11 *Health and nutrition in Mixtec Indians: factors influencing the decision to migrate to urban centres*

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In recent decades, Mexico has experienced rapid and drastic demographic, economic and sociocultural changes, which have modified both the conditions of life and the population structure. The Mexican government has made great efforts to improve education, accommodation, hygiene and food quality, and to control tropical diseases (UNDP, 1990). In 1960 the under five mortality rate was 140 per thousand; in 1988 it was 68 per thousand. In 1981 the percentage of one-year-old children with at least one disease was 50; in 1988 it was 75. The adult illiteracy rate fell from 26% in 1970 to 10% in 1985. This process of national development has been slowed by the other changes that are occurring. One such, with far-reaching effects, is the considerable migration to urban from rural areas: the urban population increased from 51% in 1960 to 71% in 1988. This has led to rapid growth of suburban areas in Mexico City, Vera Cruz, Guadalajara and other large towns (indeed, Guadalajara has a population density of 10286 per square km), where year by year the living conditions have deteriorated, become less acceptable, and less controllable. As a generalisation it seems that the worse the antecedent rural environment of the migrants, the worse the condition of their suburban settlements.

A second major problem is the worsening condition of some rural populations, among them the traditional Indian tribes or communities. Their situation has deteriorated through cultural, linguistic, historical and political isolation much more than through deterioration of their geographical environment. This second problem has led to increased interest by the Mexican government in rural and Indian populations. Several specialised institutions and programmes, to study and help these populations and monitor the changes that are occurring, have been set up. For example in 1945 the National Institute for Indian Studies was founded. In 1973 the Coplamar (coordinacion del plan nacional por zonas deprimidas e marginalizadas), a large programme for the development of poor and remote areas, was initiated, supported by the Institute of Social Security in

cooperation with the National Cooperatives. Nevertheless there still remains considerable rural–urban disparity; for example, in 1985–7 access to safe (i.e. piped) water in rural areas was only 53% of that in urban ones, and access to sanitation in rural areas only 17% of that in urban ones.

In 1983 an interdisciplinary research project was initiated jointly by the Paul Sabatier University of Toulouse, France, and the Institute of Anthropological Research of the National Autonomous University in Mexico City. Its object was to examine the relationship between nutrition, health, and urban migration, and so (of direct relevance to the present discussion) to establish the factors that influence a group's decision to continue to live and develop in its traditional territory or to migrate to urban centres, and particularly Mexico City.

Materials and methods

The Mixteca Alta (Mixtec highlands) were chosen for the study. This as a whole is an area of extreme poverty. It forms part of the mountains of western Oaxaca and settlement is at an altitude of 5000–7000 feet (1500–2100 m). The population, approximately 100 000 individuals, belongs to the Macro-mixtec family of the Otomanguean linguistic group (Munch, 1983). There are four administrative districts and two principal climatic areas. In the northern part of three of these districts and all of the fourth, the climate is semi-arid and land erosion is very severe, leading to desertification. According to historical sources, this area was very prosperous until it was devastated in the eighteenth century (Spores, 1984) and in 1630 was reported (by Bernardo Cobo) as being 'among the best lands of the New Spain'. In the southern part of the three districts with the influence of the Pacific Ocean, the climate is less dry and land erosion less severe, there is a rich tropical mountain vegetation, and agriculture has developed (for example, there are small coffee plantations in addition to the traditional farms).

The field work was planned to make a comparison of two small communities in the two zones of greatest ecological contrast: Concepcion Buenavista in the dry eroded Coixtlahuaca district, and San Pedro Yosotato on the moist Pacific edge of the Mixteca Alta. Field work in the latter in 1985–6 provided the data for the present preliminary report. In December 1986 the community of San Pedro Yosotato had a population of 600–900 people, comprising some 150 nuclear families. One third of the population migrates for several months each year to earn wages. Migration is mainly to Mexico City, but also to the town of Tlaxiaco and other parts of the country (Hendricks & Murphy, 1981). In 1985, young men started migrating to the United States to live and work for a few months. The majority of migrants from Yosotato in Mexico City live in Ciudad Nezahualcoyotl, a very poor suburb of the capital.

Field work involved several different methods of data collection. For the study of food resources and habitat usage by Dr Katz, the technique of long-term participant observation was employed. Clinical examination of a large proportion of the Yosotato inhabitants was carried out by Drs Lefevre-Witier, Martinez Maranon, Caire, and Hernandez. Samples of blood and faeces obtained from volunteers were examined partly in the field, and partly in the laboratories of haematology, virology and parasitology in Toulouse and Mexico City.

Factors predisposing to emigration

Health

According to national statistics, in Oaxaca state 32% of the mortality is due to intestinal transmissible diseases, in contrast to 14% for the Mexican nation as a whole. Oaxaca has the highest risk of intestinal contamination and complications. This situation would be expected to occur in the better-watered valleys and coastal areas and to be less likely in the mountain areas. However, our results demonstrate a similar risk in the Mixteca Alta. Table 11.1 compares our serological findings in Yosotato in 1986 with those reported in Oaxaca hospital in 1984–85, and Table 11.2 shows the prevalence of parasites in the stools of Yosotato children in 1986 compared with Tlaxiaco schoolchildren in 1985. *Ascaris* ova were present in the stools of 53% of Yosotato children (more than double the incidence in Tlaxiaco). *Entamoeba coli* were present in 34% and *Endolimax nana* in 22% of the Yosotato children but in no Tlaxiaco schoolchildren. The levels of *Entamoeba histolytica* were quite similar (15% Yosotato children, 22% in Tlaxiaco). For *Entamoeba histolytica*, confirmatory results come from the serological tests (31% positive in Yosotato, 24% in Oaxaca). Not only do the Yosotato children carry a much greater intestinal parasite load, but the serological data indicate higher levels of measles and rubella virus, the presence of *Legionella* (absent in Oaxaca) and a higher incidence of *Plasmodium*. Although levels are generally similar in the other disorders tested for, the very high incidences of salmonella, cytomegalovirus and toxoplasma antibodies give cause for concern.

The combination of our clinical observations with the results of the laboratory investigations shows the extreme liability to infection of the intestinal tract in this population, a situation which may lead to many deaths, especially in the rainy season when medical assistance or evacuation to clinics elsewhere is impossible. In addition to the risk of death,

Table 11.1. *Comparison of serological findings in Yosotato and Oaxaca hospital children*

Type of infection	1984–5 Oaxaca Hospital			1986 Yosotato		
	Number		%	Number		%
	tested	positive	positive	tested	positive	positive
Brucella	160	32	20.0	112	16	14.0
Salmonella	149	96	69.9	112	80	71.0
Streptococcus haemolysans	145	26	17.8	112	23	20.0
Legionella	—	—	—	112	13	11.6
Measles virus	160	113	76.8	80	76	95.0
Rubeolavirus	160	98	61.2	80	58	73.0
Cytomegalovirus	160	150	93.7	80	77	96.0
Coronavirus	98	97	99	80	80	100.0
HIV (LAV)	160	0	0	80	0	0
Plasmodium	162[1]	6	3.7	144	21	16.0
Entamoeba histolytica	160[2]	47	23.9	144	45	31.0
	160[1]	24	15.0	144	24	17.0
Toxoplasma	160[1]	78	48.7	144	71	50.0
	160[3]	6	3.7	144	5	3.4

[1] Assay by IIF.
[2] Assay by IHA.
[3] Assay by immune response.

Table 11.2. *Evidence of parasites found in stools*

Parasites	1985 Tlaxiaco schoolchildren			1986 Yosotato children		
	Number		%	Number		%
	tested	positive	positive	tested	positive	positive
Entamoeba histolytica	112	24	24.5	292	43	15.0
Ascaris	112	23	20.5	292	156	53.0
Trichocephales	112	4	3.5	292	3	1.0
Giardia Lamblia	112	8	7.0	292	32	11.0
Ancylostomoides	112	0	—	292	5	1.5
Entamoeba coli	112	0	—	292	100	34.0
Endolimax nana	112	0	—	292	64	22.0

parasite loads of this degree enhance the risk of associated diseases and impose a chronic reduction in functional efficiency and work capacity on both the individual and the population. These findings in Yosotato are understandable in view of the living conditions. All families live on steeply sloping hillsides, with unstable and muddy soil. All the houses are built of wood and are very damp. Food is usually prepared on the ground without any hygienic precautions or boiling of water, except in rich families. There are no toilets and no social control of defaecation, most of which occurs around the houses. The resulting soil contamination is a principal source of the high health risk.

So far there has been no real effort to change these conditions. Two projects concerned with public hygiene have been initiated in the community. In 1975 a few latrines were built by some families; in 1983 the elements of a running water system were installed, and the first pipes and taps came into operation in 1986. There is no technical assistance brought to the village from outside, and the transport of any building materials on the local tracks is difficult and costly.

Access to health care is poor. The closest rural dispensary is located in a neighbouring village three miles away. A physician and nurse visit Yosotato but very infrequently. At their clinic, free examinations and medication are provided, but the experience and training of the staff are quite limited. The physician usually comes immediately after leaving medical school to spend two years carrying out the 'social service' required to receive the final medical diploma. His integration with the local population depends on how he accepts working in such a poor area and on his dedication to his profession. The nurse is a young woman from the community who was trained locally by the doctor.

Recognising these limitations, many people of Yosotato seek assistance elsewhere. Some visit the Tlaxiaco dispensary, which is better equipped. If they have enough money, they go to a private doctor at Tlaxiaco or Putla, the main town of the neighbouring district. If they have relatives living in Mexico City, they go there to visit a private doctor, dispensary or hospital. If long courses of treatment are required, they stay in the city until they are cured, a common practice among elderly people whose children have migrated to the city.

Simple improvements to the housing conditions, cooking methods, together with some basic education in hygiene, would reduce the health risk from faecal contamination, but year after year virtually no new initiative has come either from within the community or from outside. But the population of Yosotato is beginning to understand better the lethal risk from intestinal (and other) diseases, they are beginning to understand that prevention is possible, and they know that treatment is available elsewhere.

This they are learning from what they see on their television screens. The decision of many to look elsewhere for improvement of their health is understandable.

Food resources

In the difficult but lush environment of San Pedro Yosotato, the people cultivate small plots and kitchen gardens (0.25–3.0 hectares) and yields are not very high. Traditional subsistence crops (beans, squash, several varieties of maize) as well as other food plants are raised, and there are numerous fruit trees. Gathering of wild plants plays an important part in subsistence, most being weeds collected in the course of agricultural work and consumed as greens. Most families raise pigs and poultry, but only a few have goats, sheep or cows. Hunting and insect gathering occur from time to time. Coffee, introduced at the beginning of the century, is well adapted to the subhumid slopes and is cultivated as a cash crop.

The traditional agriculture and the occurrence of rainy and dry seasons produce a very marked seasonality in the subsistence pattern, with an alternation of times of scarcity and plenty. Maize, beans and squash, sown in May at the beginning of the rainy season, are harvested between October and January depending on the altitude. The minority of families who hold smaller irrigated lands obtain a second crop from them in June, which provides their food at the beginning of the rainy season. Maize is very scarce until the crop matures at the end of the rains, so August and September are called 'months of hunger'. A second period of severe food shortage is February–March. In this period the diet was traditionally limited to peppers, insects and larvae, and edible plants collected in the fields or the forest. In the July–August scarcity period this fall-back diet was supplemented with mushrooms and wild seeds, which are plentiful during the rainy season. There are thus two periods of food shortage each year, and most families are self-sufficient in staples for only three to five months. About 1930 two changes occurred. Up to that time, in the dry season the people of the community used to work temporarily in the neighbouring haciendas, which disappeared in the 1930s. Secondly, by about 1930 coffee production was well established; it brought about a change in the farming calendar and permitted an improvement of the diet, particularly during February–March. Coffee is harvested in the dry season from October to March, so that from its sale eggs and meat, the most precious foodstuffs in the Mixteca Alta, can be purchased for two or three months. A recently introduced cooperative system of coffee production and marketing has consolidated this change in the annual diet.

Thus today the people obtain money during the dry season from coffee production and from their relatives who have migrated, and this allows them to buy staples. If they have enough money, they immediately consume the grain that they buy, and keep their own crops for the rainy season. In the rainy season, even people who have money experience shortages for they find it difficult to bring food from outside, since the mountain tracks become very bad. Even today, in order to cook enough daily tortillas, the housewives mix mushrooms or bananas in with the maize dough; older people recall a similar use of flour from acorns, mango seeds and banana roots. In the rainy season also, the very abundant wild greens often replace beans, mushrooms are cooked in the same way as meat, and the daily chili sauce is made without tomatoes. In the dry season of plenty, several religious and civil festivals are celebrated, with abundant meals. Animals may be killed and eaten. Formerly the Yosotato people used to sell lard and eggs in order to get money. Today they consume more meat, lard and eggs than they produce. Thanks to the income from the coffee, a number of families eat these products regularly in the dry season, but in the rainy season these foods become a real luxury because of the lack of money and difficulty of transportation.

Thanks to its coffee production, this community as a whole is in a better socioeconomic situation than most rural areas in southern Mexico, as is shown for instance in the higher consumption of eggs and meat. The complex traditional use of the habitat, combining polyculture, gathering, and a little animal raising and hunting, allows for a diversity in food resources over and above the diet of maize, beans and chili peppers (Casas *et al.*, 1987). The results of our study at a family level, however, show that cash crop production, besides its benefits, accentuates the economic differences deriving from inequality in land tenure. In 1986 most families harvested about one tonne of coffee per year, and produced staples for 3–6 months; they ate meat once a week and eggs three times a week during the dry season. Some families who had extra income from trade or salaries in the cooperatives produced over 2 t of coffee and enough staples for the whole year; they ate eggs and meat more frequently, and often included festive foods in their daily diet. By contrast some families produced less than 0.5 t of coffee and had to work for the richer ones, and ate eggs and meat less often. Table 11.3 sets out levels of production, income and food consumption, and shows how these variables combine to differentiate three status levels of wealth and health. These differences are more pronounced in the rainy season, since the poorer people cannot store as much food in advance.

In Yosotato, coffee production has for years been beneficial for the community. Food production and supply has improved through the development of a cash economy. It has brought about a solidarity and the

Table 11.3. *Levels of wealth as defined by combining items of production and consumption*

	Status 1	Status 2	Status 3
Coffee production: tonnes of coffee sold to the cooperative market.	2	1.5	0.5
Staple production: comparative production of staple food.	+++	+++	+
Extra income: comparative importance of extra income such as salaries.	+++	+	+
Meat consumption:cannot be evaluated in terms of weight but by frequency (no. of times eaten per week).	1–5	1	0.5
Eggs no. of times eaten per week.	3–7	3	3
Festive food: consumption is frequent and abundant for people of status 1, infrequent for others.	+++	+	+

recent establishment of a cooperative is an example of successful local management. It has improved marketing, returns and supplies, for it is able to deal more efficiently with the centralised Instituto Mexicano del Cafe. On the other hand, it has generated socioeconomic heterogeneity among the villagers because of the differences in size of land holding and because some families have to work for others and to give up the traditional collection of edible plants. Thus the nutrition of many families, particularly those of the lowest status, is now linked to the fluctuation of the coffee market and to the diseases of coffee which can ruin a crop. If any important problem affects the coffee harvest and disposal, it is to be expected that possibly half the inhabitants of Yosotato will move to the town, probably to Mexico City.

Discussion

The improvement of the diet as a result of producing and selling coffee offers to some of the Mixtecos a good chance of continuing to exist satisfactorily in this area. However, this improvement is limited by the epidemiological load of intestinal parasites and transmissible diseases. This load not only generates local conditions that increase morbidity and mortality, but it also diminishes productivity, diverting more of the food consumed to the support of the parasites, and it causes permanent malabsorption of nutrients due to local inflammation and other intestinal changes.

Our findings may be summarised in the form of a balance sheet. On the debit side Yosotato has the highest prevalence of intestinal parasites so far

observed anywhere in Mexico. The conditions of hygiene are deplorable. The growth of children is delayed. There is no health centre and no permanent medical or nursing staff. The roads are bad, leading to isolation especially at those times when communication is most needed. On the credit side there are the favourable geographical conditions, with the humidity of the Pacific slopes, the rains and the consequent rich vegetation and suitability for cultivation in the area. The people have an excellent knowledge of the local ecosystem, to which the traditional pattern of exploitation is well adapted. The production of coffee for cash provides the key to unlocking the shackles of subsistence level of living. The interaction of these three positive elements leads to the possibility of food availability throughout the year.

Overall, then, this balance is far from negative. There seems no real reason why, given attention to the facts demonstrated in this study, the Mixtec 'people of the clouds' in this region should suffer the same fate as others elsewhere in the Mixteca Alta, where aridity and soil erosion are severe, there is gross undernutrition, and half of the population has already migrated to Mexico City. The ambitious Coplamar project endeavoured to help too many communities, and had to cease part of its activities following the oil crisis of some ten years ago. For a number of years the Mixtecos themselves have supported the idea of a cooperative Mixtecan development project to modernise local production and the economy, in order to escape the 'social privations' to which they and so many other Indian populations are subject. In 1987 such a development project was offered to them by the Oaxaca State Government under the name of Lluvia, Tequio y Alimentos (rain, community work and food). Its goals are to regenerate the soil, to extend irrigation, and so to produce more food using improved seeds and improved technology. This project has every chance of success, provided that it takes into account the factors and their interaction pointed out in this study.

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