*Original Research Article*

# Socioenvironmental Conditions and Nutritional Status in Urban and Rural Schoolchildren

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*ABSTRACT* We analyzed the nutritional status of urban and rural schoolchildren from Mendoza (Argentina), but avoided rural and urban categorization by generating subpopulations as a function of their socioenvironmental characteristics. We transformed weight and height data into $z$-scores using the CDC/NCHS growth charts; defined underweight, stunting, and wasting by $z$-scores of less than $-2$ SD; and calculated overweight and obesity, according to the cutoff proposed by the International Obesity Task Force. Socioenvironmental characteristics included housing, public services, parental resources, and farming practices; we processed these variables by categorical principal-component analysis. The two first axes defined four subgroups of schoolchildren: three of these were associated with urban characteristics, while the remaining subgroup was considered rural. Nutritional status differed across groups, whereas overweight was similar among the groups and obesity higher in urban middle-income children. Urban differences were manifested mainly as underweight, but rural children exhibited the greatest stunting and wasting. Thus, the negative effects of environment on nutritional status in children are not restricted to poor periurban and rural areas, though these are indeed unfavorable environments for growth: some urban families provide children with sufficient quantity and diversity of foods to expose them to obesity. By contrast, the more affluent urban families would appear to have greater possibilities for allowing their children to adopt a healthy life-style. Although the causes of differences in nutritional status between middle- and high-income urban groups are not clear, these determinants probably involve economic as well as educational influences. Am. J. Hum. Biol. 20:399–405, 2008. 

In the early 1900s, most Latin Americans lived in rural agricultural settings. During the last 50 years, this pattern has changed from mainly rural to predominantly urban (Merrick, 1998). Such accelerated urbanization, expressed as a demographic increase, has been a consequence of domestic migration from the countryside to the cities, which urban areas today concentrate about 75% of the population (Haddad et al., 1999; Ruel, 2000). This process was more rapid in Argentina, Venezuela, and Chile, where 85–90% of the population lives in the cities (PAHO, 1998).

Several factors promoted this rural–urban movement: for example, the reduced demand of labor force in the countryside and improvements in the quality of life in the cities. Even in developing countries, urban children benefitted from these improvements, as reflected in their growth compared to rural children (Eveleth and Tanner, 1990). In fact, the classical study by Bogin and McVean (1981) found that urban children from low-socioeconomic-status (SES) families living in Guatemala were taller than rural children of the same age. During the last decades, however, the traditional rural–urban dichotomy has been discussed (Wratten, 1995).

Dufour and Piperata (2004) summarized certain so-called conceptual "challenges" in dealing with this dichotomy, such as the arbitrariness of the categories "rural" and "urban" and the tendency to separate what is urban and what is rural. The development of suburban regions that surround traditional cities (also called periurban areas), which areas extend some of the characteristics of urban life to rural towns and villages, blurs the traditional distinctions that once existed between the city and the countryside. In today's world, the migration of people, goods, and services flows along a path from urban to rural areas and back again, producing a rural–urban continuum (Bogin, 1999).

Another challenge is the high heterogeneity of Latin-American cities. With respect to this difficulty, a city contains more than one urban environment and displays a population distribution according to SES (Dufour and Piperata, 2004). This statement suggests that cities are not uniformly healthier places than the rural countryside. Newly assembled evidence from developing countries indicates that the focus of poverty and malnourishment is gradually shifting from rural to urban areas, since the number of urban poor and undernourished is increasing more quickly than the corresponding rural figure (Haddad et al., 1999), thus narrowing the urban–rural gap in child malnutrition (Fotso, 2007).

In addition, Popkin (1999) has proposed that urban areas over the world are more advanced in obesity than the rural ones. City residents have different life-styles than rural

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dwellers, and these differing living habits establish characteristic patterns of food demands and time allocation. The research in developing countries shows consistently that the highest rates of obesity are found in lower SES segments of the population (Monteiro et al, 1995; Peña and Bacallao, 2000). Thus, many of these countries often exhibit a paradoxical duality where under- and overweight coexist, even among the poorest (Caballero, 2005; Doak et al, 2000; Orden et al, 2005; Uauy et al., 2001).

In the present article, we analyze the nutritional status of urban and rural schoolchildren from the Department of General Alvear, Province of Mendoza (Argentina), using a model of categorical principal-component analysis (catPCA). This model attempts to avoid the rural–urban dichotomy by generating subpopulations, as a function of their socioenvironmental characteristics (income, parental education, and access to public services, health care, and other parameters). By this means, nutritional status is seen exclusively within the context of the characteristics that define each subpopulation.

## SUBJECTS AND METHODS

We conducted a crosssectional survey in the Department of General Alvear (Province of Mendoza, Argentina; 34° 58′ S and 67° 42′ W). The altitude of the area is around 468 m above sea level. The weather is temperate and semiarid; the average annual rainfall totals only 400 mm, mostly in summer. The average annual temperature is 15°C, ranging from –10°C to 42°C. The maximum total population is 42,000 (CNPyV, 2001), with 70% being concentrated in the city of General Alvear and the other 30% either distributed in smaller towns (fewer than 2,000 inhabitants) or dispersed in rural areas. Historically, agriculture (viticulture and horticulture) and the agroindustry (food, wine, forage, and the like) were the main economic activities, contributing to regional economy and generating sources of labor. Nevertheless, the relative importance of these resources has declined after successive economic crises and, in some circumstances, has led to the pursuit of new productive enterprises (i.e., cattle-raising).

Our sample comprised 1,280 schoolchildren of both sexes, aged 4–14 years. The children participated in the study after written consent was given by their parents or legal guardians. A physician assessed the records of school health and their parental reports. There were no cases of chronic diseases or pathological conditions.

One of the authors (E.E.O.) performed the assessment at the school from March to December, 2005, according to standard procedures (Lohman et al., 1988). We copied each pupil's age from their own identification cards or from the school's records and calculated the value in years to the 10th decimal by subtracting the child's recorded birth date from the date of measurement. Body weight (kg) was measured on a digital scale (accuracy, 10 g), with the subjects lightly clothed (the weight of the clothes being subtracted). Height (cm) was measured using a portable vertical anthropometer (accuracy, 1 mm). The precision of measurement was checked by computing the technical error of measurement (TEM), calculated as the square root of the sum of squared differences between two repeated measurements, divided by two times the number of subjects measured (here 15 subjects). The TEM values were below the maximum acceptable TEM values reported by Ulijaszek and Kerr (1999).

Data were transformed into $z$-scores using the CDC/NCHS growth charts. Low weight-for-age (underweight), low height-for-age (stunting), and low weight-for-height (wasting) were calculated by $z$-scores of less than $-2$ SD. We calculated body-mass index (BMI) as weight (kg) divided by the height squared ($m^2$) and classified individuals as having overweight or obesity according to the cutoff proposed by the International Obesity Task Force (IOTF). The IOTF definition, based on the recommendations of the Childhood Obesity Working Group convened in 1997, states that adult BMI cutoff points of 25 and 30 must be linked to BMI centiles for children in order to provide child cutoff points. These two levels correspond to an adult BMI of 25 and 30 and reflect values extrapolated to children for overweight and obesity (Cole et al., 2000; Flegal et al., 2001). This reference, which also uses age-sex-specific BMI centiles, is based on six large international crosssectional representative data sets identifying the adult BMI values that are extended to childhood.

We used a structured questionnaire filled out by the parents to evaluate several socioenvironmental characteristics and measured housing variables with information regarding structural and physical amenities. These characteristics provided information about interior and exterior housing conditions (described below).

*Building materials:* We designated houses as low-quality prefab, fired-brick masonry, makeshift materials, and so forth, according to the type of materials used in their construction. We assessed the main source of drinking water according to the system of water supply (piped water system, protected well, rain-tank storage, or unprotected well). The wastewater disposal included sewage system or septic tanks (cesspool). The main fuel for cooking and heating consisted in piped gas, bottled gas (cylinder), kerosene, or firewood. Pavement, electricity, and waste collection were recorded by their presence or absence and crowding by the number of persons per room.

Among the SES variables, we considered the lodging or home-tenure status (house owner, lease holder, or free lodging).

Parental characteristics consisted in education and work. The former was evaluated in terms of the formal educational level (elementary, high school, university). The latter was divided into five categories: employed (formal worker), unskilled worker (unqualified worker who performs mostly temporary jobs), informal worker (without work contract), autonomous worker (freelance jobs), and unemployed.

*Health insurance:* meaning medical insurance at the expense of the employer or paid by the person (fee-for-service health insurance plans) and measured as presence or absence.

*Household income:* considered in the form of wages and salaries (before withholding and other taxes), as well as other forms of income, such as unemployment insurance, disability, child support, etc.; measured in Argentinean pesos.

*Public assistance:* referring to national or local programs (from government agencies, NGO's, or other entities) that benefit poor families by supplementing their food budget (nutritional support) and/or by providing cash relief to the heads of households (monetary support); measured by presence or absence.

*Farming:* additional activities possibly contributing to household income, such as animal husbandry, orchard, or horticulture; measured by presence or absence.

*TABLE 1. Eigenvalues from categorical principal components (catPCA) of socioenvironmental variables*

| Dimension | Cronbach's alpha | Variance accounted for multiple nominal variables | | Variance accounted for nonmultiple variables | | Total (Eigenvalue) | % of Variance |
|---|---|---|---|---|---|---|---|
| | | Total | % of Variance | Total | % of Variance | | |
| 1 | 0.82 | 0.42 | 10.49 | 4.24 | 20.18 | 4.66 | 18.63 |
| 2 | 0.60 | 0.29 | 7.15 | 2.05 | 9.77 | 2.34 | 9.35 |
| Total | 0.89 | 0.35 | 8.82 | 6.29 | 29.95 | 6.64 | 26.57 |

### *Data analysis*

Principal-components analysis (PCA) is a common and relatively simple technique that is easily accessible in any statistical-software package and requires multivariate normality of original variables (Krzanowski and Marriott, 1994). Nevertheless, despite the recommendations for and limitations in its application to categorical and ordinal variables, PCA had been applied in many studies using these kinds of data (Wachs et al., 2005; Fotso, 2006). In this study, we used the ordering technique described by Meulman et al. (2004) on catPCA. This analysis is characterized by the following criteria: (1) that in well fitted models, individuals with similar profile are near together, (2) that the "average" individuals are near to the origin of coordinates, (3) that nominal variables can be observed as the centroids of individuals who share a given attribute, (4) that the distance between the centroids and the origin indicates the discriminant capacity of each variable, (5) that the categories of different variables which are shared by many individuals are close together in space, and (6) that the proximity or separation of points subgroups according to different categories from a variable indicates their discriminant power.

We used catPCA results to define groups of observations, compared socioenvironmental variables among groups, and tested differences using $X^2$ for nominal variables or ANOVA for numerical ones.

The prevalence of each indicator of nutritional status was analyzed by means of a generalized linear model with "link" logit. All the statistical procedure was made with SPSS 12.0 statistical program.

Our research protocols followed the principles outlined in the Helsinki Declaration and successive modifications as well as those under the National Law N° 25.326 on the privacy of personal data.

## RESULTS

### *Socioenvironmental conditions*

Table 1 summarizes eigenvalues from catPCA. The first two dimensions represent 26.5% of the total variance. Cronbach's Alpha values were 0.82 and 0.60 for the first two axes, respectively. Table 2 shows the eigenvectors for the first two dimensions. Variables more influential in the analysis were parental education and some physical amenities such as gas, sewage system, waste collection, and health insurance. Kerosene, monetary support, and nutritional support had low frequencies in nearly all groups as well as the lowest eigenvectors.

From the ordering established by the mean values of the two first principal components, we defined four subgroups of schoolchildren that coincided with the four corners obtained from catPCA. Figure 1 shows the magnitude and orientation of the eigenvectors.

*TABLE 2. Eingenvectors from catPCA of socioenvironmetal variables*

| Characteristic | Dimension 1 | Dimension 2 |
|---|---|---|
| Father's education | 0.620 | 0.525 |
| Mother's education | 0.588 | 0.525 |
| Gas | 0.688 | −0.307 |
| Bottled gas | −0.581 | 0.348 |
| Sewage system | 0.577 | −0.351 |
| Waste collection | 0.631 | −0.130 |
| Household income | 0.583 | 0.243 |
| Piped water system | 0.559 | 0.182 |
| Health insurance | 0.562 | 0.123 |
| Animal husbandry | −0.407 | 0.361 |
| Firewood | −0.290 | 0.455 |
| Septic tank | −0.217 | 0.487 |
| Orchard | −0.397 | 0.283 |
| Electricity | 0.209 | 0.408 |
| Pavement | 0.418 | −0.082 |
| Rain tank storage | −0.239 | 0.325 |
| Crowding | −0.320 | −0.183 |
| Nutritional support | −0.226 | −0.234 |
| Protected well | −0.276 | 0.026 |
| Monetary support | −0.189 | −0.117 |
| Kerosene | −0.040 | −0.002 |

*Group I (dimension-1 positive, dimension-2 positive)*: families, with access to public services, high incomes, high parental education (high school, university) and health insurance. Most of their members were formally employed or worked freelance.

*Group II (dimension-1 positive, dimension-2 negative)*: families, with access to public services, middle incomes, and middle parental education (elementary, high school). A lower percentage of families than in Group I had health insurance. Most of their members were formally employed or worked freelance.

*Group III (dimension-1 negative, dimension-2 negative)*: families, living in areas with deficient dwellings and limited public services. Some of these habitations have no electricity, piped water, sewage, or septic tanks. This group also had the highest percentage of crowding plus the lowest income and parental education. More than 25% were assisted by public social policies (nutritional and/or monetary support). Only 9% of these families carried health insurance.

*Group IV (dimension-1 negative, dimension-2 positive)*: families with limited access to public services (piped water and electricity). Sewage, gas, waste disposal, and paved streets were restricted to a small proportion of these households. This group had middle incomes and middle parental education. Many of the families practiced horticulture and raised animals for their own personal consumption.

Table 3 depicts the frequency of each variable (expressed as a percentage) per group. Except for the use of kerosene, all differences were statistically significant. Comparisons among groups with respect to income were

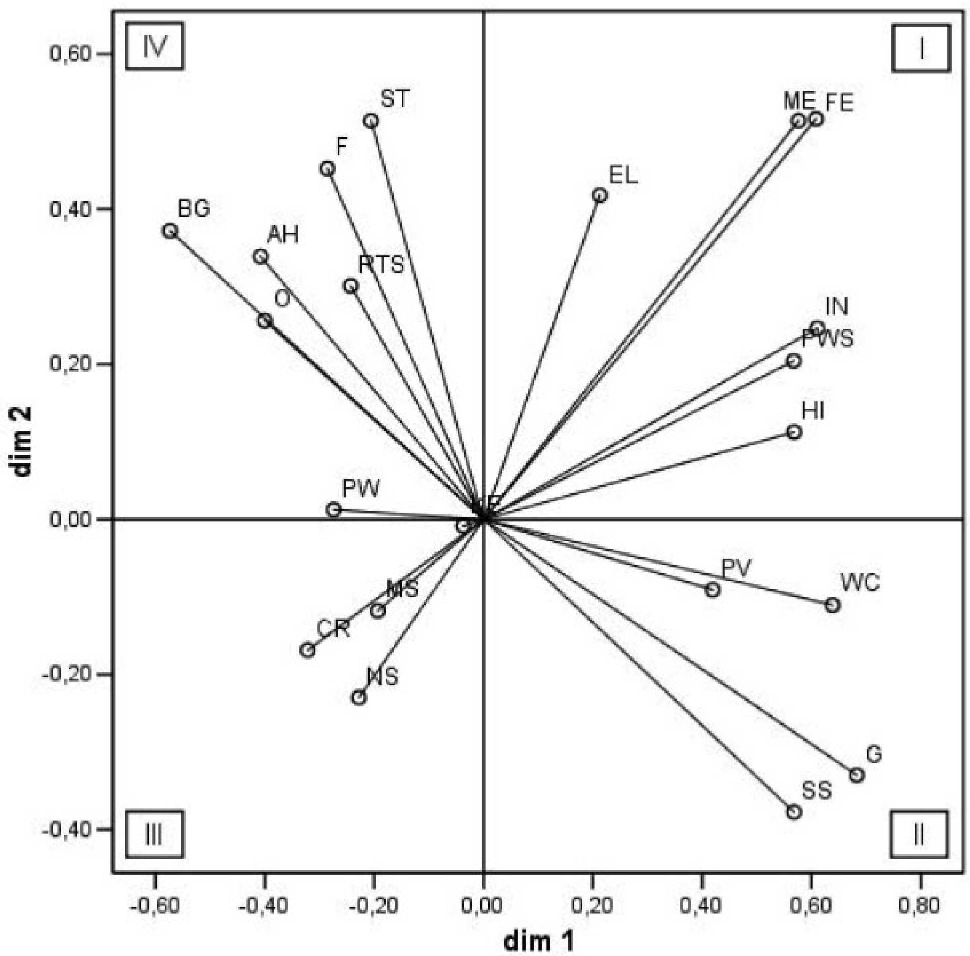


Fig. 1. Eigenvectors corresponding to socioenvironmental characteristics. Group I (top right), Group II (lower right), Group III (lower left), Group IV (top left). FW, MW, BM, and LS were excluded because they are multiple nominal variables (nonlinear).

also statistically significant. Crowding showed significant differences except between Groups I and II (Table 4).

Groups I and II included children who shared socioenvironmental conditions traditionally associated with the "urban" category, while groups III and IV were associated with the "periurban" and "rural" categories, respectively. Here we see that, by our present methodological approach, the groups are redefined in such a way that the new urban, periurban, or rural categories are not strictly coincident with the traditional system of classification.

### Nutritional status

The logistic analysis of prevalences as a function of age and group demonstrated that differences in the constants for each group and the group-age interactions were not significant.

Table 5 shows the prevalence of each indicator of nutritional status. The highest prevalence of underweight occurred in Group III (7.4%), followed by Groups IV, II, and I (6.1%, 4.9%, and 3.2%, respectively). Stunting was the highest in Group IV (8.5%), followed by Group III (6.3%). Groups I and II had the lowest prevalence of these indicators. Group IV also showed the highest prevalence of wasting (8.5%), while the others groups had percentages between 4.1% and 4.5%. The comparison among groups showed significant differences for underweight between Groups III and I and for stunting in Group IV compared with Groups I and II. Wasting showed significant differences between Group IV and Groups I, II, and III.

Overweight was high in all groups (13.2%–8.9%), but the highest prevalence was found in Group IV. Obesity was higher in Group II (6.6%) and next in Groups IV (4.1%), III (2.3%), and I (2.1%). Overweight did not exhibit significant differences ($P > 0.05$), and obesity was significantly higher in Group II compared to Groups I and III.

## DISCUSSION

The populations we studied manifested clear internal differences with respect to environmental quality and several variables involved with SES, with these distinctions being more evident among urban groups. Children from high-income urban families (Group I), whose parents had the highest education and who lived in healthy environments, enjoyed the best nutritional status. By contrast, children coming from middle-income urban families, with intermediate parental education (Group II), and better public services than those of Group I, had the highest rate

*TABLE 3. Socioenvironmental characteristics of the groups*

| | | Frequency by group (%) | | | | | |
|---|---|---|---|---|---|---|---|
| Characteristic | Abbreviation | I | II | III | IV | Statistic | P |
| *Structural qualities and amenities* | | | | | | | |
| Building materials | BM | | | | | $X^2$ = 237.00 | 0.000 |
| Low quality prefab | | 2 | 1 | 8 | 3 | | |
| Fired brick masonry | | 94 | 87 | 56 | 92 | | |
| Makeshift materials | | 3 | 8 | 13 | 2 | | |
| Other | | 1 | 5 | 23 | 3 | | |
| Drinking water (main source) | | | | | | | |
| Piped water system | PWS | 99 | 96 | 51 | 66 | $X^2$ = 285.50 | 0.000 |
| Protected well | PW | 5 | 7 | 21 | 22 | $X^2$ = 65.33 | 0.000 |
| Rain tank storage | RTS | 3 | 1 | 2 | 17 | $X^2$ = 102.37 | 0.000 |
| Wastewater disposal | | | | | | | |
| Sewage system | SS | 32 | 72 | 16 | 3 | $X^2$ = 447.19 | 0.000 |
| Septic tank | ST | 66 | 24 | 41 | 82 | $X^2$ = 269.84 | 0.000 |
| Fucl (cooking and heating) | | | | | | | |
| Gas (piped) | G | 49 | 79 | 16 | 2 | $X^2$ = 541.82 | 0.000 |
| Bottled gas (cylinder) | BG | 50 | 22 | 73 | 93 | $X^2$ = 395.99 | 0.000 |
| Kerosene | KE | 6 | 5 | 5 | 5 | $X^2$ = 0.50 | ns |
| Firewood | F | 35 | 6 | 23 | 58 | $X^2$ = 231.71 | 0.000 |
| Crowding (persons by room) | CR | 2.4 ± 1.1 | 2.4 ± 1.0 | 3.6 ± 1.6 | 2.8 ± 1.2 | F = 58.59 | 0.000 |
| Pavement | PV | 59 | 65 | 29 | 28 | $X^2$ = 152.26 | 0.000 |
| Electricity | EL | 99 | 92 | 71 | 97 | $X^2$ = 180.40 | 0.000 |
| Waste collection | WC | 88 | 93 | 41 | 27 | $X^2$ = 443.51 | 0.000 |
| *Socioeconomic status* | | | | | | | |
| Lodging status | LS | | | | | $X^2$ = 110.03 | 0.000 |
| House owner | | 70 | 67 | 48 | 56 | | |
| Lease holder | | 16 | 19 | 17 | 7 | | |
| Free lodging | | 14 | 15 | 35 | 36 | | |
| Mother's education | ME | | | | | $X^2$ = 807.05 | 0.000 |
| Universitary | | 33 | 6 | 2 | 0 | | |
| High school | | 54 | 31 | 21 | 6 | | |
| Elementary | | 14 | 63 | 77 | 94 | | |
| Father's education | FE | | | | | $X^2$ = 837.50 | 0.000 |
| Universitary | | 34 | 9 | 3 | 0 | | |
| High school | | 52 | 34 | 21 | 2 | | |
| Elementary | | 13 | 58 | 76 | 98 | | |
| Mother's work | MW | | | | | $X^2$ = 46.03 | 0.000 |
| Employed | | 33 | 34 | 19 | 24 | | |
| Unskilled worker | | 4 | 1 | 3 | 4 | | |
| Informal worker | | 7 | 6 | 8 | 7 | | |
| Autonomous worker | | 10 | 13 | 11 | 4 | | |
| Unemployed | | 45 | 47 | 59 | 62 | | |
| Father's work | FW | | | | | | |
| Employed | | 43 | 41 | 24 | 24 | $X^2$ = 125.63 | 0.000 |
| Unskilled worker | | 19 | 28 | 18 | 9 | | |
| Informal worker | | 17 | 16 | 22 | 19 | | |
| Autonomous worker | | 10 | 9 | 20 | 28 | | |
| Unemployed | | 11 | 6 | 16 | 20 | | |
| Health insurance | HI | 65 | 49 | 9 | 17 | $X^2$ = 304.72 | 0.000 |
| Household Income ($) | IN | 642 ± 416 | 440 ± 240 | 180 ± 94 | 266 ± 145 | F = 156.21 | 0.000 |
| Public assistance | | | | | | | |
| Nutritional support | NS | 1 | 7 | 28 | 12 | $X^2$ = 118.62 | 0.000 |
| Monetary support | MS | 6 | 8 | 25 | 12 | $X^2$ = 62.98 | 0.000 |
| Farming practices | | | | | | | |
| Animal husbandry | AH | 18 | 6 | 25 | 63 | $X^2$ = 301.30 | 0.000 |
| Orchard (agriculture) | O | 13 | 6 | 23 | 54 | $X^2$ = 243.39 | 0.000 |

ns, nonsignificant.

of obesity. In the remaining urban group (Group III), comprised of the poorest families living in overcrowded periurban areas (slums), with the lowest parental education and the highest unemployment, the children were frequently underweight. On the other hand, rural children (Group IV) exhibited the worst nutritional status and had the highest rates of undernutrition.

While all the groups showed similar rates of overweight, there were differences in the obesity rates. It is difficult to ascertain the key variables causing obesity. Some authors point to an inverse relationship between SES and obesity, with SES acting as a powerful influence on the adoption of a healthy life-style (Kaplan and Keil, 1993). The mother's education is another important social determinant that affects a child's nutrition either indirectly, as an indicator of SES, or directly—for example, through the mother's ability to provide good nutrition and prevent infections (Wachs et al., 2005; Wamani et al., 2004). These observations may explain why the group with the highest income and education (Group I) had the lowest rate of obesity.

Even though the causes determining obesity in the urban middle-income group are complex, they could be summarized in terms of "purchase capacity." In middle-income families, parents can buy processed and ready-to-

*TABLE 4. Multiple comparisons among groups for income and crowding*

| Variable | Comparisons (groups) | Mean difference | Std.error | Sig. |
|---|---|---|---|---|
| Income | I–II | 201.851 | 24.167 | 0.000 |
| | I–III | 461.875 | 22.999 | 0.000 |
| | I–IV | 375.452 | 22.977 | 0.000 |
| | II–III | 260.024 | 23.609 | 0.000 |
| | II–IV | 173.601 | 23.588 | 0.000 |
| | III–IV | −86.423 | 22.389 | 0.000 |
| Crowding | I–II | 0.030 | 0.110 | ns |
| | I–III | −1.167 | 0.106 | 0.000 |
| | I–IV | −0.446 | 0.105 | 0.000 |
| | II–III | −1.197 | 0.103 | 0.000 |
| | II–IV | −0.476 | 0.101 | 0.000 |
| | III–IV | 0.721 | 0.097 | 0.000 |

ns, nonsignificant.

*TABLE 5. Prevalences (%) in indicators of nutritional status by group*

| Indicator | Group I | Group II | Group III | Group IV | Comparison | *P* |
|---|---|---|---|---|---|---|
| Underweight | 3.1 | 4.9 | 7.4 | 6.1 | III–I | 0.02 |
| Stunting | 3.2 | 3.6 | 6.3 | 8.5 | IV–I | 0.02 |
| | | | | | IV–II | 0.01 |
| Wasting | 4.5 | 4.4 | 4.1 | 8.5 | IV–I | 0.05 |
| | | | | | IV–II | 0.03 |
| | | | | | IV–III | 0.01 |
| Overweight | 12.0 | 8.9 | 9.1 | 13.2 | All | ns |
| Obesity | 2.1 | 6.6 | 2.3 | 4.1 | II–I | 0.01 |
| | | | | | II–III | 0.01 |

ns, nonsignificant.

eat foods, as opposed to the traditional complementary foods, which latter often require long processing and cooking times. The main health concern with the former foods is their often high content of fat, cholesterol, and refined sugar and their low amount of fiber (Ruel, 2000). At the other extreme, the poorest urban families (Group III) are limited in their buying power, so that this segment of the population exhibited the highest occurrence of low weight-for-age. Underweight, a global indicator of malnutrition, was the principle indicator responsible for the intraurban differences. Moreover, the extremely high prevalence of infectious diseases and diarrhea in children raised in urban slums contributes to their patterns of growth and nutritional status (Adair et al., 1993). As a result of such unhealthy conditions, the rate of child malnutrition is higher in periurban areas with low-income families than in the more privileged urban neighborhoods (Hakeem, 2001).

The results obtained in Group IV showed that stunting was consistently more prevalent in rural than in urban areas. Furthermore, the children from the rural area had the highest rate of wasting. The variables associated with chronic and acute malnutrition differ among populations. In a study of Fillipino children, Adair et al. (1993) found that in the isolated rural areas the parameter associated with inadequate growth in length in infants seemed to be the quality of the diet, especially with respect to deficiency in one or more micronutrients. Wasting is an indicator of acute malnutrition, and the high prevalence of this variable is usually indicative of an emergency situation or of a high rate of infections. The prevalence of stunting and wasting in our rural children may reflect a worsening of the nutritional situation in this province as a result of the acute crises in rural economies during the last decade. Thus, the differences between groups here may be attributed to economic shortcomings. According to Ruel (2000), urban dwellers are highly dependent on the cash economy. The generation of income may have positive effects on the household budget and, as such can, allow access to food along with a greater possibility of more diverse diets. If this increased dietary diversity in the household manages to include the child, the enhanced nutritional accessibility will provide clear benefits for its growth and state of health. The present results confirm the conclusions outlined by Ruel (2000) indicating that rural children in Latin America are still worse off in terms of growth and dietary diversity than their urban peers.

## CONCLUSIONS

Neither are urban and rural populations uniformly different, nor are the urban ones internally homogeneous. The negative effects of environment on nutritional status in children are not restricted only to poor periurban and rural areas, though these two regions are still poor environments for growth. Some urban families may afford sufficient quantity and diversity of foods for children to expose them to obesity. At the other extreme, the more affluent urban families seem to have greater possibilities for their children to adopt a healthy life-style. Although the determinants of differences between middle- and high-income urban groups are not clear, these causes are likely to involve differences in parental education as well as the family's economical wherewithal.

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