The double burden of undernutrition and excess body weight in Ecuador[1–4]

Wilma B Freire, Katherine M Silva-Jaramillo, María J Ramírez-Luzuriaga, Philippe Belmont, and William F Waters

ABSTRACT

Background: Ecuador's current nutrition policies have not taken adequate notice of the double burden of malnutrition and continue to focus on stunting and to a lesser extent on overweight, without addressing the simultaneous presence of undernutrition, micronutrient deficiencies, and overweight or obesity (OW/OB).

Objective: The aim of this article was to describe the prevalence and distribution of undernutrition (stunting, anemia, and zinc deficiency), overweight, and obesity in Ecuador to explore the evolving double burden of malnutrition at the national, household, and individual levels and to discuss whether current public health policies are addressing the double burden.

Design: Data from the 2012 Ecuadorian National Health and Nutrition Survey (ENSANUT-ECU) was used to estimate the dual burden of malnutrition at the national, household, and individual levels in children <5 y old, school-aged children, and women of reproductive age.

Results: In 13.1% of households, mothers with excess body weight coexist with a stunted child <5 y old. Moreover, among households with overweight or obese mothers, 12.6% have an anemic child and 14% have a zinc-deficient child. At the individual levels, the coexistence of OW/OB and stunting, anemia, or zinc deficiency was found in 2.8%, 0.7%, and 8.4% of school-aged children, respectively. In addition, 8.9% and 32.6% of women aged 12–49 y have excess body weight and anemia or zinc deficiency, respectively.

Conclusions: This article shows the coexistence of high rates of undernutrition and OW/OB at the individual, household, and national levels in Ecuador. Although integrated approaches to address the emerging double burden are required, public health policies to date have not responded adequately. *Am J Clin Nutr* 2014;100(suppl):1636S–43S.

Keywords Ecuador, double burden, overweight, undernutrition, obesity, malnutrition, epidemiological transition

INTRODUCTION

Most underdeveloped countries have substantial experience in addressing undernutrition, which persists as an important public health issue. In addition, dramatic increases in rates of overweight and obesity have been noted in many countries (1). Because this is a relatively new phenomenon, the issue has not yet been adequately addressed or even fully recognized. The evolving double burden of undernutrition and overweight or obesity (OW/OB)[5] is expressed within the context of a complex web of social determinants (2, 3). It has been observed in many Latin American countries that, within the same household, stunting among children persists along with OW/OB in mothers, whereas household members also suffer from micronutrient deficiencies (4–6). The double burden is related to the epidemiologic transition, globalization, urbanization, shifts in occupational structures, and changing patterns of diet and physical activity (2, 7, 8). Although diets in developing countries still include large proportions of unprocessed foods, traditional diets have been replaced in whole or in part by energy-dense foods, particularly processed foods high in fat, sugar, and salt (9). In addition, traditional lifestyles have changed dramatically, particularly in terms of substantial reductions in physical activity (10).

Most underdeveloped countries either have not taken adequate notice of this looming problem or if they have, they lack the resources to address it adequately. Consequently, they continue to concentrate on undernutrition without addressing OW/OB. The current situation in Ecuador is not dramatically different from the trends and transitions that are currently unfolding on the world stage. Ecuador's population of ∼15 million is >70% urban (11), although the rural and agricultural sectors remain important. Ecuador is geographically diverse and is home to important ethnic and racial minorities, including Afro-Ecuadorians, Montubios (mixed-race rural residents of the coastal region), and

[1] From the Ministerio de Salud Pública del Ecuador, Quito, Ecuador (WBF, KMS-J, MJR-L, and PB), and the Health and Nutrition Research Institute, University of San Francisco de Quito, Quito, Ecuador (WFW).

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[4] Address correspondence to WB Freire, Ministry of Public Health of Ecuador, Moscú 380 y República del Salvador, Quito, Ecuador. E-mail: freirewi@gmail.com.

[5] Abbreviations used: ENSANUT-ECU, Ecuadorean National Health and Nutrition Survey; Hh An-OW/OBm, household level, child <5 y with anemia and overweight or obese mother; Hh St-OW/OBm, household level, stunted child <5 y and overweight or obese mother; Hh Zn-OW/OBm, household level, child <5 y with zinc deficiency and overweight or obese mother; Ii An-OW/OB, intraindividual level, school-aged children with anemia and overweight or obese; Ii An-OW/OBw, intraindividual level, anemic women of reproductive age with overweight or obese; Ii St-OW/OB, intraindividual level, school-aged children with stunting and overweight or obese; Ii Zn-OW/OB, intraindividual level, school-aged children with zinc deficiency and overweight or obese; Ii Zn-OW/OBw, intraindividual level, zinc-deficient women of reproductive age with overweight or obese; OW/OB, overweight or obesity.

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members of 14 indigenous groups. Although average incomes have increased in the past 2 decades, the country remains highly unequal, with a Gini coefficient that is still ~0.50 (12). Rapid social and economic development in the face of persistent poverty and inequality are factors that provide the context for the double burden of malnutrition.

The aim of this article is to describe the magnitude and distribution of the prevalence of both undernutrition (stunting, anemia, and zinc deficiency) and overweight and obesity in Ecuador to explore the double burden of malnutrition at the individual, household, and national levels and to discuss whether current public policies are addressing the double burden.

SUBJECTS AND METHODS

The data presented here come from the 2012 Ecuadorian National Health and Nutrition Survey (ENSANUT-ECU), which was based on a representative sample of Ecuadorians aged from 0 to 59 y (13). The probabilistic multistage sampling strategy is representative at the national and subregional levels: urban and rural Sierra (highlands), urban and rural coast, urban and rural Amazon (the tropical and semitropical region east of the highlands), Galápagos, and the cities of Quito and Guayaquil. The sample included 57,727 individuals and 19,803 households. A questionnaire collected information on sociodemographic characteristics and anthropometric measurements for all participants in different age groups: children <5 y (*n* = 8894), school-aged children 5–11 y (*n* = 11,534), adolescents aged 12–19 y (*n* = 8529), and adults aged 20–59 y (*n* = 28,740). From a subsample of subjects, venous blood and urine specimens were collected for micronutrient status determinations, including hemoglobin and zinc, in children aged 6–59 mo (*n* = 2047), 5–11 y (*n* = 4443), and 12–19 y (4039) and adults aged 20–59 y (*n* = 10,950).

Data collection and handling

Trained fieldworkers applied structured questionnaires to participants in the selected households with the use of standardized procedures, protocols, and equipment (14). Height was measured in subjects >2 y old by using portable stadiometers, whereas infantometers were used to measure length in children <2 y to the nearest 0.1 cm. Portable electronic scales were used to measure weight in children and adults to the nearest 0.1 kg. To ensure reliability, anthropometric data were collected for each variable twice, with an interval of 5 to 10 minutes. When there was a difference of ±0.5 kg in weight or ±0.5 cm in height, a third measure was made, and the mean value was calculated from the 2 closest values. In addition, supervisors remeasured participants in every tenth household, and interviewers were retrained after every 11 d of field work. Age was verified by observing each subject's national identity card. Venous blood and urine specimens for micronutrient status determinations were collected by using standardized procedures. Hemoglobin was measured by using sodium lauryl–hemoglobin method/spectrophotometry. Zinc was measured by using Flame atomic absorption spectrophotometry.

To assess nutritional status in preschool-aged children, school-aged children, and adolescents, *z* scores were calculated by using WHO 2006 and 2007 standards (15, 16). Preschool-aged children were classified as stunted if their length- or height-for-age *z* scores were < −2 SDs. Risk of overweight and overweight including obesity were defined as >1 SD and ≤2 SDs and >2 SDs of BMI-for-age *z* score, respectively. Stunting in school-aged children was defined as length- or height-for-age *z* scores < −2 SDs. For school-aged children and adolescents, overweight and obesity were determined by *z* scores between >1 SD and ≤2 SDs and >2 SDs in BMI-for-age, respectively. For individuals >19 y, BMI (in kg/m^2) was established according to WHO standards by using cutoffs of ≥25 and <30 for overweight and ≥30 for obesity (17). Weight and height outliers for individuals <19 y were defined by using the WHO SD boundaries, and for adults outliers were set at 5 SDs above or below the reference mean.

Anemia was defined by using WHO cutoffs (18). Hemoglobin values were adjusted for altitude by using the method proposed by Nestel (19) and adjusted by the CDC's Pediatric Nutrition Surveillance System. This method proposes an individual correction that uses a curvilinear equation of observed hemoglobin concentrations according to the altitude at which each subjects live (which in the case of the highlands is frequently >2500 m above sea level). The hemoglobin correction equation is as follows: adjusted hemoglobin = −0.32 (altitude in meters above sea level × 0.0033) + 0.22 (altitude in meters above sea level × 0.033)^2. Zinc deficiency was defined by using the International Zinc Nutrition Consultative Group and the WHO/UNICEF/International Atomic Energy Agency/International Zinc Nutrition Consultative Group cutoffs for >10 and <10 y, respectively (20, 21).

Double burden at the household level was defined as the coexistence of a stunted child <5 y and an overweight or obese mother, referred to hereafter as an Hh St-OW/OBm pair. The double burden at the household level was also defined as the coexistence of a child <5 y with anemia or zinc deficiency and an overweight or obese mother, referred to hereafter as an Hh An-OW/OBm pair and an Hh Zn-OW/OBm pair, respectively. Pregnant women and women with no children or with missing data for their <5-y-old child were excluded from the analysis. At the individual level, the prevalence of double burden in school-aged children (5–11 y) was defined as the coexistence in the same individual of OW/OB, stunting, anemia, or zinc deficiency, referred to hereafter as Ii St-OW/OB, Ii An-OW/OB, and Ii Zn-OW/OB, respectively. The double burden at the individual level was also defined for women of reproductive age (12–49 y) as the coexistence of OW/OB and anemia (referred to hereafter as Ii An-OW/OBw) and as the coexistence of OW/OB and zinc deficiency (referred to hereafter as Ii Zn-OW/OBw). School-aged children and women of reproductive age with missing data on weight, height, hemoglobin, or zinc were excluded from the analysis.

Before the initiation of field work, the study was approved by the Institutional Review Board of the San Francisco de Quito University. All participants signed informed consent forms, and all data were handled anonymously during data entry and analysis.

Statistical analysis

The normality of the distribution of variables was checked by Q-Q plot and histogram observation. The expected prevalence of

Hh St-OW/OBm, Hh An-OW/OBm, and Hh Zn-OW/OBm pairs was calculated by multiplying the prevalence of OW/OB in mothers by the prevalence of stunting, anemia, and zinc deficiency in children <5 y old divided by 100. The expected prevalence of Ii St-OW/OB, Ii An-OW/OB, Ii Zn-OW/OB, Ii An-OW/OBw, and Ii Zn-OW/OBw was calculated by multiplying the prevalence of OW/OB with the prevalence of stunting, anemia, or zinc deficiency divided by 100 in each case, assuming independence of the occurrence of the 2 conditions that encompass the double burden (22). The differences between the expected and the observed prevalence were compared by using a chi-square test. All statistical procedures were performed with Stata 12 (StataCorp) by using the SVY module for complex surveys (23).

RESULTS

Sociodemographic characteristics are described in **Table 1**. These data are comparable to the results of the 2010 national population census (11). Note that only 18.5% of mothers have more than a secondary school education. With regard to anthropometric measurements, 1 of 10 mothers is <145 cm tall, whereas nearly 6 in 10 are either overweight or obese. The national prevalence of stunting and OW/OB in children <5 y, as well as of anemia and zinc deficiency in preschool-aged children, school-aged children, adolescents, and women of reproductive age, is shown in **Figure 1**. As shown in Figure 1A, the traditional problem of stunting persists, affecting 1 in 4 preschool-aged children (25.3%) and nearly 1 in 3 children between 12 and 23 mo of age (32.6%). Although the prevalence

TABLE 1
Characteristics of children <5 y old and their mothers, school-aged children, and women of reproductive age in the ENSANUT-ECU, 2012[1]

Characteristics	Children <5 y old (0–59 mo)	School-aged children (5–11 y)	Women of reproductive age (12–49 y)
n	8894	11,534	18,909
Sex, % male	51.0 (49.5, 52.5)[2]	51.1 (49.7, 52.5)	—
Age, y	2.0 ± 1.4[3]	8.0 ± 2.0	28.5 ± 10.8
Area, %			
Urban	65.0 (62.5, 67.3)	63.7 (61.3, 66.0)	69.0 (66.9, 71.1)
Rural[4]	35.0 (32.7, 37.5)	36.3 (34.0, 38.7)	31.0 (28.9, 33.1)
Economic status index,[5] %			
Q1	27.0 (24.9, 29.1)	23.4 (21.7, 25.3)	20.4 (18.9, 22.1)
Q2	22.5 (21.0, 24.1)	23.4 (21.9, 25.1)	21.1 (19.9, 22.5)
Q3	20.1 (18.6, 21.7)	19.5 (18.1, 20.9)	20.0 (18.8, 21.2)
Q4	16.9 (15.4, 18.5)	18.6 (17.0, 20.3)	19.6 (18.2, 21.1)
Q5	13.6 (11.9, 15.4)	15.1 (13.5, 16.8)	18.9 (17.2, 20.6)
Ethnicity, %			
Indigenous	8.4 (7.1, 9.8)	7.6 (6.5, 8.9)	6.3 (5.5, 7.3)
Afro-Ecuadorian	4.5 (3.7, 5.4)	4.4 (3.6, 5.4)	4.6 (4.0, 5.4)
Montubio	5.1 (4.1, 6.4)	5.5 (4.5, 6.6)	5.5 (4.7, 6.5)
Mestizo, white, and others	82.0 (80.2, 83.7)	82.5 (80.8, 84.0)	83.5 (82.2, 84.8)
Region, %			
Highlands	46.4 (42.8, 50.0)	45.9 (42.4, 49.4)	45.6 (42.1, 49.0)
Coast	46.3 (42.6, 50.1)	47.6 (44.1, 51.2)	49.5 (46.0, 53.1)
Amazon	7.3 (6.4, 8.3)	6.5 (5.7, 7.4)	4.9 (4.3, 5.5)
Maternal characteristics (*n* = 7470)			
Height, %			
<145 cm	—	—	9.8 (8.8, 11.0)
145–149 cm	—	—	23.8 (22.3, 25.4)
≥150 cm	—	—	66.4 (64.5, 68.2)
Age, y	—	—	28.5 ± 6.8
Level of education, %			
No schooling/incomplete primary school	—	—	2.0 (1.6, 2.6)
Primary school/incomplete secondary school	—	—	54.0 (51.9, 55.9)
Secondary school	—	—	25.4 (23.8, 27.1)
Greater than secondary school	—	—	18.5 (17.1, 20.3)
BMI,[6] %			
Underweight (<18.5 kg/m^2)	—	—	1.4 (1.1, 1.8)
Normal (18.5–24.9 kg/m^2)	—	—	40.4 (38.7, 42.0)
Overweight (25.0–29.9 kg/m^2)	—	—	37.8 (36.1, 39.6)
Obese (≥30.0)	—	—	20.4 (19.0, 22.0)

[1]ENSANUT-ECU, Ecuadorian National Health and Nutrition Survey; Q, quintile.
[2]Prevalence (%); 95% CI in parentheses (all such values).
[3]Mean ± SD (all such values).
[4]Rural subjects lived in a locality with <2500 residents; urban subjects lived in a locality with ≥2500 residents.
[5]Q1 = poorest and Q5 = wealthiest.
[6]BMI-for-age *z* scores were used for mothers <19 y old.

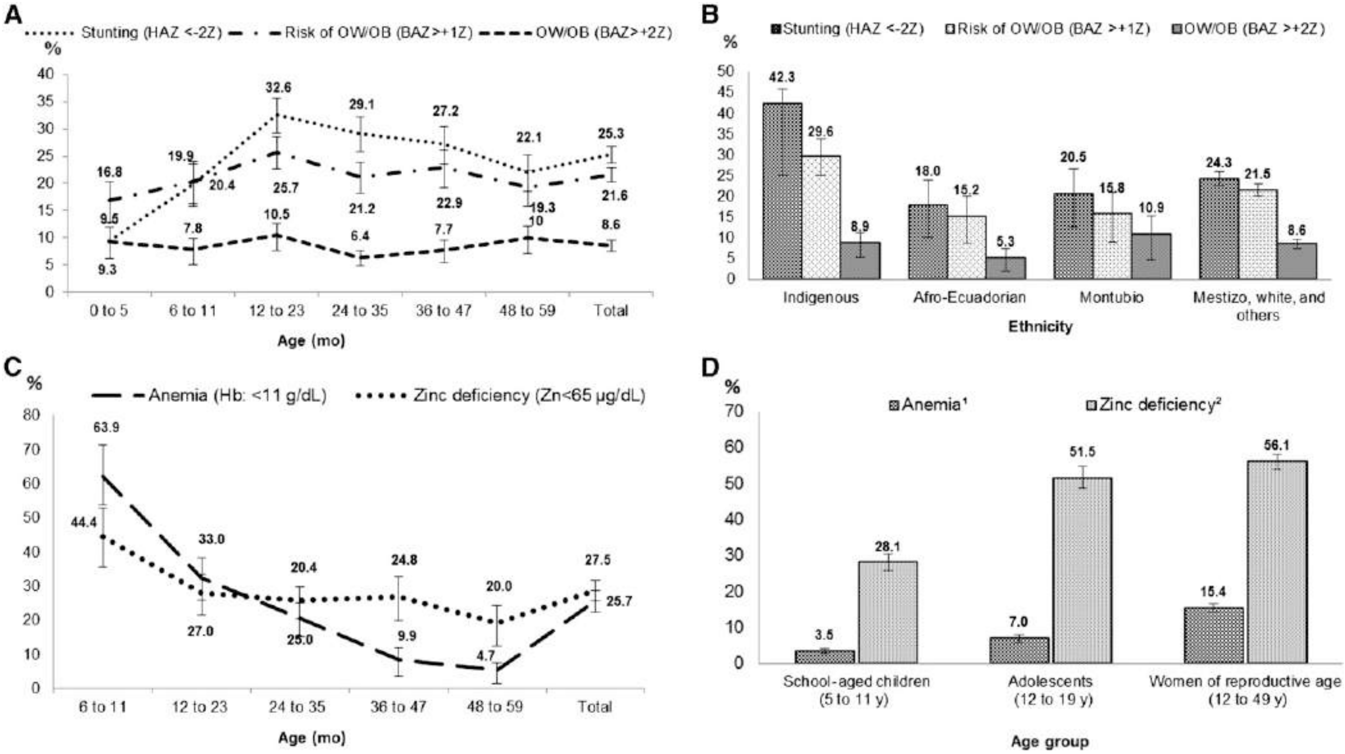

FIGURE 1 Prevalence of stunting, risk of OW/OB, and OW/OB in children <5 y old by age (A) and ethnicity (B). Prevalence of anemia and zinc deficiency in children <5 y old by age (C). Prevalence of zinc deficiency and anemia in school-aged children, adolescents, and women of reproductive age (D). [1]Cutoffs for anemia: school-aged children (Hb <11.5 g/dL) and adolescents and nonpregnant women of reproductive age (Hb <12 g/dL). [2]Cutoffs for zinc deficiency: males (Zn <74 μg/dL) and females (Zn <70 μg/dL). BAZ, BMI-for-age *z* score; HAZ, length- or height-for-age *z* score; Hb, hemoglobin; OW/OB, overweight or obesity.

of OW/OB is lower, affecting 8.6% of children <5 y, the risk of OW/OB is considerably higher and affects 21.6% of children <5 y. With regard to ethnicity, Figure 1B shows that historically high levels of stunting persist in the indigenous population (42.3%). Moreover, the risk of OW/OB in indigenous children <5 y old is double that of children in the other ethnic groups. As shown in Figure 1C anemia and zinc deficiency affect 25.7% and 27.5% of preschool-aged children, respectively. The prevalence of both deficiencies is very high, especially in infants between 6 and 11 mo of age. Anemia is more prevalent than zinc deficiency in the first year of life, but by the second year zinc deficiency is more prevalent. As shown in Figure 1D, 1 in 4 school-aged children continue to be affected by zinc deficiency and more than half of adolescents from 12 to 19 y of age are affected by this problem. Moreover, nearly 6 in 10 women of reproductive age suffer from zinc deficiency and 1 in 10 from anemia. As shown in **Figure 2**, the prevalence of OW/OB among school-aged children is higher in boys (32.5%) than in girls (27.1%), but in both sexes it affects >1 in 4 children. Among adolescents, in contrast, overweight is more prevalent in girls (21.9%) than in boys (16.2%), whereas the rates of obesity are similar, affecting ∼7% of subjects in this age range. By the time adulthood is reached, however, overweight is more prevalent in men (44.3%) than in women (38.3%) who nevertheless suffer from obesity in higher proportions.

Data that show the double burden of undernutrition and excess body weight at the household and individual levels are presented in **Table 2**. At the household level, 57.6% of mothers were either overweight or obese, and 24.8% of children <5 y were stunted. In 13.1% of households, mothers with OW/OB coexist with a stunted child <5 y old. This proportion was lower than expected ($P < 0.05$) assuming independence of the occurrence of each condition. Moreover, the coexistence of an overweight or obese mother with an anemic or zinc-deficient child <5 y old was observed in 12.6% and 14.0% of households, respectively. Both values were lower than expected, although not significant assuming burdens were independent ($P > 0.05$). At the individual level, the double burden of OW/OB and stunting, anemia, or zinc deficiency was found in 2.8%, 0.7%, and 8.4%

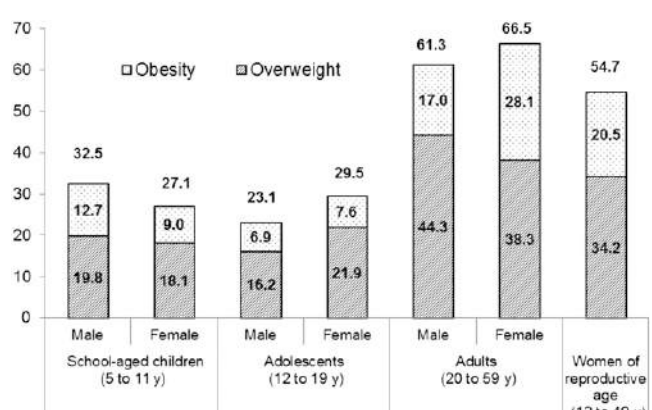

FIGURE 2 Prevalence of overweight and obesity in school-aged children, adolescents, adults, and women of reproductive age.

TABLE 2
Assessment of the double burden of undernutrition and OW/OB at the household and individual levels in Ecuadorian children and women: ENSANUT-ECU, 2012[1]

	Stunting, %			Anemia, %			Zinc deficiency, %		
	With	Without	Total[2]	With	Without	Total[2]	With	Without	Total[2]
Household level									
Children <5 y old									
Nonpregnant mother with OW/OB	13.1[3] (12.0, 14.4)	44.5 (42.7, 46.3)	57.6 (55.8, 59.4)	12.6[4] (10.6, 14.9)	40.9 (37.6, 44.2)	53.5 (49.9, 57.0)	14.0[5] (11.9, 16.5)	39.4 (36.1, 42.8)	53.4 (49.9, 56.9)
Nonpregnant mother without OW/OB	11.7 (10.6, 12.9)	30.7 (29.0, 32.4)	42.4 (40.6, 44.2)	13.8 (11.4, 16.6)	32.8 (29.7, 36.1)	46.5 (43.0, 50.1)	13.5 (11.2, 16.2)	33.0 (29.8, 36.5)	46.6 (43.1, 50.1)
Total	24.8 (23.3, 26.5)	75.2 (73.5, 76.8)	100.0 [8078]	26.4 (23.4, 29.5)	73.6 (70.5, 76.6)	100.0 [1893]	27.5 (24.5, 30.8)	72.4 (69.2, 75.5)	100.0 [1893]
P			0.002			0.057			0.378
Individual level									
School-aged children (5–11 y old)									
With OW/OB	2.8[6] (2.4, 3.2)	26.7 (25.3, 28.2)	29.5 (28.0, 31.0)	0.7[7] (0.4, 1.3)	28.3 (26.1, 30.6)	29.0 (26.8, 31.4)	8.4[8] (7.0, 10.0)	20.6 (18.8, 22.6)	29.0 (26.8, 31.4)
Without OW/OB	12.2 (11.3, 13.2)	58.3 (56.8, 59.9)	70.5 (69.0, 72.0)	2.7 (2.1, 3.4)	68.3 (66.0, 70.6)	71.0 (68.7, 73.2)	19.5 (17.6, 21.6)	51.5 (48.9, 54.0)	71.0 (68.7, 73.2)
Total	15.0 (13.9, 16.1)	85.0 (83.9, 86.1)	100.0 [11,379]	3.4 (2.7, 4.2)	96.6 (95.8, 97.3)	100.0 [4396]	27.9 (25.6, 30.3)	72.1 (69.7, 74.4)	100.0 [4395]
P			0.001			0.133			0.582
Women of reproductive age (12–49 y old)									
With OW/OB	—	—	—	8.9[9] (7.9, 9.9)	49.1 (47.3, 50.9)	58.0 (56.3, 59.7)	32.6[10] (30.7, 34.5)	24.9 (23.2, 26.8)	57.5 (54.0, 58.4)
Without OW/OB	—	—	—	6.2 (5.4, 7.1)	35.8 (34.1, 37.5)	42.0 (40.3, 43.8)	23.6 (22.0, 25.4)	18.8 (17.4, 20.4)	42.5 (41.6, 46.0)
Total	—	—	—	15.1 (13.9, 16.4)	84.9 (83.6, 86.1)	100.0 [8014]	56.2 (55.7, 59.3)	43.8 (40.7, 44.3)	100.0 [7205]
P			—			0.664			0.606

[1]Values are prevalences (%); 95% CIs in parentheses. All *P* values are for comparisons between the percentage with double burden and the percentage expected if the burdens were independent. Differences between the expected and the observed prevalence were compared by using a chi-square test. ENSANUT-ECU, Ecuadorian National Health and Nutrition Survey; OW/OB, overweight or obesity.

[2]*n* in brackets.

[3–10]Expected values = [3]14.3%, [4]14.1%, [5]14.7%, [6]4.4%, [7]1.0%, [8]8.1%, [9]8.8%, and [10]32.3%.

of school-aged children, respectively. The observed prevalences of Ii An-OW/OB and Ii Zn-OW/OB corresponded to the expected value because they were not significant. At the individual level, the coexistence of OW/OB and anemia was found in 8.9% of women of reproductive age. Moreover, 32.6% of overweight or obese women aged 12–49 y also suffer from zinc deficiency. In both cases, the prevalence corresponded to expected values because they were not significant. In synthesis, the data show that micronutrient deficiencies are present in women of reproductive age, independent of their BMI. Moreover, the data confirm findings presented earlier that show that anemia is less prevalent than zinc deficiency but that both persist as important nutritional problems.

DISCUSSION

Although stunting and micronutrient deficiencies have been observed in Ecuador for at least 2 decades (24), the emerging phenomenon of OW/OB is still not widely recognized, even though other recent studies also found high rates of overweight and obesity in women of reproductive age as well as in older adults (25, 26). In this highly dynamic scenario, rates of undernutrition in the form of stunting, anemia, and zinc deficiency persist, particularly in vulnerable segments of the population. At the same time, rates of overweight and obesity have increased dramatically in all points of the life cycle (13).

A study conducted by the World Bank (27) that estimated the prevalence of undernutrition in children <5 y old in Ecuador is the only previous work that shows simultaneous high levels of undernutrition and OW/OB in mothers, thereby suggesting the presence of the double burden. Nevertheless, as far as we are aware, the data presented in this article are the first collected from a national, representative sample that conclusively show the coexistence of high rates of undernutrition and OW/OB in Ecuador at the individual, household, and national levels. Specifically, in >13.1% of the households, a stunted child <5 y old coexists with an overweight or obese mother. The dual burden was also observed at the individual level; 8.4% of school-aged children are both zinc-deficient and either overweight or obese whereas 32.6% of women of reproductive age are also zinc-deficient and suffer from OW/OB.

Most of the prevalence values observed with regard to the double burden at the individual and household levels fall within the range of expected values, although the prevalance of Hh St-OW/OBm and Ii St-OW/OBs was lower than expected and was significant. Therefore, the analysis of the double burden in different population segments shows that the presence of each condition (stunting, OW/OB, anemia, and zinc deficiency) in the same household or at the individual level is the product of the magnitude of the individual prevalence rates in the population. Nevertheless, the independence of each condition does not change the fact that both conditions coexist and therefore the underlying determinants of undernutrition and OW/OB should be simultaneously addressed by appropriate public health policies.

The coexistence of nutritional problems of deficit and excess in the same individuals and households can be explained by several factors, which are hardly unique to Ecuador. In this sense, the present case is particularly relevant because, although Ecuador is a middle-income country, the United Nations places it in the high-development category in the 89th place of 186 countries (12).

First, the increase in the rate of overweight and obesity in the Ecuadorian population is greater than the decrease in undernutrition. Second, the double burden is related to changing patterns of diet and physical activity. The ENSANUT-ECU study suggests that emerging food consumption patterns in Ecuador might be substantially contributing to the double burden. On one hand, 30% of the population has an excessive intake of carbohydrates based in large part on the consumption of rice, which is the most important staple in that it also contributes significantly to the daily intake of protein, iron, and zinc, even though it provides low nutrient bioavailability (13). In contrast, Ecuadorians consume, on average, very small quantities of fresh fruit and vegetables; although the recommendation is 400 g/d, mean consumption is only 183 g. Hence, the prevailing pattern of food consumption incorporates an inadequate consumption of micronutrients but at the same time might promote overweight and obesity. In addition, levels of physical activity are low in all age groups. Among school-aged children and adolescents, 21% and 26%, respectively, spend an average of ≥2 h/d watching television or playing electronic games, whereas 45% of adults have a low level of physical activity or are inactive (13). Third, recent studies have shown that overweight and obese individuals have a greater probability of suffering from iron and zinc deficiency than do those who are not overweight or obese (28–30). Fourth, these patterns have evolved within the context of structural changes observed in Ecuador and throughout the world to one degree or another. Specifically, nutritional status has been irrevocably altered by the globalization of agricultural production and food consumption fueled in part by transnational markets, the diffusion of technological innovations (particularly the near-universalization of television and digital communications), accelerated rates of urbanization, dramatic shifts in occupational structure, improved educational status, and changing sex roles (31, 32).

Although the double burden of undernutrition and OW/OB should be part of public discourse and should also frame health policy in Ecuador, decision makers have yet to recognize the implications of the high prevalence of overweight and obesity or to fully understand that the presence of this problem in children and adolescents presages an unhealthy future. In short, there is little appreciation or sufficient understanding of the double burden of undernutrition and OW/OB in different segments of the population.

The Ecuadorian government has allocated unprecedented proportions of the budget to investments in health and nutrition. Among the priorities is a reduction in the persistently high rates of undernutrition in children <5 y, for whom substantial resources have been dedicated, according to an action plan that was based on scientific evidence (33). Nevertheless, the prevalence of stunting remains at very high levels and is much higher than levels found in other countries in the region, including Brazil, Mexico, and Colombia (34–36).

The government has implemented a set of interrelated actions, including a package of health services for mothers and children called "Desnutrición Cero" (Zero Undernutrition), a school lunch program called "Programa de Alimentación Escolar" (School Lunch Program), and the promotion of physical activity. In addition, the government is presently considering various alternatives for regulating the advertising and sale of processed foods. Nevertheless, at the implementation level, these actions are poorly articulated and fail to address the looming double burden of malnutrition. Moreover, these programs have not been evaluated to determine whether or not they have had any impact.

To be able to define an integrated strategy that simultaneously addresses the double burden, it is essential that there be broad consensus on the causes and determinants of this evolving public health problem. In that context, it is expected the ENSANUT-ECU study will contribute to a shared understanding of the evolving epidemiologic and nutritional profile of the diverse Ecuadorian population and to the development of an integrated strategy that considers both undernutrition and overweight and obesity.

The principal lesson to be learned from the Ecuadorian experience is that although program implementation in some places may suffer from inadequate resources, this is not always the case. Rather, the ability to successfully address this complex and emerging problem may be limited by other factors, including gaps between knowing what should be done and being able to implement effective solutions, in part because of political realities and because qualified professionals are often not in a position to take the lead in implementing innovative solutions. Even at the local level, public health teams, which generally include physicians, nurses, and nutritionists, are often unable to include nutrition components within a package of primary health services. Given these limitations, it is essential that a broad range of actors be incorporated into interdisciplinary and integrated efforts at all levels of decision making and implementation to address the double burden discussed in this article.

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