Social inequalities and health in rural Chiapas, Mexico: agricultural economy, nutrition, and child health in La Fraylesca Region

Desigualdades sociales y salud en Chiapas, México. Economía agrícola, nutrición y salud infantil en la región de La Fraylesca

Héctor Ochoa-Díaz López [1]
Héctor Javier Sánchez-Pérez [1]
Magdiel Ruíz-Flores [1]
Michael Fuller [1]

[1] *Departamento de Epidemiología y Salud Pública, División de Población y Salud, El Colegio de La Frontera Sur (Ecosur). Carretera Panamericana y Periférico Sur s/nº, C. P. 29290, San Cristóbal de Las Casas, Chiapas, México. hochoa@sclc.ecosur.mx*

Abstract   *The objective of this study was to investigate the association between farmers' socioeconomic conditions and their children's health in La Fraylesca, Chiapas. Data were collected using a cross-sectional survey of 1046 households (5546 individuals) sampled from locations in two counties situated in the study area. The survey included anthropometric measurements, a 24-hour dietary recall, stool tests, and childhood mortality data. Children of private farmers and "wealthy peasants" displayed better nutritional status, higher quality diet, lower prevalence of intestinal parasites, and a lower risk of dying than those whose parents were communal farmers, from ejidos, or "poor peasants". The results suggest that using volume of maize production as a classification method proved more valuable than land tenure to identify agricultural groups with different health status. It appears that the main determinants of health differentials are structural inequities in resource distribution. Thus, the impact of medical interventions on inequalities will be limited unless they are accompanied by redistribution of resources.*
Key words   *Social Conditions; Child Health; Rural Health; Nutritional Status; Anthropometry*

Resumen   *El objetivo de este trabajo es investigar la relación entre las condiciones socioeconómicas de los productores agrícolas y la salud de sus hijos en La Fraylesca, Chiapas, México. Los datos se recopilaron mediante una encuesta transversal de una muestra de 1046 hogares (5546 individuos) de dos municipios del área de estudio. La encuesta incluyó mediciones antropométricas, recordatorio alimentario de 24 horas, exámenes coprológicos y datos sobre mortalidad infantil. Los hijos de productores privados y campesinos "ricos" presentaron mejor estado nutricio, mejor dieta, prevalencias más bajas de parásitos intestinales y menor riesgo de morir que los hijos de ejidatarios/comuneros o campesinos "pobres". Estos resultados sugieren que el volumen de producción de maíz es mejor indicador que la tenencia de la tierra para analizar desigualdades en salud y nutrición. Los principales determinantes de dichas disparidades pueden encontrarse en las inequidades en la distribución de los recursos. De modo que el impacto de intervenciones médicas en las desigualdades será limitado, a menos que se acompañen de una redistribución de recursos.*
Palabras clave   *Condiciones Sociales; Salud Infantil; Salud Rural; Estado Nutricio; Antropometría*

Introduction

The *Zapatista* rebellion beginning on the first day of January 1994 awakened Mexico to the neo-liberal policies of globalization of capital, the weakened role of the state, and the privatization and concentration of industries, formally initiated that same day under the North American Free Trade Agreement (Nafta). The rebellion brought into sharp relief the extreme polarization and social exclusion of rural *campesinos* and indigenous peoples in Mexican society. It was no accident that the rebellion began in the State of Chiapas, where peasants in rural areas exhibit the sharpest contrasts in living standards and health conditions (Sánchez-Pérez et al., 1995). For example, Chiapas has the highest morbidity and mortality rates in all of Mexico for the main infectious diseases: in 1992, the malaria rate was eight times higher than other malarial areas of Mexico, while prevalence of tuberculosis was three times higher (SSA, 1993a); mortality rates from diarrheal infections for children under five years of age were also three times higher (CAE, 1991; SSA, 1993b). In 1991, nearly 50% of households in Chiapas lacked piped drinking water and toilet facilities (Inegi, 1990).

The health delivery system is divided between the public and private sectors. Between and within each sector there are many inconsistencies in quality: between urban and rural areas; by the various public clinics and hospitals organized for blue- and white-collar workers, *campesinos*, and the uninsured; and between the Mexico City metropolis and the rest of the country. As a result, in 1995 Chiapas had the lowest number of available hospital beds and medical consultations in Mexico (by general practitioners and specialists), was the second lowest in the number of clinical tests and X-rays per inhabitant, and was the third lowest in the percentage of attended births per 1000 fertile women (SSA, 1995), while fewer than 60% of the population had access to basic medical services (SSA, 1992). In 1995 one out of two Mexicans were covered by social security benefits, while only one out of five inhabitants were covered in Chiapas (SSA, 1995).

There is strong evidence to suggest that the low standard of living and poor health and nutritional status in Chiapas, particularly amongst the peasant population, are partially due to the fact that this State did not participate in the agrarian reforms initiated after the Mexican Revolution. This has prolonged an unequal social structure focused on the land tenure system (García de León, 1996). Landless laborers and peasants tilling marginal land suffer over-exploitation and are excluded from the benefits of basic health services, all of which is aggravated by an unstable employment market and disastrous migration flows (Espinoza-Cortés, 1995). On January 1, 1994, government agrarian policies were proved a dismal failure by the indigenous rebellion of the *Zapatista* National Liberation Army (EZLN).

While previous health studies have concentrated primarily on the comparison of urban and rural areas, this study focuses exclusively on rural areas from a region in the State of Chiapas (La Fraylesca), where we examine the contrast in health and nutritional status amongst children of various agricultural groups under different socioeconomic conditions. Identifying vulnerable children at greater health risk is particularly important for the development of a sound social and health policy (Hayes, 1991).

The objective of this paper is to examine the association between farmers' socioeconomic conditions and their children's health in La Fraylesca, Chiapas. This is expected to highlight the public policy implications of the agrarian law reforms passed during the last Presidential Administration of Carlos Salinas de Gortari (1988-1994). Within the present context, the findings could be relevant for future peace negotiations between the federal government and the EZLN. The Chiapas conflict is basically one of inequality in agriculture, and this paper presents a practical approach to the problem using epidemiological and socioeconomic classificatory methods that can prove useful for health planners and policy-makers.

The paper is organized as follows: we begin by presenting the agricultural and socioeconomic characteristics of the study area in La Fraylesca and the disparities between the various *municipios* (district or county administrative units) comprising the region. Next, we provide a description of the methodology used for classifying agricultural groups. The results are presented in four sections: differentials in childhood mortality between agricultural groups, nutritional status for children 0 to 4 years old, diet for children aged 1-4 years, and level of intestinal parasitic infection amongst children 1 to 4 years old. Finally, the principal findings are discussed in terms of the methods used and their implications for health policy.

The study area: the La Fraylesca region

La Fraylesca is situated in the Soconusco mountain range and the flat central valley, parallel to, but not including, the Chiapas coastal low-

lands (Figure 1). It comprises four *municipios* with a total population of 182,992 people, of whom half live in rural areas. Just over forty-three percent of the total are under 15 years of age (Inegi, 1990). The study focuses on two *municipios*: Angel Albino Corzo (formerly Jalte-nango La Paz) and Villaflores. For years, La Fraylesca has been called the "breadbasket" of Chiapas because agriculture is the main economic activity. The region is an important pro-

ducer of maize, beans, dairy products, meat, vegetables, and fruits. Total maize production is second only to the highly productive Central Valley region. Villaflores is the wealthiest *municipio* and has the largest number of livestock in the region. In La Fraylesca a capitalist agricultural economy and a peasant economy co-exist. The agricultural sector of La Fraylesca fairs better and is more modern than other poverty-stricken regions of the State. For exam-

Figure 1

Study area. La Fraylesca Region, Chiapas, Mexico.
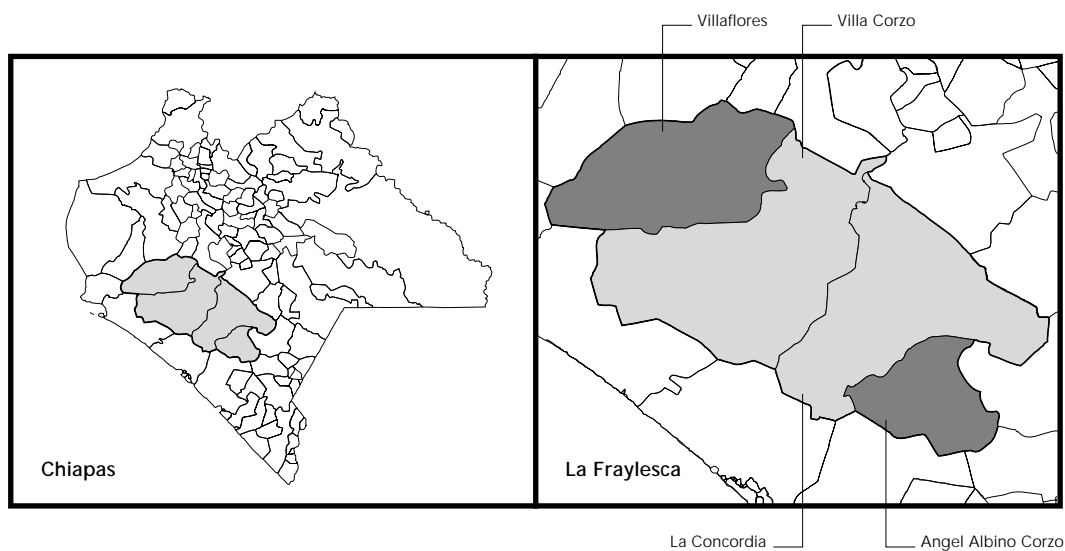
ple, La Fraylesca has more fertile land, better irrigation systems, uses more agrochemicals, and has more access to farm credit and technological support than the highlands region of Chiapas (Pohlenz-Córdova, 1994). The so-called "agricultural modernizing model" as applied to La Fraylesca has created a heterogeneous agricultural structure of disparate incomes and social inequalities. Small and medium landowners predominant, ranging from subsistence family plots to simple farms partially integrated into the market economy. Farmers have adopted different survival strategies, some even traveling to other regions of the State, resorting to salaried work as their main source of income (Ordoñez-Morales, 1983, 1984, 1989; Montoya, 1989; Villafuerte-Solis & García-Aguilar, 1995).

There are striking differences in living conditions between the various *municipios* of La Fraylesca. For example, in 1990 the illiteracy rate in Villaflores was 23%, whereas in Angel Albino Corzo it was 36%. The percentage of households in Villaflores with no access to electricity was 11% and in Villa Corzo it was 22%, while lack of sewage disposal facilities was 33% and 47% respectively (Conapo, 1990). The population of La Fraylesca is poorly covered by the different public health services. In 1995 only 55% of its population was covered. Of the 55% covered, government health services (Secretary of Health) accounted for 32%, while the combined social security institutions (including the solidarity program, a poverty-relief scheme) totaled 23%. Use of private services including doctors (the health professionals most widely consulted) and pharmacies is high at 42% (Ochoa-Díaz et al., 1995).

Methods

Data were collected using a cross-sectional survey of 1046 households (5549 individuals). The sample was drawn from a three-stage stratified cluster sampling scheme. Half of the households sampled were from towns and villages in the *municipio* of Angel Albino Corzo, and the other half were from Villaflores. The sampling fraction was approximately 6.0% of the total population of the two *municipios*. The main criterion for choosing these two *municipios* was that they represented the worst (Angel Albino Corzo) and best (Villaflores) socioeconomic conditions in the region. The survey of preschool children included anthropometric measures, a 24-hour dietary recall, stool tests for intestinal parasites, and childhood mortality data.

Nutritional status was measured using three indices: height-for-age, weight-for-age, and weight-for-height. Prevalence of malnutrition was defined as the proportion of children below -2 standard deviations of the WHO/NCHS reference values (WHO Working Group, 1986). The sample for the 24-hour dietary recall survey included the youngest child of the household between 1-4 years of age. We used standardization procedures in the collection of the dietary data: a short recall period (24 hours) and an interview with the child care provider. To measure amounts of food we used standards such as plates, glasses, cups, and spoons. The nutrient content of food was estimated using food composition tables adjusted for the region from Quintín-Olascoaga (1970) and Hernández (1987).

The sample of children for the stool examination survey included all children (1-14 years old) from every fourth household (selected by systematic sampling) from the 1046 household sample.

Mortality data were collected from women 15-49 years of age who had had one or more children. Data included information on the number of their children who had died.

Classification of agricultural groups

Two methodologies are used in this study to define agricultural groups: one is based on land tenure, and the other relies on the volume of maize production per year (from the previous year of the survey). The first classification includes two broad sub-groups: *ejidos* along with communal land peasants, and private farmers. The *ejido* is similar to communal land except that it is divided into smaller plots and is tilled by individuals. *Ejidos* and communal land peasants produce low yields and rely almost exclusively on rainfall and primitive technologies. The private farmers, on the other hand, obtain higher yields due to their more fertile lands and the implementation of better irrigation systems and modern technology.

The second method to categorize agricultural population defines three groups of peasants according to their maize yields: "poor peasants", those producing less than four tons of maize in the previous harvest; "middle peasants", those producing four to twelve tons; and "rich peasants", those producing over twelve tons. Distinct groupings were found analyzing the estimated standard deviations of the crop yield data that roughly corresponded to groupings used in similar studies (Miranda & Ortega, 1995). This classification scheme expresses two

key concepts: the size of a plot of land and (by measuring maize production) the amount of investment inputs in the production process (capital and labor employed). Volume of maize production depends on both the size of the plot and the amount of labor employed and the use of machinery and technology.

Results

Childhood mortality

As measured by the proportion of mothers (15-49 years of age) with deceased children, and analyzed by both land tenure and volume of maize production, children of households with private farms and those of "rich peasants" showed a lower risk of dying than children from households with *ejido/*communal lands and those of "poor peasants". Figure 2 shows marked disparities between land tenure and socioeconomic groups. For instance, the prevalence rate of mothers with deceased children from households on *ejidos* and communal farms was more than one and a half times higher than that of private farms (p < 0.05). Differences between socioeconomic groups are even more pronounced: for "poor peasants" the prevalence rate was almost three times that of "rich peasants" (p < 0.01).

Nutritional status of children (0 to 4 years old)

The proportions of malnourished children among the overall population for height-for-age, weight-for-age, and weight-for-height were 31.6%, 19.8%, and 6.8%, respectively. Children from households on private farms or of "rich peasants" displayed better overall nutritional status (Figures 3 and 4). Prevalence of stunting (low height-for-age), associated with chronic malnutrition, was 1.3 times higher for *ejidos* or communal farms as compared to private farms (p = 0.07), while for "poor peasants" it was 1.7 times that of "rich peasants" (p = 0.05). Prevalence of underweight children (low weight-for-age) from *ejidos* or communal farms was 1.4 times that of private farms (p = 0.07); for "poor peasants" it was 4.3 times that of "rich peasants" (p < 0.01). Prevalence of wasting (low weight-for-height), associated with acute malnutrition, was 3.8 times higher for *ejidos* and communal farms than for private farms (p < 0.01), while for "poor peasants" it was 2.3 times higher than for "rich peasants" (p = NS).

Figure 2

Mothers (15 to 49 years old) with one or more deceased children by land tenure and socioeconomic groups, La Fraylesca, Chiapas, 1995.
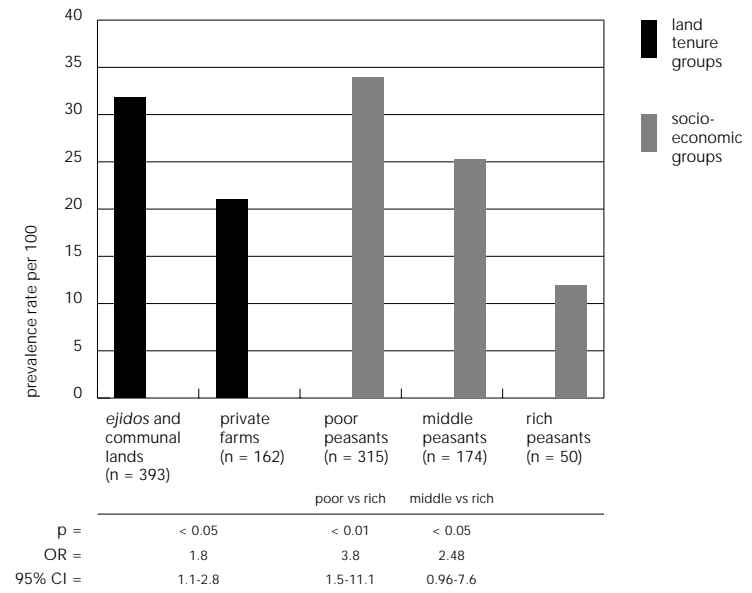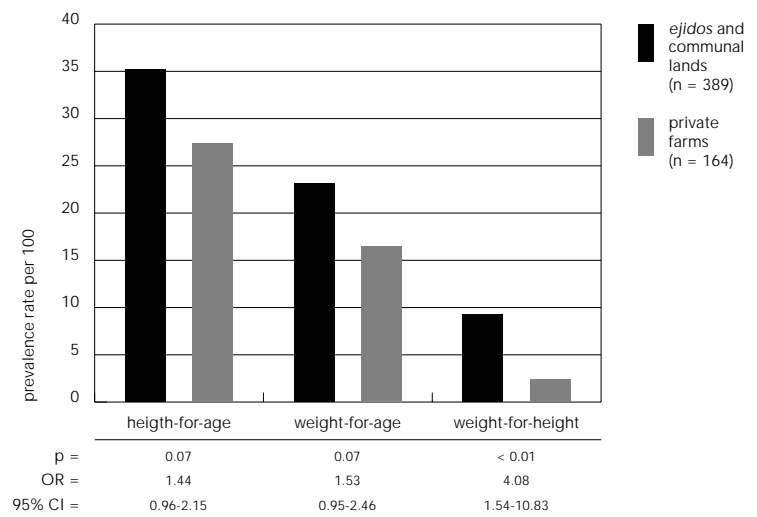

		poor vs rich	middle vs rich
p =	< 0.05	< 0.01	< 0.05
OR =	1.8	3.8	2.48
95% CI =	1.1-2.8	1.5-11.1	0.96-7.6

Figure 3

Prevalence of malnutrition* among children (0 to 4 years old) by land tenure groups, La Fraylesca, Chiapas, 1995.

	heigth-for-age	weight-for-age	weight-for-height
p =	0.07	0.07	< 0.01
OR =	1.44	1.53	4.08
95% CI =	0.96-2.15	0.95-2.46	1.54-10.83

* % of children below -2 standard deviations of the WHO/NCHS reference values (WHO Working Group, 1986).

Figure 4

Prevalence of malnutrition* among children (0 to 4 years old) by socioeconomic groups, La Fraylesca, Chiapas, 1995.
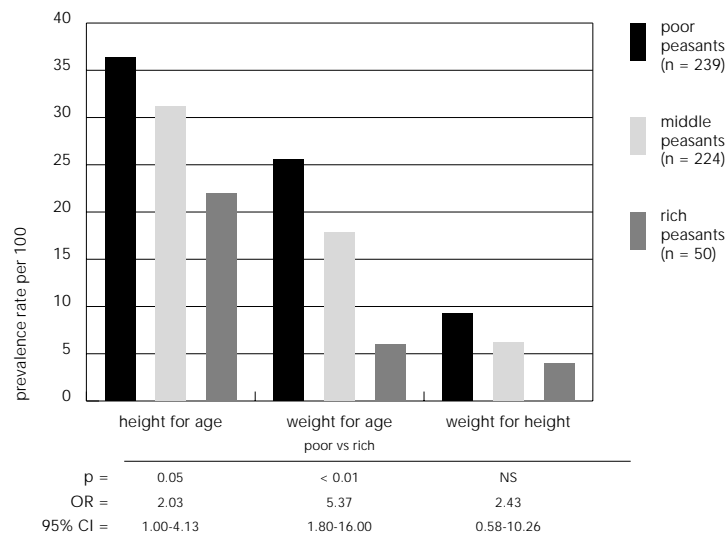
p =	0.05	< 0.01	NS
OR =	2.03	5.37	2.43
95% CI =	1.00-4.13	1.80-16.00	0.58-10.26

* % of children below -2 standard deviations of the WHO/NCHS reference values (WHO Working Group, 1986).

Dietary Survey (1 to 4 years old)

The results show that in general, children's intake of both energy and protein was inadequate (Figures 5 and 6). Most of the energy in the children's diet came from corn-based dishes and sugar. Beans and corn were the main sources of protein.

The two most frequently consumed food groups (from the previous day of the interview) by children were sugar (98%) and corn dishes (93%), while eggs (43%), fruits (43%), vegetables (44%), meat (45%), and milk (60%) were less frequently consumed. Of the five selected food groups analyzed (maize, eggs, beans, milk, and meat), striking disparities in consumption were observed among the three peasant groups and between the land tenure categories (Figures 5a and 5b). The children of "poor peasant" households consumed more corn (p < 0.01) and beans (p < 0.05) than those in either the "middle peasant" or "rich peasant" categories. Meanwhile, the "middle" and "rich peasants" consumed more milk (p < 0.01) and meat (p < 0.0001). The same trend was observed when comparing *ejidos*/communal lands and private farms.

Foods of animal origin were scarcely consumed by any of the agricultural groups, as reflected in the low average animal protein in-take of children of all groups. There were striking disparities in the average animal protein intake between agricultural groups in both classifications used. For example, mean consumption of animal protein among children from private farms was 1.7 times that of children from *ejidos* and communal farms (p < 0.001), while for children of "rich peasants" it was twice that of children of "poor peasants" (p < 0.001) (Figure 6).

Intestinal Parasitic Infections (children 1 to 4 years old)

Intestinal parasites are common in preschool children, as measured by stool tests. The main parasites identified were protozoans, such as *Entamoeba histolytica* and *Giardia lamblia*, and roundworms, such as *Ascaris lumbricoides*. In general, children of "heads of households" who were *ejido* or communal farmers or were in the "poor peasants" category had a higher prevalence of multiple intestinal parasites (Figure 7). To illustrate, children of "poor peasants" had a prevalence rate of multiple intestinal parasites almost three times that of children of "rich peasants". Prevalence rates for the entire population (agricultural and non-agricultural groups) for specific parasites such as *E. histolytica* are quite high at around 40 percent. While all groups are affected, children of households from *ejidos* or communal farms or "poor peasants" are at an even greater disadvantage: their rates were three and four times, respectively, those of private farms or "rich peasants" (Figure 8).

Discussion

The results of this study provide evidence of inequalities in the health and nutritional status of preschool children from different agricultural groups living in the two *municipios* under study in the rural areas of La Fraylesca, Chiapas. Comparisons of childhood mortality, nutrition, diet, and parasitic infections for children of households from *ejidos*/communal farms and private farms show an association between land tenure and health and nutritional status. Categories based on volume of maize production are also associated with health and nutritional status, and to a greater degree. These findings are remarkably consistent with those of previous studies carried out at other sites in Mexico and elsewhere in Latin America (Laurell & Blanco-Gil, 1977; Victora & Vaughan, 1985). A classification scheme based on volume of maize production (as compared to land

Figure 5a

Average intake per food group among children (1 to 4 years) by land tenure groups, La Fraylesca 1995.
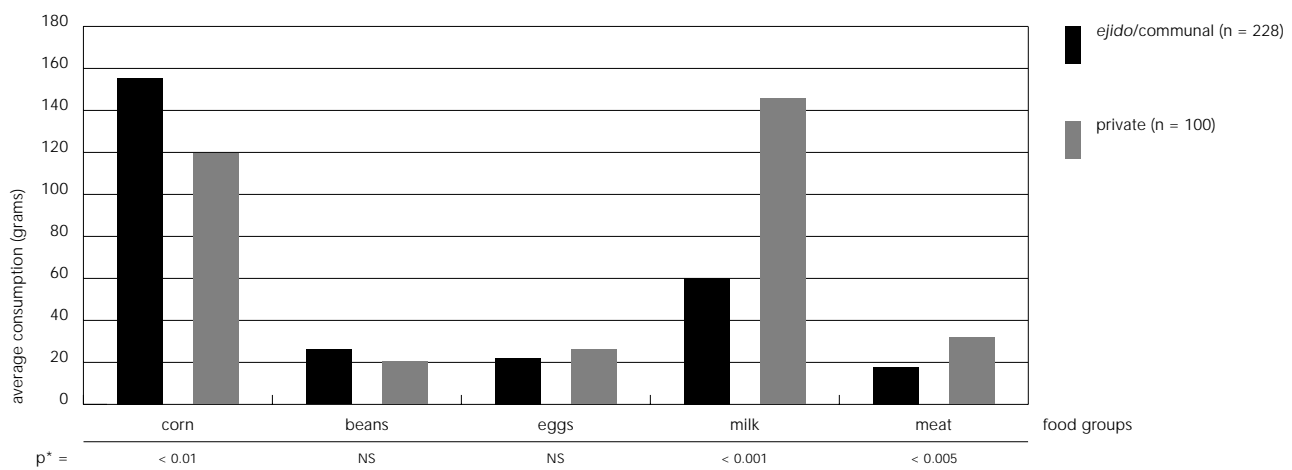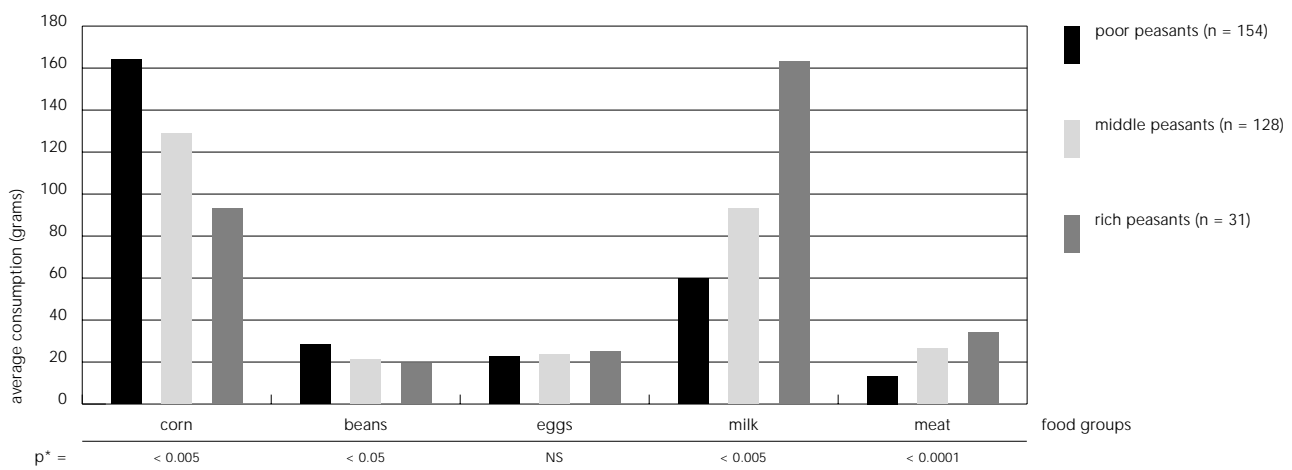

| p* = | < 0.01 | NS | NS | < 0.001 | < 0.005 |

Figure 5b

Average intake per food group among children (1 to 4 years) by socioeconomic groups, La Fraylesca 1995.

| p* = | < 0.005 | < 0.05 | NS | < 0.005 | < 0.0001 |

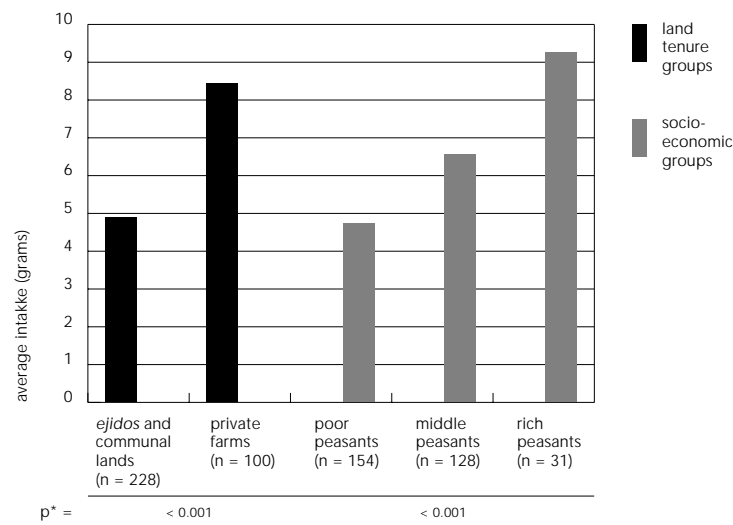* Non-parametric ANOVA Kruskal-Wallis test.

tenure) has allowed us to more precisely characterize the material circumstances of the different groups of peasants living in the region.

As with the typology proposed by the *Comisión Económica para la América Latina* (Cepal, 1986) to differentiate between groups within the agricultural sector, ours is also based on the idea of the capacity of a productive unit to regenerate its production over a specific period of time. However, while Cepal's typology

bases its measures of regenerative productive capacity on the size of a plot of land, our typology is based on the volume of maize production and, consequently, on investment inputs (a *direct* social and economic indicator, rather than an *indirect* one). In some aspects this is similar to Cepal's categories. Accordingly the "poor peasants" category corresponds to its "infra-subsistence" category, "middle peasants" to "subsistence" and "stationary" categories, and
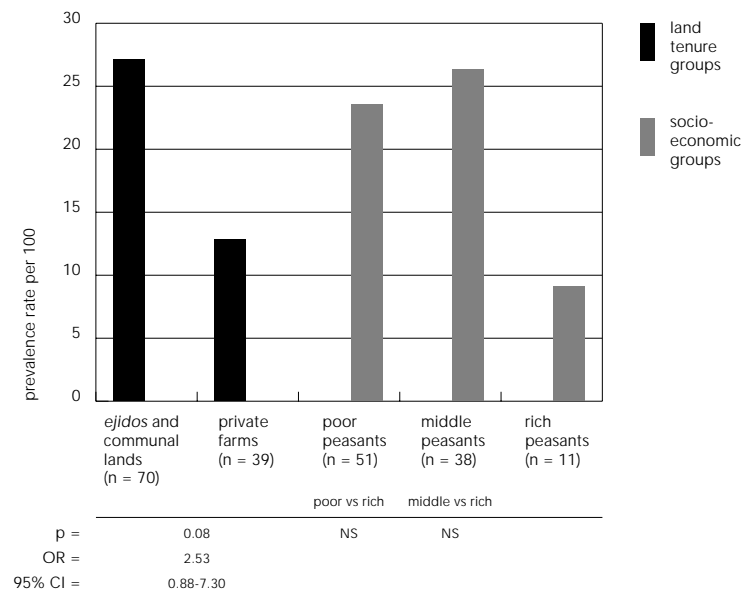
Figure 6

Average animal protein intake of children (1 to 4 years old) in the preceding 24 hours by land tenure and socioeconomic groups, La Fraylesca, Chiapas 1995.

* Non-parametric ANOVA Kruskal-Wallis test.

Figure 7

Multiple* intestinal parasites among children (1 to 4 years old) by land tenure and socioeconomic groups, La Fraylesca, Chiapas, 1995.

* Point prevalence rate with 2 or more intestinal parasites identified.

the "rich peasants" to the "exceeding" category. However, using plot size as an indicator may not accurately represent the socioeconomic conditions of households. For example, high yields are possible on small plots of land if there are substantial capital and labor inputs, and vice versa, low yields are possible from large plots of land with a low investment in inputs.

Comparing the two classification schemes used in this study (land tenure and maize yields), the two follow the same pattern as measures of socioeconomic well-being (Table 1). The *ejido/*communal farmers have smaller plots of land and employ lower numbers of salaried workers than private farmers. Comparing "poor peasants" to "middle" and "rich peasants" shows the same trend, but to a greater degree. The same type of correlation can be seen for lack of education, poor housing conditions, and in low meat consumption. In all cases of comparison between the two classification schemes, the one based on maize production (as opposed to land tenure) has proven more valuable in illustrating disparities in health and nutrition, while still reflecting the general trends of land tenure and Cepal's classification scheme.

The results of this study have two implications for health policy. The first is related to the identification of groups in the rural population at higher risk (which is relevant for a more effective and equitable health policy and planning based on health needs). The second is concerned with the type of intervention options.

First, to obtain the greatest impact, children of impoverished *campesinos* and from *ejidos/* communal farms could be identified as priority targets for special deployment of resources within the rural population, reducing health inequalities through the principle of positive discrimination. The ability to identify these groups at greater risk could provide an opportunity to achieve significant improvements in their low health status. However, this approach has some limitations. While improved accessibility to health services and implementation of specific health care measures (the so-called "basic health package") could have a major effect in the short term by reducing infectious diseases and mortality in rural societies like the one under study, there are many examples where health differentials persist despite the availability of health services and medical technologies (Rifkin & Walt, 1986). That is, delivery of health services alone is not sufficient to improve the health of socially excluded groups. Moreover, socioeconomic barriers may prevent *campesino* and indigenous populations from receiving the limited benefits of medical interventions.

Table 1

Main study groups by selected socioeconomic and agricultural characteristics, La Fraylesca, Chiapas, 1995.

Indicator	"Ejidos" and Communal land	Private land	Poor peasants	Middle peasants	Rich peasants
% of households with poor housing conditions	50.2	31.3	57.7	34.1	12.0
% of head of households with over 7 years of schooling	5.6	17.5	4.4	12.5	20.0
% of households consuming meat once a month or less	47	39	61.1	42.1	22
% of plots of land with more than 12 hectares	15.4	24.5	6.3	22.7	56
% of households employing laborers for more than 250 paid working days	5.7	13	1.5	8.4	29

Second, when considering the range of health policy options resulting from this study's findings we must inevitably consider the socioeconomic determinants of inequalities in health status. The findings suggest that health differentials such as these call for profound changes in the unequal distribution of land and resources in rural Chiapas. While intervention strategies aimed at improving the precarious health status of the *campesino* and indigenous population are necessary to prevent the situation from getting worse, such strategies will remain ineffective in the long term unless the underlying causes of existing social inequalities and widespread poverty in rural Chiapas are addressed.

Conclusions

Our results suggest that the two classifications used in this study, based on land tenure and volume of maize production, proved useful in detecting significant differentials in child health and nutritional status in the agricultural sector. Classifications based on volume of maize production show greater differentials between categories for most nutritional and health variables. In general, small plots of land and low crop yield in the agricultural sector identify high risk groups and signal serious health and nutritional problems for children. In addition, working and living conditions play an important role in explaining the poor health and nutritional status of children in rural Chiapas. Medical interventions may have some impact in preventing infectious diseases and reducing infant mortality. However, there is much evidence to show that social changes are more ef-

Figure 8

Prevalence of *E. histolytica* among children (1 to 4 years old) by land tenure and socio-economic groups, La Fraylesca, Chiapas, 1995.

		poor vs rich	middle vs rich
p =	< 0.01	0.07*	NS
OR =	4.27	5.88	
95% CI =	1.56-11.72	0.85-40.83	
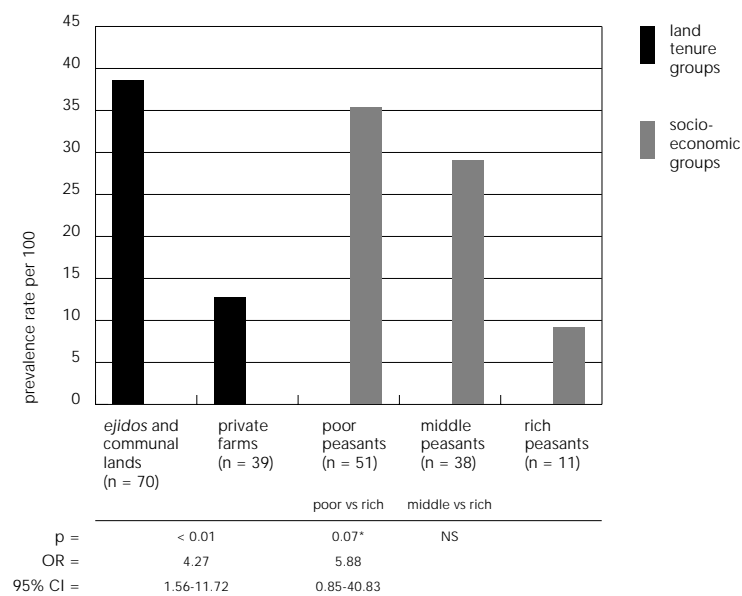
* Fisher's Exact Test (Right).

fective than medical interventions in reducing health inequalities. Thus, to reduce health inequalities and improve health status among poorer population groups from rural Chiapas it is essential to ensure that the *campesinos* and indigenous population have equitable access to power and resources, one of the central demands of the *Zapatista* rebels.

References

CAE (Consejo Asesor en Epidemiología), 1991. *Información Prioritaria de Salud*. México: Secretaría de Salud.

CEPAL (Comisión Económica para la América Latina), 1986. *Economía Campesina y Agricultura Empresarial*. México: Siglo XXI Editores.

CONAPO (Consejo Nacional de Población), 1990. *Indicadores Socioeconómicos e Índice de Marginación Municipal*. México: Conapo.

ESPINOZA-CORTEZ, L. M., 1995. Aproximación a la producción agropecuaria en Chiapas. In: *Chiapas el Regreso a la Utopía* (R. Miranda-Ocampo, ed.), pp. 63-80, Chilpancingo: Universidad Autónoma de Guerrero/México: Editorial Comuna.

GARCIA DE LEON, A., 1996. *Resistencia y Utopía: Memorial de Agravios y Crónica de Revueltas y Profecías Acaecidas en la Provincia de Chiapas Durante los Últimos 500 Años de su Historia*. 4th Ed. México: Ediciones Era.

HAYES, M. V.,1991. The risk approach: unassailable logic? *Social Science and Medicine*, 33:55-70.

HERNANDEZ, M., 1987. *Valor Nutritivo de los Alimentos Mexicanos. Tablas de Uso Práctico. Publication of the Nutrition Division L-12.* 10th Ed. México: Instituto Nacional de la Nutrición Salvador Zubirán.

INEGI (Instituto Nacional de Estadística, Geografía e Informática), 1990. *Censo General de Población y Vivienda*. México: Inegi.

LAURELL, A. C. & BLANCO-GIL, J., 1977. Disease and rural development: a sociological analysis of morbidity in two Mexican villages. *International Journal of Health Services*, 7:401-423.

MIRANDA, R. & ORTEGA, M., 1995. Economía de la Oncocercosis en Chiapas: Aproximación Ambiental. In: *Chiapas el Regreso a la Utopía* (R. Miranda-Ocampo, ed.), pp. 127-163, Chilpancingo: Universidad Autónoma de Guerrero/México: Editorial Comuna.

MONTOYA, G., 1989. *Producción y Comercialización de Granos Básicos (Maíz y Frijol) en la Región Valles Centrales de Chiapas*. Tesis de Licenciatura en Economía, San Cristóbal de las Casas, Chiapas: Universidad Autónoma de Chiapas.

OCHOA-DIAZ, H.; SANCHEZ-PEREZ, H. J. & RUIZ-FLORES, M. 1995. *Proyecto Bienestar Social, Salud y Servicios de Salud en La Fraylesca, Chiapas. Resultados Preliminares*. San Cristóbal de Las Casas: El Colegio de la Frontera Sur.

ORDOÑEZ-MORALES, C. E., 1983. *Subregión Tuxtla Gutiérrez, Información Estadística Seleccionada Período 1930-1980*. San Cristóbal de las Casas: Centro de Investigaciones Ecológicas del Sureste.

ORDOÑEZ-MORALES, C. E., 1984. *Contexto Socioeconómico de la Producción Agrícola en la Subregión Tuxtla Gutiérrez, Chiapas*. San Cristóbal de las Casas, Chiapas: Centro de Investigaciones Ecológicas del Sureste.

ORDOÑEZ-MORALES, C. E.,1989. *Consideraciones sobre la Política de Modernización y el Desarrollo Agrícola en Chiapas. San Cristóbal de las Casas.* Chiapas: Centro de Investigaciones Ecológicas del Sureste.

POHLENZ-CORDOVA, J., 1994. *Dependencia y Desarrollo Capitalista en la Sierra de Chiapas.* México: Centro de Investigaciones Humanísticas sobre Mesoamérica y el Estado de Chiapas (CIHMECH), Universidad Nacional Autónoma de México.

QUINTIN-OLASCOAGA, J., 1970. *Tablas de Valor Nutricional*. México: Pax.

RIFKIN, S. B. & WALT, G., 1986. Why health improves: defining the issues concerning "comprehensive primary health care" and "selective primary health care". *Social Science and Medicine*, 23:559-566.

SANCHEZ-PEREZ, H. J.; OCHOA-DIAZ, H. & MIRANDA-OCAMPO, R., 1995. La situación de salud en Chiapas: algunas consideraciones para su análisis. In: *Chiapas el Regreso a la Utopía* (R. Miranda-Ocampo, ed.), 63-80, Chilpancingo: Universidad Autónoma de Guerrero/México: Editorial Comuna.

SSA (Secretaría de Salud), 1992. Recursos y Servicios. *Boletín de Información Estadística*, № 12. México: SSA.

SSA (Secretaría de Salud), 1993a. *Compendio de Estadísticas de Morbilidad*. México: SSA.

SSA (Secretaría de Salud), 1993b. *Programa Nacional de Enfermedades Diarreicas 1993-1994*. México: SSA.

SSA (Secretaría de Salud), 1995. Recursos y servicios. *Boletín de Información Estadística*, No. 15. México: SSA.

VICTORA, C. G. & VAUGHAN, J. P., 1985. Land tenure patterns and child health in southern Brazil: The relationship between agricultural production, malnutrition and child mortality. *International Journal of Health Services*, 15:253-274.

VILLAFUERTE-SOLIS, D. & GARCIA-AGUILAR, M. C., 1995. Las sombrías perspectivas para los productores de maíz en Chiapas. Neoliberalismo y campo. *Cuadernos Agrarios*, 11-12:179-194.

WHO WORKING GROUP, 1986. Use and interpretation of anthropometric indicators of nutritional status. *Bulletin of the World Health Organization*, 64:929-941.