food sources among the rural poor, the urban poor, and the rural nonpoor to see how urbanization of residence and poverty affected their consumption (tables 3 and 4).

Both poverty and rural residence appear to be associated with inadequate consumption of fruits and vegetables rich in vitamins A and C. Among rural resi-

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Rural poor tend to have even more chronic nutritional deficiencies than the urban poor.

Table 1—Population consuming less than 67 percent of the recommended daily allowances of nine essential nutrients

Nutrient	Rural poor	Rural nonpoor	U.S. nonpoor
		Percent	
Protein	12.3	6.7	6.2
Calcium	43.6	39.6	38.1
Vitamin A	48.0	41.6	38.7
Iron	43.6	32.2	31.3
Thiamin	24.6	22.5	23.0
Riboflavin	22.5	16.3	16.4
Niacin	23.0	14.6	13.9
Vitamin C	43.2	31.1	29.1
Phosphorus	16.2	10.7	9.4
		Number	
Sample size	1,252	3,701	11,538

Nonpoor were those with incomes of at least double the poverty threshold.

Table 2—Contributions of food groups to intakes of ...

Food group	Vit. A	Vit. C	Iron
		Percent	
Milk, cheese, etc.	11.7	2.3	1.7
Meats	1.3	2.1	23.2
Poultry	.5	–	2.3
Organ meats	12.5	.5	1.3
Fish, shellfish	–	–	2.3
Eggs	6.0	–	4.2
Fats and oils	4.5	–	–
Legumes and nuts	–	.8	3.7
Cereals	5.5	3.0	9.4
Grains, grain products	.4	.7	14.5
Fruits, vegetables	38.0	73.9	10.1
Total	80.4	83.3	72.6

– = Negligible
Based on Block et al., *American Journal of Epidemiology*, 1985, 122, p. 13-26.

dents across the age spectrum, I found that poverty was consistently related to inadequate consumption of these foods. This income-related trend was largest with regard to consumption of fruits and vegetables rich in vitamin C.

The rural poor were about twice as likely as the nonpoor to fail to eat fruits or vegetables rich in vitamin C at least weekly. The disparities were greatest among the youngest (2-5 years) and the oldest (65-74 years) groups.

The rural poor were also less likely than the nonpoor to consume fruits and vegetables rich in vitamin A, but the disparity was smaller than for vitamin C. Rural poor adolescents were the least likely to consume fruits or vegetables rich in vitamin A on at least a weekly basis (58 percent failed to do so). This income-related disparity increased with age. Although differences between the three groups were not tested for significance, given their magnitude and the large sample sizes included in the NHANES II survey, it is likely that they represent real differences in the consumption patterns of these subpopulations. The data also showed that fewer than one in six rural poor children consumed vitamin-A-rich fruits or vegetables at least three times a week. Again, adolescents were least likely to do so (10 percent).

The rural poor were also less likely than the urban poor to consume fruits and vegetables rich in vitamin C on a frequent basis. This negative "rural effect" was greatest among children, especial-

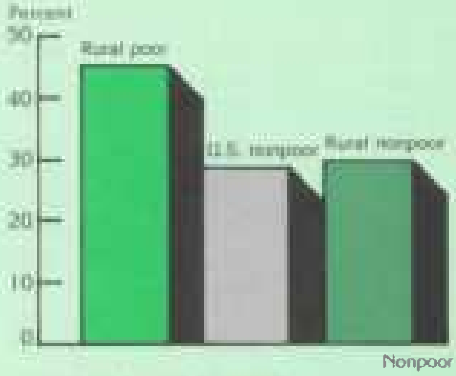
Biochemical Tests of Nutrient Status

In addition to the analysis of dietary intake data, I also analyzed data from the nutritional biochemistry component of the NHANES II survey. Because vitamins A and C and iron (no test for calcium status was available) were found to be the nutrients for which the greatest proportion of the rural poor failed to consume adequate levels, and because data for these nutrients were available, they were included in this analysis.

Biochemical tests of nutritional status, which typically involve measuring levels of specific nutrients in body fluids, provide a more direct assessment of an individual's nutritional status than can be determined from dietary intake alone.

The findings of these analyses corroborated those of the dietary intake analysis. The rural poor were consistently more likely to experience abnormally low circulating levels of each of the nutrients examined than either the general nonpoor population or the rural nonpoor. These differences were all statistically significant (95-percent level of confidence).

Figure 1
Who is deficient in vitamin A*...



*Measured by serum blood levels

Figure 2
...vitamin C

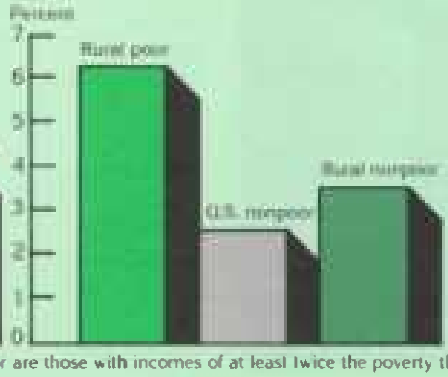
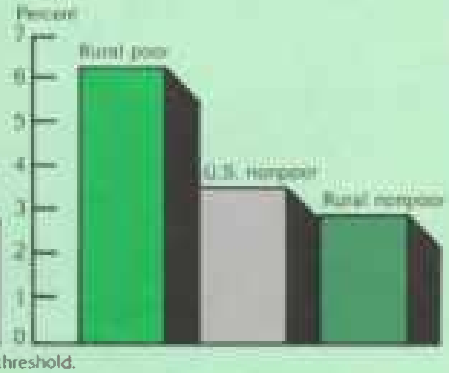


Figure 3
...and iron*



*Hemoglobin measured as iron indicator

Nonpoor are those with incomes of at least twice the poverty threshold.
Source: NHANES II

Table 3—Frequency of consumption of fruits and vegetables rich in vitamin A

Age	Less than weekly consumption			Consumption less than three times a week		
	Rural poor	Urban poor	Rural nonpoor	Rural poor	Urban poor	Rural nonpoor
	Percent					
2-5 yrs	46	33	43	87	73	81
6-11	43	36	40	84	80	83
12-20	58	45	50	90	84	86
20-45	51	41	44	84	82	80
45-64	44	32	36	78	77	78
65-74	42	43	32	78	76	77

All percentages are rounded.

Fruit and vegetable sources of vitamin A included broccoli, cantaloup, mango, apricots, papaya, peaches, watermelons, carrots, greens (collard, mustard, turnip, and kale), pumpkin, spinach, sweetpotato, and squash.

Table 4—Frequency of consumption of fruits and vegetables rich in vitamin C

Age	Less than weekly consumption			Less than daily consumption		
	Rural poor	Urban poor	Rural nonpoor	Rural poor	Urban poor	Rural nonpoor
	Percent					
2-5 yrs	27	9	12	73	64	62
6-11	23	17	15	77	68	68
12-20	34	24	23	76	67	60
20-45	30	20	20	77	67	69
45-64	36	27	17	74	61	57
65-74	35	33	15	64	65	49

All percentages are rounded.

Fruit and vegetable sources of vitamin C included avocado, broccoli, cantaloup, citrus, strawberries, brussels sprouts, cauliflower, green pepper, tomato, and greens (collard, kale, mustard, and turnip), pumpkin, spinach, sweetpotato, and squash.

ly the youngest (ages 2-5). For that age group, the effect was extreme: the proportion of poor rural children who consumed fruits and vegetables rich in vitamin C less than once a week (27 percent) was triple that of urban poor children (9 percent). Only among the oldest age group (65-74 years) was the difference only marginal.

Poor rural children 2-5 years old were more likely to consume vitamin-A-rich fruits or vegetables less than once a week than were poor urban children (46 percent versus 33 percent). Rural poor children were also more likely than urban poor children to consume foods of this group fewer than three times per week (87 percent versus 73 percent).

About the Survey

The National Health and Nutrition Examination Survey (NHANES II) was conducted between 1976 and 1980 on a national probability sample of approximately 28,000 persons, age 6 months to 74 years, from the civilian noninstitutionalized population of the United States. The survey included information on demographic variables, dietary history, dietary intake, medical history, anthropometry, hematological and nutrient biochemistry laboratory tests, as well as other health information less pertinent to this study.

The survey intentionally oversampled certain population groups thought to be at high risk for malnutrition (the elderly, the poor, and pre-school-age children) in order to improve the statistical reliability of data from these groups. Completed survey responses from 20,322 people were used in the analysis.

These urbanization-based disparities, however, did not hold for older residents. The poor rural elderly ate nearly as well with regard to these foods as the poor urban elderly.

Causes of Rural Nutritional Problems

The data demonstrate that a serious nutritional shortcoming in the diet of the rural poor is the inadequate consumption of particular fruits or vegetables. While these foods are also consumed inadequately by the urban poor, there appears to be a "rural effect" that adds to the difficulties posed by poverty alone in obtaining these foods. In particular, fruits and vegetables that are rich sources of vitamins A and C, such as dark green and deep orange vegetables, broccoli, citrus fruits, cantaloupes, tomatoes, and so on, were too seldom consumed by the rural poor. Especially for fruits and vegetables rich in vitamin C, the rural poor are more likely than even the urban poor to consume extremely small amounts.

No single factor is responsible for the poor nutrient profile I found. Poverty,

Physiological Significance of Nutrient Deficiencies

Vitamin A plays several important physiological roles. It is essential for maintaining the normal condition of mucous membranes throughout the body, a function recently recognized for its important role in providing resistance against infection, especially critical among children. It is necessary for several visual processes, for normal bone growth, and for healthy skin and tooth enamel. Vitamin A is especially needed during infancy and early childhood, when deficiency can lead to reduced nutrient absorption.

Among the most critical and only recently recognized results of vitamin A deficiency is an increase in infant and early childhood mortality, chiefly due to lowered resistance to infection among this especially vulnerable age group.

Iron deficiency also is most serious among children. The anemia resulting from iron deficiency reduces the body's ability to transport oxygen to cells throughout the body. As oxygen levels fall, cells lose their ability to metabolize energy efficiently, leading to fatigue, weakness, and dizziness.

As anemia persists, a wide range of debilitating physical and psychological conditions ensue, including decreased resistance to infections, impaired learning and cognitive development in children, and decreased work capacity. The physiological outcomes of this condition are especially detrimental to children, whose normal development depends upon their ability to keep up with their peers in the cognitive areas. With cognitive development impaired, a child's ability to develop normally and reach his or her potential is reduced. In this regard, even marginal iron deficiencies have been demonstrated to hamper a child's ability to learn at a normal pace.

Among pregnant women, iron deficiency results in a higher prevalence of low-birthweight and premature babies, fetal death, and other birth abnormalities.

Vitamin C's function as an antioxidant and as an acid are required for numerous vital physiological processes. Its best known function is in the synthesis of the connective protein, collagen. However, it is also involved in the production of the adrenal hormones epinephrine and norepinephrine as well as in the synthesis of the hormone thyroxin. It is necessary for the normal deposition of calcium for bone and tooth formation, as well as for enhancing the body's absorption of dietary iron.

In this latter role, infrequent or inadequate consumption of the vitamin, which may not show up in biochemical examinations, can result in decreased iron absorption, and, eventually, iron deficiency anemia. In addition, deficiencies can result in impaired wound healing, softening of the bones and teeth, metabolic imbalances (which lessen one's ability to cope with stress), and scurvy.

which in itself denotes the inability to purchase all basic necessities, including adequate levels of food, is a particularly critical factor. Other conditions, when coupled with inadequate income, can make it even more difficult to attain an adequate diet and good health. Many of these conditions are unique to rural life and therefore affect primarily the nutritional health of the rural poor.

Poor access to supermarkets in impoverished rural regions puts additional pressures on people's limited budgets. Supermarkets generally offer the best combination of selection, quality, and prices. A 1987 examination (by the House Select Committee on Hunger) of the availability and use of food markets of varying size found that high-poverty rural counties have fewer large foodstores than more urbanized counties, and that residents of these rural areas spend a smaller portion of their food budget in supermarkets than do residents of poor urban areas. The study also found a net loss of supermarkets from these rural counties during the 1980's. With less access to affordable and efficient foodstores, and to foodstores that carry a selection of good quality produce, impoverished rural families have less opportunity to purchase fruits and vegetables on a regular basis.

Even for those with cars, the expense of traveling the distances necessary to reach a supermarket can be significant. And since many of the rural poor lack vehicles, they are further dissuaded from shopping at a supermarket, because they often have to pay a friend or neighbor to take them. Many urban poor residents face similar problems, frequently having to take taxis or buses to get to less expensive grocery stores.

To compensate for the difficulty in reaching large foodstores, the rural poor buy much of their food from small, local markets or general stores. These stores generally do not carry a wide selection of produce because of the slow turnover, the up-front costs necessary for the purchase of refrigeration equipment, irregular demand, difficulty finding wholesalers willing to deliver relatively small quantities on a routine basis, and the perishability of these foods.

Low use of food and health assistance programs may also contribute to poor diets among the poor. The rural poor participate in and therefore benefit from these programs considerably less than the urban poor. The lower participation among rural people may be due to the distance to program offices, eligibility criteria that disqualify many (for instance, to qualify for benefits under Aid to Families with Dependent Children, most States with large rural populations require that the family have only one parent living at home), the stigma from being on the dole, which appears to be more pronounced in rural communities, and other factors. The Summer Feeding Program for Children illustrates this rural/urban disparity. Less than 5 percent of rural poor children participated

in this program in 1987, whereas participation among urban poor children was more than double that level.

* * *

The "rural effect" on dietary adequacy has gone virtually unnoticed to date. One way to alleviate dietary inadequacies among the rural poor is to design and implement nutrition education and assistance interventions better tailored to address the rural environment and limitations on access to certain foods and food assistance programs. This suggests a need for more detailed studies to specify the nature of potentially effective rural poverty-related nutrition programs. These studies would need to be specific to regions and localities, since food access and lifestyle factors differ from one area to the other.

The data suggest that rural poverty is associated with increased nutritional risk. These findings call attention to the need for unique policy options to address the nutritional shortcomings of the rural poor. In addition to reevaluating current nutrition assistance programs for their effectiveness in meeting the needs of the rural poor, new programs specifically tailored to their special circumstances and needs should be explored. A component of that might be new marketing and distribution strategies to increase access to crucial foods, like fruits and vegetables. RDP

For Additional Reading...

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Sonya Salamon

What Makes Rural Communities Tick?

Settlement patterns and cultural beliefs help explain how people relate to their communities and how concepts of community can differ. These factors play a role in how communities adjust to change. In the Midwest, for example, they suggest why many communities populated by descendants of Germans evolved differently from others populated by "Yankees" of British descent.

A traveler through the Midwest's rural countryside is struck by the contrasts in vitality between villages only a few miles down the road from one another. One village has people visibly about and a bustling main street, while its neighbor has boarded-up storefronts and little sign of residents. My field studies of Illinois farming communities, populated by typical Corn Belt ethnic groups, produces a better understanding of how ethnic heritage and cultural beliefs affect the way rural people and communities respond to the economic and demographic changes they face. Different forms of community structure provide clues to why citizens become involved in local development activities, and whether such energy can be sustained.

Many involved in community development have assumed that most rural people react in similar ways to similar events. Such a supposition would lead one to expect similar farming communities, for example, to develop along similar lines. Yet when I compared communities in the same geographical area, with similar soils and crops, and served by comparable roads connecting them to cities equally distant, I found neighboring communities with very different personalities, depending on the dominant ethnic origin of the local population. When businesses died, churches and schools consolidated, or populations declined, local rural residents responded according to priorities about their way of life, their attitudes toward farming, and the relationship of households to the community derived from ethnic heritage. Ethnic origin obviously is not the only explanation, but within

Sonya Salamon is professor of family studies at the University of Illinois at Urbana-Champaign. She is currently a visiting scholar with the Agriculture and Rural Economy Division, ERS.

Photo © by Sonya Salamon

In some rural towns, the local high school is an important contributor to social hegemony. When schools from several towns are consolidated, towns may lose part of their local identity.