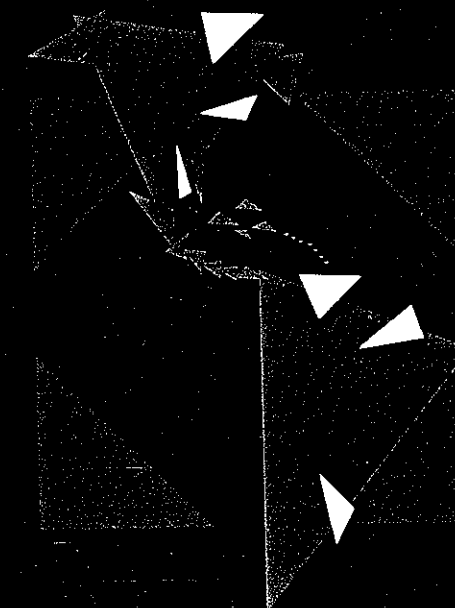


Panamerican Health
in the 21st Century



**Strengthening International
Cooperation and Development
of Human Capital**

Jaime Sepúlveda
Editor

Nutrition Transition in Latin America

Juan Rivera Dommarco
Simón Barquera Cervera
National Institute of Public Health Mexico



Mexico and other Latin American countries are experiencing important health, nutrition, and demographic transitions.^{1,3} The demographic transition is marked by shifts from high to low fertility and mortality and by aging the population. The health or epidemiological transition is characterized by a shift from high infectious disease morbidity and mortality to the preponderance of non-communicable chronic diseases (NCCD).

The nutrition transition, a shift from high prevalence of undernutrition to predominance of diet-related NCCD, is caused by the rapid process of urbanization and economic growth, by technological changes and innovations that lead to reduced work and leisure related, physical activity, and by changes in food patterns and dietary intake, including increased consumption of processed foods.⁴

Various countries and regions on the American continent are experiencing different stages of the nutrition transition. Some are experiencing the "receding famine" stage, characterized by starchy, high fiber, low fat, diets with little variety and labor intensive work and leisure activities. In these countries, stunting, underweight, and micronutrient deficiencies are highly

prevalent and infant mortality related to infectious diseases, low birth weight and undernutrition is high.

Other countries and regions are in the so called "degenerative diseases" stage, with increased fat, sugar and processed food intake, reduced physical activity due to shifts in technology for work and leisure and the emergence of obesity, bone density problems and increased risk of NCCD.

The last stage of the nutritional transition, referred to as "behavioral change", is an ideal stage in which people, after experiencing the devastating effects of the transition from receding famine to degenerative diseases adopt behavioral changes in diet and lifestyle such as reduced fat and increased fruits, vegetables, fiber and carbohydrate intakes and replace sedentarism with purposeful increases in recreation and physical activity. As a result, a reduction in body fatness and improvements in bone density occur, with the corresponding reductions in NCCD.⁵ No country as a whole can be identified as experiencing the last stage of the nutrition transition. However, certain groups of highly educated, informed and motivated people in some countries are in this stage of the transition.

In recent years obesity, diabetes, and other NCCDs are increasing among the poor.¹¹ Moreover, a growing number of studies are finding associations between low birth weight and obesity, diabetes and coronary heart disease in adults,^{8,12} which seem to support the hypothesis of the fetal origins of a number of NCCD.

This paper presents information about the nutrition transition in Latin America, with emphasis on data from México, Brazil and Chile.

The prevalence of undernutrition is declining in most countries and regions in the World. Table 1 presents prevalences of stunting (length-for-age < -2 S.D. of the WHO/NCHS/CDC reference population¹³) in less developed countries (LDC) by region of the world in 1990 and 2000.¹³ The estimated prevalences are based on nationally representative surveys of countries in each region. A decline in prevalence is observed in all regions; however, reductions are important in Asia and Latin America and the Caribbean, while in Africa the rate of decline has been modest. This small reduction is due to an increase in prevalence observed in Sub-Saharan Africa; the only sub-region in which stunting did not decline.

Examination of the prevalences of stunting in 10 Latin American countries at two points in time between 1986 and 1999¹⁵ shows declining rates occurring in all countries (Figure 1), although the rate of decline in some countries is such that several decades will be needed before

the prevalences drop to desired values. For example, in Mexico the prevalence of stunting declined from 22.2% in 1988 to 17.1% in 1999, 5.1 percentage points in 11 years or 22.4% relative to 1988.¹⁶ The rate of decline is modest, compared to the Latin American region as a whole (Table 1). At the current decline rate, about 30 years would be needed to reduce the prevalences of stunting to 2.3% or less. This rate of decline is clearly not satisfactory.¹⁶ In fact, apart from Brazil, Dominican Republic, and Colombia, all other countries in figure 1 have prevalences above 15%, indicating that stunting is still a public health problem. Despite the fact that the prevalence is declining in all countries, the reduction of stunting should be a public health priority. The prevalence of wasting (weight-for-length < -2 standard deflection (S.D.) of the WHO/NCHS/CDC reference population¹⁴) in most Latin American countries is below 2.5%, the proportion expected in a healthy population. Stunting declined substantially (Table 1).

In contrast to the decline in chronic malnutrition, particularly stunting, distribution in countries such as Mexico and Brazil are shifting toward higher fat and lower carbohydrate content (Figure 2).^{17,18} Per capita food purchases in Chile are increasing in total energy and fat content (Figure 3). At the national level, the percentage of total energy from fat went from 23.5% to 30.3% during the period (28.9% relative to 1988), while the percentage of total energy from carbohydrate intake shifted from 59.7% to 57.5% during the period (Figure 2). The increase in fat intake occurred not only in all, in the wealthiest regions in México. For example, although the percent increase in the relative contribution of fat to total energy intake was larger in the North and Mexico City, the more urbanized and wealthier regions (between 30 and 32% relative to 1988), the South, the poorest region, also experienced an increase of almost 22% relative to 1988.

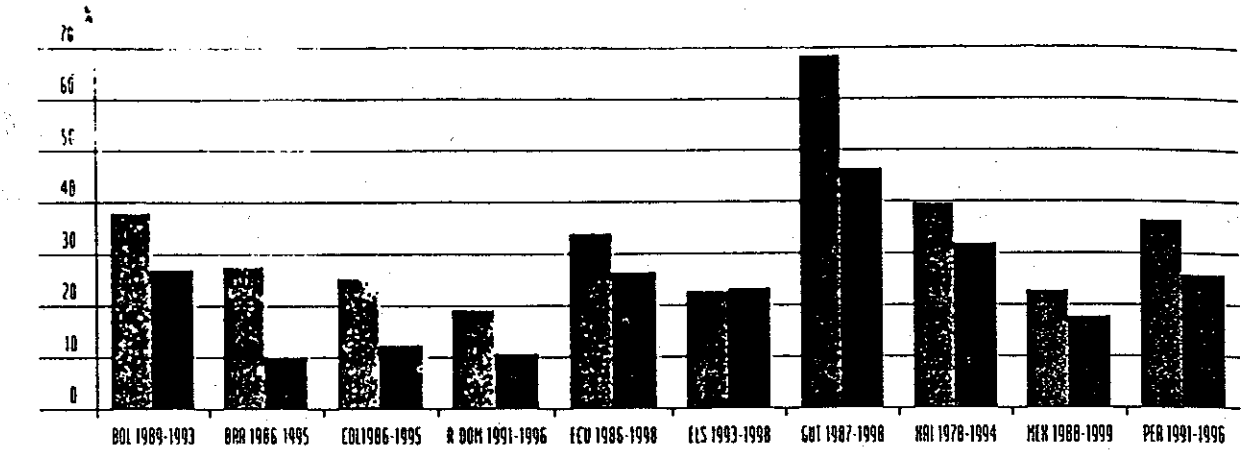
Parallel to the increase in fat intake, the prevalence of overweight and obesity have risen. Prevalences of overweight and obesity in women from the Mexican National Nutrition Surveys conducted in 1988 and 1999,¹⁶ are presented in Figure 4. The combined prevalences of overweight and obesity in women 18-49 years of age were 33.4% in 1988 and 59.6% in 1999, an increase of 78% relative to the baseline prevalence. The 11-year increments of overweight and obesity, relative to baseline

Table 1

Trends in the prevalence of stunting in children under 5 years of age in less developed countries (LDC) by world region between 1990 and 2000

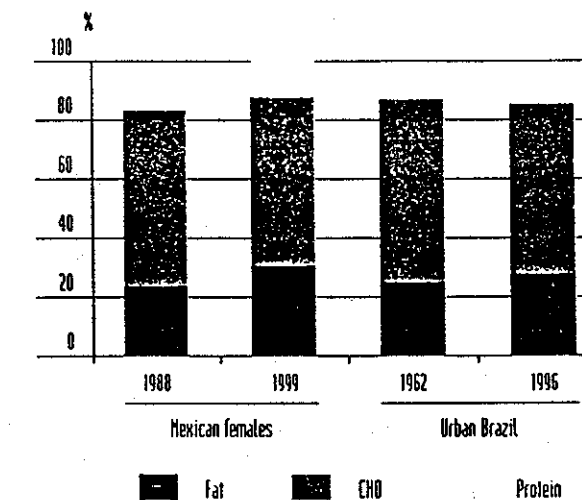
Region	Stunting (%)		Change during period	
	1990	2000	Percent points	% relative to 1990
Africa	37.8	35.2	-2.6	-6.9
Asia	43.3	34.4	-8.9	-20.5
Latin America and Caribbean	19.1	12.6	-6.5	-34.0
All LDC	39.8	32.5	-7.3	-18.3
Mexico*	22.8	17.7	-5.1	-22.4

* From 1988 to 1999.
Source: IEC/SCN-IPM, 2000



Source: Lutter, 2000

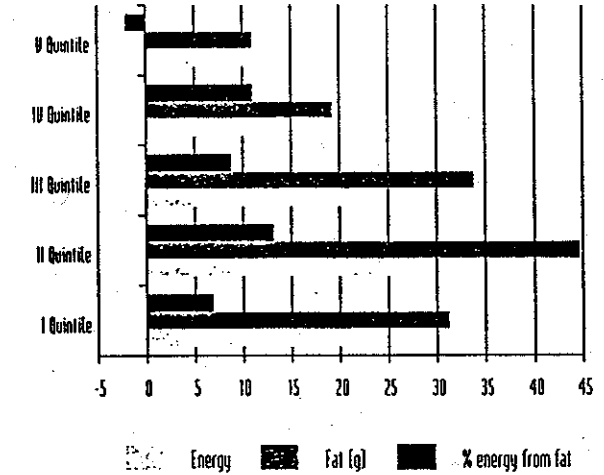
Figure 1 Changes in the prevalences of stunting in children under 3 years of age in Latin America



Adapted from Pokin, 2002

Figure 2 Trends in the dietary macronutrient intakes in two Latin American Countries

prevalences, were about 70% in Mexico City and the North, 81.3% in the South and 101.4% in the Center region. Increments in overweight during the period were almost 47% at the national level, ranging from 29% in the North to 73% in the Center, while obesity increased 160%, ranging from 133% in Mexico City to 174% in the Center.¹⁷ The prevalence of obesity in children under 5 years of age increased from 4.2% in 1988 to 5.3% in

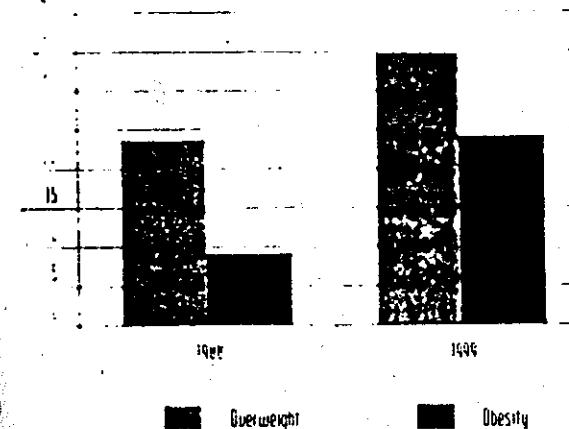


Source: Ribala et al., 2002

Figure 3 Change in food purchase per capita in Chile from 1988 to 1998

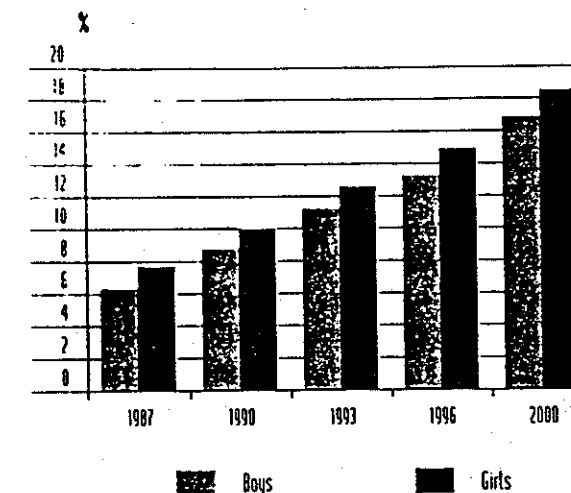
1999, a 26% increase. The highest prevalences in 1988 were in the North and Center however, the relative changes were much higher in Mexico City and the South (increases of over 80%) as compared to the North (12.5%) and the Center (-18.5%).^{16,17}

The dramatic increase in the prevalence of overweight and obesity in Chile is evidenced by the trends in obesity in first-grade school children in the 13-year period



Source: Rivera et al. 2002

Figure 4 Changes in the prevalence of overweight and obesity among women 18-49 years of age in Mexico (1988 to 1999)



* Weight for age z-score > 2 points
Source: Mbalia et al. 2002

Figure 5 Trends in the prevalence of obesity in first grade school children in Chile (1987-2000)

from 1987 to 2000 (Figure 5).¹⁹ The prevalence of obesity (weight-for-age > 2 S.D. of the WHO/NCHS/CDC reference population) increased 2.6 times (161%) in boys and 2.4 times (138%) in girls.

The increases observed both in Mexico and in Chile are striking and call for immediate action to reduce the epidemic of obesity that is taking place in Latin America. Obesity is a known risk factor for morbidity and mortality due to NCCD. For example, the prevalence of hypercholesterolemia (serum cholesterol > 200 mg/dL) in two cross-sectional samples of Chilean male and female adults living in Santiago increased from approximately 34% in 1987 to 42.5% in males and 46.1% in females in only 5 years.¹⁹

In Mexico, the national prevalences of various NCCD in 20 to 69 years old urban adults were obtained from the Mexican National Chronic Diseases Survey, a national probabilistic survey conducted in urban areas.²⁰ The prevalence of hypertension (systolic pressure ≥ 140 mmHg and/or diastolic pressure ≥ 90 mmHg during two measurements) was 28.5% for males and 25.1% for females, with higher prevalences in the North (30.3% males, 26.1% females), followed by the South (31.3% males, 24.6%

females), the Center (27.2% males, 26.7% females), and Mexico City (25.0% males, 23.0% females). The prevalence of diabetes (concentration of glucose in serum from casual fasting venous blood samples ≥ 120mg/dl or 200 mg/dl) at the national level was 7.2% for both sexes, with higher prevalences for the North (8.6% males, 9.3% females), followed by the South (7.3% males, 6.1% females), the Center (6.0% males, 7.5% females), and Mexico City (6.9% males, 6.1% females). The prevalence of hypercholesterolemia (concentration of total cholesterol in plasma ≥ 240 mg/dl) at the national level was 10% for males and 8.1% for females, with higher prevalences in the Center (12.0% males, 9.7% females), followed by Mexico City (11.9% males, 9.3% females), the South (7.7% males, 7.2% females) and the North (8.3% males, 6.3% females).²⁰

The increases in the prevalences of overweight and obesity are also reflected in the rise of mortality due to diet-related chronic diseases. We conducted an analysis of age-adjusted standardized mortality rates (SMR) for acute myocardial infarction (AMI), diabetes mellitus, and hypertension from 1980 to 1998 at the national level, and by region.¹⁷ Results are presented in Figure 6 as index

SMR relative to 1980-1998. The Figure also presents SMR for cirrhosis and vascular cerebral disease as references for comparison with the three diet related NCCD of interest.

Dramatic increases in SMR between 1980 and 1998 were observed for the three causes of death analyzed (Figure 6). A sharp increase for AML is observed in the last ten years (1988-1998). A steady increase for diabetes is observed over most of the period (1980-1997), with a sharp increase in 1998. The increase in 1998 may be due to a change in the classification system that year. Finally, an abrupt increase for hypertension is observed between 1983 and 1985, with a slower slope thereafter. The increases over the period 1980-1998 were 53% for AML, 62% for diabetes (40% from 1980 to 1997, before the sharp increase) and 55% for hypertension.

Analysis by region showed that the baseline (1980) SMR was higher in Mexico City and the North, relative to the less developed regions (Center and South), for the three causes of death. However, the relative increments were substantially larger for the South and Center compared to the more developed regions (North and Mexico City). The relative increments in the South and Center ranged from 70% to 140% for the different causes; the corresponding figures for the North and Mexico City range from -10% and 50%.¹⁷

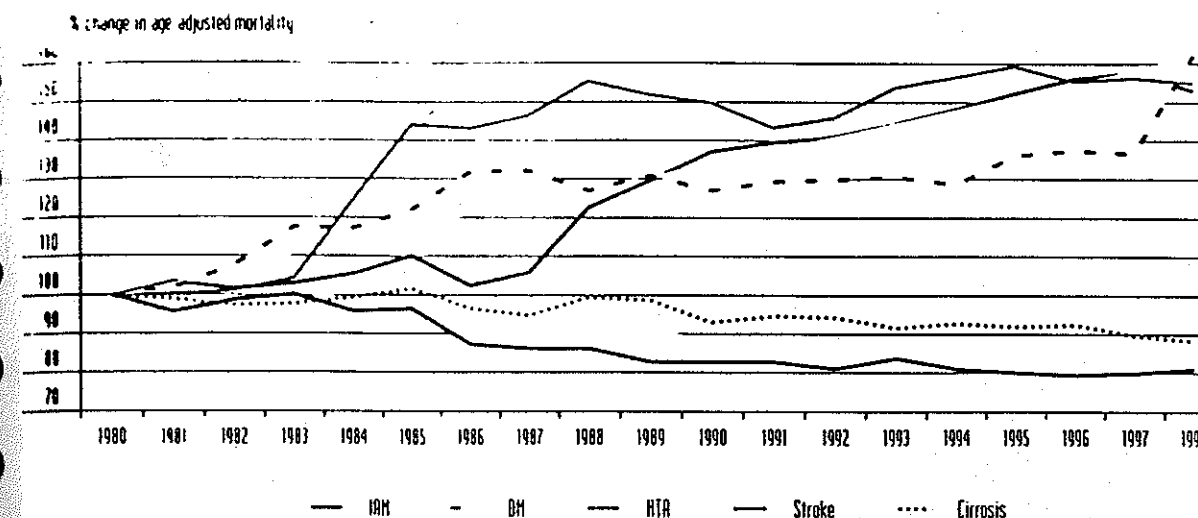
It is possible that increases observed are explained by improvements in the quality of the deaths registry system in Mexico. In 1980, medical doctors certified 86% of total deaths, while in 1998 this figure increased to 96.8%.²¹ Ill-defined causes decreased from 6.7% in 1980 to 2.0% in 1992.²¹ Thus, at least part of the sharp increases may be due to improvements in the quality of the registry system. However, the relative small magnitude of the increase in certifications by medical doctors and of the decrease in ill-defined causes of death relative to the increases in mortality for the three causes studied suggests that improvements in the registry system do not account for a significant part of the increases in mortality observed. This claim is further substantiated by the decline or by the lack of change in mortality rates for several other causes of death during the study period. For example, mortality rates due to accidents have decreased by approximately half during the period, deaths due to liver disease decreased by 28%, and

neonatal mortality remained constant. As shown in Figure 6, SMR for cirrhosis and vascular cerebral disease decreased during the study period. Further support for the mortality findings is the morbidity information presented here, which show high prevalences of diabetes, hypertension and hypercholesterolemia. Our conclusion is that the observed increase in SMR for the three causes studied is real.

Epidemiological studies indicate that the three causes of death studied are of multiple etiologies and result from a variety of risk factors. Hereditary factors play a role in all, but the three causes of death share common risk factors, such as obesity, inadequate dietary intakes (high energy, fat, cholesterol and carbohydrates intake with a reduction in consumption of fruits and vegetables), and physical inactivity.

Overweight and obesity in women 18-49 years increased dramatically during 78% the last decade. This increase is consistent with the increases in mortality for the three causes considered, for which obesity is a risk factor. Moreover, obesity rates parallel mortality rates in the four regions studied. The highest prevalences of overweight and obesity in 1988 were found in the North and in Mexico City, coincident with the highest SMR during the first half of the 1980s in these regions. The changes in overweight and obesity in women from 1988 to 1999 were larger for the South and Center, which is consistent with the largest increases in SMR in the same regions. Comparisons of trends in obesity and SMR for the NCCDs suggest that overweight and obesity are playing an important role in the etiology of these NCCDs in Mexico. This is probably the case in other Latin American countries as well.

A widespread misconception is that obesity and NCCD are problems associated with wealthy in a population. As a result, in the view of some people, including decision makers, obesity and NCCD in low income countries are low priority health problems when compared to undernutrition or to diseases that are associated with the poorest population. This is not the case. For example, the Mexican National Nutrition Survey of 1999 found that the prevalence of overweight and obesity combined in women 18-49 years of age was slightly higher in the middle socioeconomic tertile (62.8%) as compared to the high tertile (61.9%). The prevalence



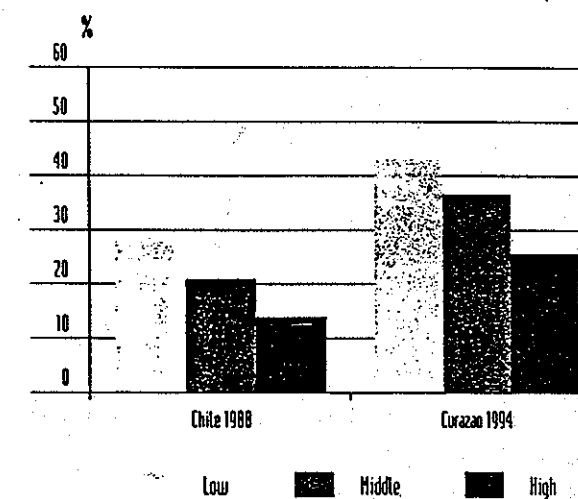
Source: Rivera et al., 2002

Figure 6 Relative change in age-adjusted mortality rates for diet-related NCCD in Mexico from 1980 to 1998

of overweight and obesity combined in the lowest tertile was 53.5%. Although lower than the other two tertiles, this clearly calls for immediate action even among the poorest segment of the population.

Other Latin American countries also show a clear pattern of higher prevalences of obesity in low income groups. For example, data from Chile in 1988²³ indicates that the prevalence of obesity in women of the lowest of three categories of socioeconomic status was twice the prevalence found in the highest income category (Figure 7). A similar inverse trend between socioeconomic level and prevalence of obesity was found in 1994 in Curaçao (Figure 7).²⁴ Other risk factors for NCCD are also more frequent in low socioeconomic groups. For example, a study in Brazil found that any leisure time physical activity was positively associated with socioeconomic status both in men and women¹⁸ (Figure 8). Over 30% of men from the highest socioeconomic quintile engaged in leisure time physical activity, as compared to about 8 in the lowest quintile; almost a four times difference. In women the difference was even larger (approximately 14 times) (Figure 8).

Other important risk factor for some chronic diseases, notably cardiovascular diseases and several types of cancer, is smoking. In Brazil, smoking is negatively

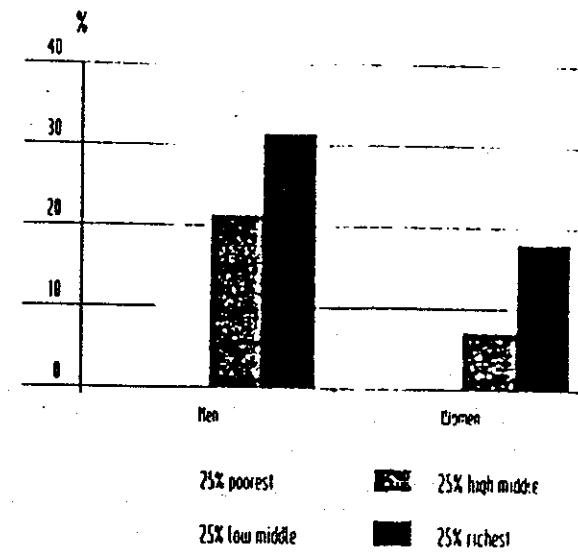


Sources: Berríos 1990; Grot 1997; and Monteiro, 2002

Figure 7 Prevalence of obesity (BMI > 30) in women by socioeconomic status

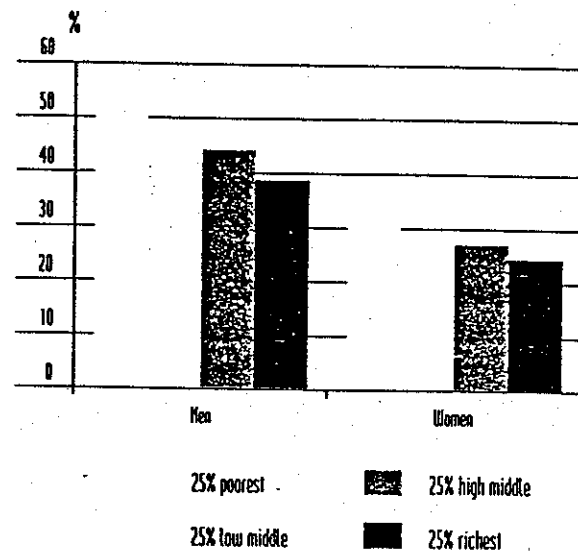
associated with socioeconomic status both in men and women (Figure 9).¹⁸

Evidence published by Martorell et al.²⁵ relating obesity with education level in five Latin American countries (Haiti, Guatemala, Peru, Dominican Republic and



Source: Monteiro et al., 2002

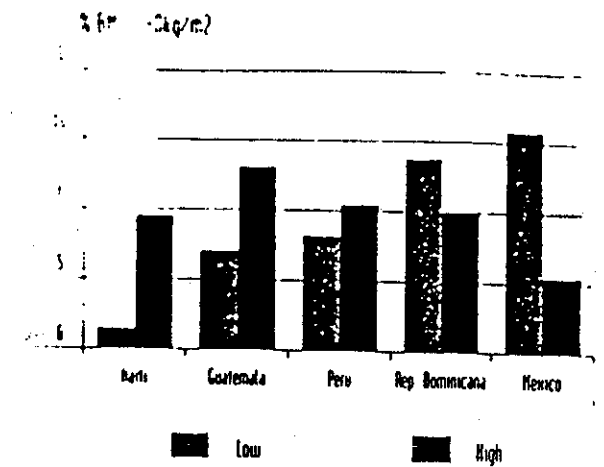
Figure 8 Any leisure-time physical activity by income in Brazil (1997)



Source: Monteiro et al., 2002

Figure 9 Smokers by income in Brazil (1997)

Mexico), indicates that prevalences of obesity were higher in less educated women in the three countries with the highest GNP per capita (Mexico, Dominican Republic



Source: Martorell et al., 2000

Figure 10 Prevalence of obesity in women by years of school (1987-1996) in Latin America

and Peru) while in the countries with lower GNP (Haiti and Guatemala), obesity was highest among the more educated women (Figure 10). Similar evidence was found by Monteiro et al.¹⁸ in Brazil. They analyzed obesity trends in adult women from the 25% lowest and the 25% highest socioeconomic groups in the wealthy area of Southeastern Brazil and in poor Northeastern Brazil in 1975, 1989, and 1997. In Northeastern Brazil, they found increasing trends for obesity in both the low and high socioeconomic quintiles. In contrast, in Southeastern Brazil the trend in obesity increased from 1975 to 1997 among the lowest quintile, while in the highest quintile, a clear drop in obesity was observed from 1989 to 1997. This suggests that during this period, women from high socioeconomic groups living in the wealthies areas began to reverse the trend, probably as a result of moving to the last phase of the nutrition transition (the behavioral change stage). The results of the analysis by Martorell et al.²⁵ also tend to suggest that in countries with middle to high income, more educated women, who also tend to have better living conditions and more access to high quality health information were probably moving towards the behavioral change stage.

If our interpretation is correct, the findings are encouraging because they show that under certain con-

La etapa de transición en retroceso a la de enfermedades degenerativas adoptan cambios en la conducta sobre dieta y estilo de vida, tales como la reducción en la ingesta de grasas e incremento en la de frutas, verduras, fibra y carbohidratos; reemplazando el sedentarismo con cambios intencionales en la recreación y actividad física. Como resultado, se observa una reducción en la masa corporal grasa y mejora en la densidad ósea, con correspondientes reducciones en ECNT. En la actualidad ningún país en su totalidad está experimentando la última etapa de la transición nutricional; sin embargo, en algunos países ciertos grupos de personas con altos niveles educativos, informadas y motivadas están en esta etapa de la transición.

En años recientes la obesidad, la diabetes y otras ECNT se están incrementando entre los pobres.⁶⁷ Más aún, un número creciente de estudios están encontrando asociaciones entre el bajo peso al nacer y obesidad, diabetes y enfermedades cardiovasculares en los adultos,^{6,12} lo cual parece apoyar la hipótesis sobre el origen fetal de varias enfermedades crónicas no transmisibles.

Este trabajo presenta información sobre la transición nutricional en América Latina, con énfasis en la información proveniente de México, Brasil, y Chile.

La prevalencia de la desnutrición está disminuyendo en la mayoría de los países y regiones en el mundo. El cuadro I presenta prevalencias de desnutrición crónica (talla para edad <-2 desviaciones estándar de la población de referencia de WHO/NCHS/CDC)¹⁴ en los países menos desarrollados (PMD) por región en 1990 y 2000.¹³ Las prevalencias fueron estimadas a partir de encuestas representativas de países en cada región. En todas las regiones se observa una disminución en las prevalencias; sin embargo, las reducciones son significativas en Asia, América Latina y el Caribe, mientras que en África la tasa de disminución ha sido modesta. Esta pequeña reducción se debe a un incremento en la prevalencia observada en regiones de África al sur del Sahara; la única sub-región en la cual no disminuyó la desnutrición crónica.

Cuadro I

Tendencias en la incidencia de retraso en el crecimiento lineal en niños menores de 5 años de edad en países menos desarrollados (PMD) por región, entre 1990 y 2000

Regiones	Retraso (%)		Cambio durante el periodo	
	1990	2000	Puntos porcentuales	% relativo en 1990
África	37.8	35.2	-2.6	-6.9
Asia	43.3	34.4	-8.9	-20.5
América Latina y el Caribe	19.1	12.6	-6.5	-34.0
Todos los PMD	39.8	32.5	-7.3	-18.3
México*	22.8	17.7	-5.1	-22.4

* Entre 1988 a 1999

Fuente: NCHS/CDC-IFPMI, 2000

La desnutrición crónica disminuyó substancialmente (Cuadro I), a pesar del hecho de que la prevalencia basal en 1990 fue la menor de todas las regiones. Al examinar las prevalencias de desnutrición crónica en 10 países de la región latinoamericana en dos momentos del período 1986-1999,¹⁵ se observan disminuciones en prácticamente todos los países (figura 1), aunque la velocidad de disminución en algunos es tal que se necesitarán varias décadas antes de que las prevalencias lleguen a valores deseables. Por ejemplo, en México la prevalencia de desnutrición crónica disminuyó de 22.8% en 1988 a 17.7% en 1999, 5.1 puntos porcentuales en 11 años o 22.4% en relación a 1988.¹⁶ Sin embargo, la velocidad de disminución es moderada en comparación al total de la Región (cuadro I). Si se mantuviera la actual velocidad de disminución, se necesitarían aproximadamente 30 años para reducir la prevalencia de desnutrición crónica de 2.3% o menos. Este índice de disminución es claramente no satisfactorio.¹⁶ De hecho, con excepción de Brasil, República Dominicana y Colombia, todos los demás países incluidos en la figura 1 tienen prevalencias por arriba de 15%; por lo tanto, la desnutrición crónica todavía es un

18. Monteiro CA, Wolney L, Popkin B. Is obesity replacing under-nutrition? Evidence from different social classes in Brazil. *Public Health Nutrition* 2002;5 (1A): 105-112.
19. Abala, C, Vio F, Kain J, Uauy R. Nutrition transition in Chile: determinants and consequences. *Public Health Nutrition* 2002;5 (1A):123-128.
20. SSA. Encuesta Nacional de Enfermedades Crónicas México. Secretaría de Salud, Dirección de Epidemiología. 1993.
21. SSA. La mortalidad en México: registro, estructura y tendencias. Cuadernos de Salud 1^{ra} ed. México: Secretaría de Salud; 1994.
22. SSA. Mortalidad 1998. Contexto actual y aspectos relevantes. Perfiles estadísticos. No. 13. México: Secretaría de Salud Dirección General de Estadística e Informática. México, 1999.
23. Berrios X, Jadue L, Zenteno J, Ross MI, Rodríguez H. Prevalence of risk factors for chronic diseases. A study in the general population of the metropolitan area, 1986-1987. *Rev Med Chil* 1990;118 (5):597-604.
24. Grol ME, Eimers JM, Alberts JF, Bouter LM, Gerstenbluth I, Halabi Y, van Sonderen E, van den Heuvel WJ. Alarming high prevalence of obesity in Curaçao: data from an interview survey stratified for socioeconomic status. *Int J Obes Relat Metab Disord* 1997;21 (11):1002-1009.
25. Martorell R, Khan LK, Hughes ML, Grummer-Strawn LM. Obesity in Latin American Women and Children. *J Nutr* 1998;128:1464-1473.
26. Puska, P, Pirjo P, Ulla U. Influencing public nutrition for noncommunicable disease prevention: from community intervention to national programme-experiences from Finland. *Public Health Nutrition* 2002;5:245-251.