Chapter 6
Epidemiology of Obesity in Children in South America

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Introduction

South America is experiencing rapid epidemiologic and nutrition transitions. In the last two to three decades, profound demographic, socio-economic and environmental changes have occurred in the region (Popkin 1994). As a result, dietary and physical activity patterns of the population have changed, influencing the epidemiologic and nutritional profiles of the countries. The epidemiologic situation in the Americas is now characterized by a reduction of communicable diseases, maternal, and perinatal diseases, and a progressive increase of non-communicable chronic diseases (i.e., cardiovascular diseases, diabetes and cancer) and injuries as causes of mortality, morbidity and disability (Albala and Vio 1995). At the same time, the nutritional profile of the region has dramatically changed. Low birth weight, wasting, stunting, and nutrient deficiencies have decreased and obesity and overweight increasingly arise as the main nutritional problems in all age groups and even among low-income and indigenous people (Albala et al. 2001).

However, these changes have occurred at different speeds within the region portraying a picture of high variability among the different countries. Some countries, such as Uruguay and Chile, are in the advanced stages of the demographic, epidemiologic and nutrition transitions while others, such as Peru or Bolivia, still present high infant mortality rates, significant prevalence of infectious diseases and persistence of stunting, anemia, and micronutrient deficiencies. Early life undernutrition (i.e., low birth weight) as well as chronic undernutrition (i.e., stunting) may contribute to exacerbate obesity and nutrition-related chronic disease risk later in life (Duran et al. 2006; Sawaya et al. 2003). Thus, the coexistence of yesterday`s unsolved problems with the emerging challenges of obesity, chronic diseases and injuries poses additional difficulties for ensuring healthy life in the region (Frenk et al. 1991).

According to the 2004 report of the International Obesity Task Force (IOTF), more than 20% of school-age children in the Americas have excess weight (Lobstein et al. 2004). Moreover, in most countries childhood obesity is worsening at a dramatic rate. The World Health Organization (WHO) global estimates predict that if the current trends persist, by 2050 one out of four children will be obese and almost 40% will be overweight. Current evidence suggests that overweight in children persists into adulthood. More than half of the children who are overweight at 2–5 years of age and 80% of children who are overweight at 7–11 years will remain overweight at age 12 years (Nader

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et al. 2006); similar tracking from childhood to adulthood has been described for obese children with obese parents (Whitaker et al. 1997). Moreover, obese children are more likely to develop similar metabolic complications and cardiovascular disease as adults (Baker et al. 2007; Bibbins-Domingo et al. 2007; Freedman et al. 2001; Srinivasan et al. 2002). If current obesity trends persist among adolescents, it is estimated that by 2035 cardiovascular disease will increase to 5–16% with more than 100,000 excess cases attributable to the increased obesity (Bibbins-Domingo et al. 2007). Childhood obesity is also associated with several concurrent medical and psychological problems. Insulin resistance, hypertension, dyslipidemia, type 2 diabetes and the metabolic syndrome are increasingly diagnosed in obese young people (Eisenmann 2003; Freedman et al. 1999) among many other diseases. Obese children are also at risk of developing psychosocial problems such as depression, shame, low self esteem, self-blame, etc. that may impair their social and academic performance (Schwartz and Puhl 2003). Overall, the social and economic cost of obesity and its related problems are staggering (Powers et al. 2007).

The aim of this paper is to display a picture of childhood obesity in Latin South America and to provide a general overview of some of its risk factors in the context of the nutrition transition that the region is experiencing.

Geographic Region

According to the Pan-American Health Organization (PAHO) America is divided into three main regions: North America, the Caribbean, and Latin America. The South portion of Latin America in turns encompasses three sub regions: Brazil, the Southern Cone (Argentina, Uruguay, Chile and Paraguay) and the Andean Area (Bolivia, Colombia, Peru, Venezuela and Ecuador).

Socio-economic and demographic characteristics of countries of the South part of Latin America are presented in Table 6.1 and Table 6.2, respectively. In terms of socio-economic conditions, on average, countries of this sub region are located in an intermediate position worldwide and in a high position within developing countries. Demographic indicators also reflect a higher degree of development compared to other regions worldwide. However, within the region there are important differences in the level of socio-demographic development. Countries of the southern cone are the most advanced into the demographic, epidemiologic and nutrition transition, with the exception of Paraguay. Correspondingly, people in these countries have better socio-economic condition and higher life expectancy than the rest of the countries of the region. Countries of the southern cone present lower infant, maternal, and perinatal mortality rates and lower infectious diseases whereas morbidity and mortality from chronic diseases are more common than in other countries. Brazil, Colombia, and Venezuela are in an intermediate position while Bolivia, Peru, Ecuador and Paraguay are at an early stage of the demographic, epidemiologic and nutrition transitions.

Methods

This chapter is based on descriptive cross-sectional population-based data. Data were obtained from multiple sources: national surveys conducted from 2000 onwards that were publically available; governmental data and publications when they were available at the web; World Health Organization (WHO) and Pan American Health Organization (PAHO) databases and publications; databases from non-governmental organizations; and published articles compiled trough Medline, Scielo and Lilacs.

Table 6.1 Socio-economic characteristics of the south region of Latin America (WHO 2008)

	Year	Argentina	Bolivia	Brazil	Chile	Colombia	Ecuador	Paraguay	Peru	Uruguay	Venezuela
HDI (ranking)	1990 (UNDP 2007)	0.813	0.606	0.723	0.788	0.729	0.714	0.718	0.71	0.806	0.762
		(38)	(117)	(70)	(40)	(75)	(89)	(95)	(87)	(46)	(74)
	2008 (UNDP 2008)	0.860	0.723	0.807	0.874	0.787	0.807	0.752	0.788	0.859	0.826
		(46)	(111)	(70)	(40)	(80)	(72)	(98)	(79)	(47)	(61)
GDP US	1990	6,850	1,600	5,150	4,430	4,310	2,330	3,690	3,020	5,510	4,630
PPP	2006	15,390	2,890	8,800	11,270	7,620	4,400	5,070	6,080	11,150	7,440
H20/L20 (PAHO 2007)	2000–2005	17.9	42	21	15.8	21	17.6	25.8	15.3	10.1	15.8
% Urban population (UNDP 2007)	1990	87	56	75	83	69	55	49	69	89	84
	2006	90	65	85	88	73	63	59	73	92	94
Drinking water access %	2006	96	86	91	97	93	95	77	84	100	89
Access to sanitation %	2006	91	43	77	94	78	84	70	72	100	83
% Literacy (≥ 15 years)	2000–2005	97.2	86.7	88.6	95.7	92.8	91	93.5	87.9		93
Calories availability (FAO 2007)	2003	2,959	2,219	3,146	2,872	2,567	2,641	2,524	2,579	2,883	2,272

HDI human development index; *GDP PPP* gross domestic product at purchasing power parity; *H20/L20* ratio of share in total income/expenditure of the highest quintile group to the lowest quintile group

Table 6.2 Demographic characteristics of the south region of Latin American countries 1990–2006 (WHO 2008)

	Year	Argentina	Bolivia	Brazil	Chile	Colombia	Ecuador	Paraguay	Peru	Uruguay	Venezuela
IMR (per 1,000 live births)	1990	24	89	48	18	26	43	33	41	22	27
	2006	14	50	19	8	17	21	19	24	13	18
Mortality <5 years (per 1,000 live births)	1990	28	125	57	21	35	57	41	78	25	33
	2006	17	61	20	9	21	24	22	25	15	21
LBW (%)	2000–2002	7	9	10	5	9	16	9	11	8	7
TFR (per woman)	1990	3	4.9	2.8	2.6	3	3.3	4.5	3.9	2.5	3.4
	2006	2.3	3.6	2.3	1.9	2.3	2.8	3.2	2.5	2.1	2.6
Mortality 15–60 year rate (per 1,000 pop)	1990	150	277	212	147	211	214	119	178	147	148
	2006	124	208	176	91	131	166	132	136	125	142
Men	1990	198	307	272	196	268	254	173	204	195	178
	2006	162	242	230	98	176	206	123	153	164	187
Women	1990	103	248	150	98	152	173	99	152	98	117
	2006	86	176	121	60	87	123	101	118	88	95
Life expectancy at birth (year)	1990	72	58	62	72	68	67	73	67	72	72
	2006	75	66	72	78	74	73	75	73	75	74
Men	1990	69	57	63	69	65	64	71	65	69	70
	2006	72	64	68	75	71	70	72	71	72	71
Women	1990	76	59	70	76	71	69	75	69	76	74
	2006	78	67	75	81	78	76	78	75	79	78

IMR infant mortality rate; *TFR* total fertility rate; *LBW* low birth weight

Socio-Economic and Demographic Indicators

General socio-economic and demographic information were obtained from the World Health Statistics 2008 (WHO 2008), and PAHO Health in the Americas: basic indicators 2007 (PAHO 2007). Human development indexes were obtained from United Nations Development Programme (UNDP) (UNDP 2007, 2008).

Obesity Estimates

Pre-school children were defined as children 0–4.99 years of age. Prevalence of obesity at this age was obtained from WHO global data base on child growth and malnutrition (WHO 2009a). Data for obesity trends in pre-school children were abstracted from previous reports of WHO and published papers.

School age children were defined as children 5–9.99 years of age, except in the case of Venezuela where those data were available for 7–14 years old children only. Excess weight estimates for school children comes from published papers and national data sources.

Adolescence was defined as the period between 10 and 18 years of age, except in the case of Brazil where those data were available for the 10–19 years old age range. Data on excess weight prevalence in adolescents come from published papers and available national data sources.

Obesity Definition

In pre-school children, excess weight was defined based on z-scores (i.e., standard score that indicates the number of standard deviations (SD) over or below the mean). Obesity was defined as weight for-height z-score (WHZ)>+2SD and overweight as WHZ>+1SD of the WHO Child Growth Standards (World Health Organization (WHO) 2006). Survey data prior to 2006 were analyzed using the National Centre for Health Statistics (NCHS WHO) international reference population (Hamill et al. 1979).

In school age children and adolescents available information was based on various definitions of excess weight (i.e., WHO 2006 (WHO 2006), NCHS/WHO 1978 (Hamill et al. 1979), Centers for Disease Control (CDC) (Kuczmarski et al. 2002), IOTF (Cole et al. 2000) and Must criteria (Must et al. 1991)).

Obesity Risk Factors

Breastfeeding data were obtained from the global data bank on breastfeeding and complementary feeding (WHO 2009b) and national health surveys.

Physical activity information was not available from official web sites or representative reports. Thus, we used non-comparable information available from published papers.

Dietary intake information was mainly abstracted from FAO statistical yearbook (FAO 2007) and published papers.

In women, obesity was defined as body mass index (BMI) ≥30 and overweight as a BMI ≥25. This information was available from IOTF and national surveys.

Results

Prevalence of Obesity in Pre-School Children

Table 6.3 shows figures from the 1990s and the latest available data for the ten countries of the Latin American region. As shown, in the 1990s, Peru, Argentina and Brazil had the highest prevalence (9.0, 7.3, and 6.6%, respectively), while the lowest prevalence is observed in Colombia and Venezuela (4.5 and 3.0% respectively). In the last two decades the trends in the prevalence of obesity in pre-school children has increased in all countries of the region with the exception of Venezuela. As it is depicted in Table 6.3, presently the Southern Cone as a whole has the highest prevalence. In Paraguay obesity among pre-schoolers reaches a prevalence of 14.2% and it is the highest in South America. In the Andean region, Peru and Bolivia have the highest prevalence while Ecuador, Colombia and Venezuela have the lowest. Brazil with a prevalence of 7% is in an intermediate position.

Prevalence of Obesity in School Children

In the region, anthropometric measurements in school age children are less systematically collected than in pre-school children. The figures presented in Table 6.4 come from different sources but almost all are from official governmental organizations or ministries. In some countries with a national surveillance system there are annual data available as in Chile, while in others, national data come from cross-sectional surveys such as in Colombia, Ecuador, Paraguay, Uruguay, and Venezuela. In Argentina, Bolivia, Brazil, and Peru we were unable to find national data, therefore we present latest estimates from specific samples. This lack of consistency in the sample population and in the obesity definition used in each of the countries did not allow us to validly compare obesity prevalence among countries. Nonetheless, and considering this limitation, it can be observed that at this age the general picture is similar to that described for pre-school children, with countries of the Southern Cone of Latin America presenting the highest obesity prevalence of the region. Information about obesity trends was available only in a few countries and indicated that there is a consistent upward trend. In Peru for example the prevalence of overweight in the

Table 6.3 Trends in the prevalence of obesity[a] in pre-school children from the south region of Latin America in the last decade, by country

Andean sub region	1990–1998 (WHO 2008)	2000–2007 (WHO 2009a)
Bolivia	6.5 (1998) (Lobstein et al. 2004)	9.2 (2003–2004)
Colombia	4.5 (1995)	5.1 (2004–2005)
Ecuador		5.1 (2004)
Peru	9.9 (1996)	11.8 (2000)
Venezuela	3.0 (1997) (Lobstein et al. 2004)	3.2 (2000)
Southern Cone		
Argentina	7.3 (1994) (de Onis and Blossner 2000)	9.9 (2004–2005)
Chile	6.2 (1996)	9.8 (2007)
Paraguay	6.3 (1990)	14.2 (2002) (PAHO 2007)
Uruguay	6.2 (92–93) (PAHO 2007)	9.4 (2004)
Brazil	6.6 (1996)	7.3 (2006–2007)

Reference population = 1978 NCHS/WHO for 1990–2005 estimates
Reference population = WHO 2006 for 2006–2007 estimate
[a] Obesity = weight for height >2SD

Table 6.4 Prevalence of excess weight in school children from the south region of Latin America, by country

Andean sub region	Age (years)	Year	Sample	Definition	% Overweight	Definition	% Obesity
Bolivia (Perez-Cueto et al. 2009)	5–7	2007	NR	85th≤BMI≤95th (WHO 2007)	24.0	BMI≥95th (WHO 2007)	6.0
Colombia (Instituto colombiano de bienestar familiar (ICBF) 2006)	5–9	2005	National			WHZ≥2 SD (NCHS/WHO 1978)	4.3
Ecuador (Yépez 2005)	7.5–8.5	2001	National	85th≤BMI≤95th	8.0	BMI≥95th	6.0
Peru (Pajuelo et al. 2004)	6–10	2004	NR	85th≤BMI≤95th (Must 1991)	16.5	BMI≥95th (Must 1991)	13.9
Venezuela (Instituto Nacional de Nutrición Gobierno Bolivariano de Venezuela 2005)	7–14	2005	National	WHZ≥90th (NCHS/WHO 1978)	19.3		
Southern Cone							
Argentina (Bejarano et al. 2005)	4–10	2000	NR	85th≤BMI≤95th (CDC 2000/IOTF)	17.5/17.0	BMI≥95th (CDC 2000/IOTF)	6.7/11.9
Chile (Junta Nacional de auxilio escolar y becas (JUNAEB) Gobierno de Chile 2008)	6–8	2008	NR-National			WHZ≥2 SD (NCHS/WHO 1978)	20.8
Uruguay (Pisabarro et al. 2000)	9	2000	National	85th≤BMI≤95th (Must 1991)	21.8	BMI≥95th (Must 1991)	10.0
Paraguay (Sistema de Vigilancia Nutricional (SISVAN) 2008, 2009)	6–8	2008	National	85th≤BMI≤95th (CDC 2000)	11.4	BMI≥95th (CDC 2000)	5.1
Brazil (Triches and Giugliani 2005)	8–10	2003	NR	85th≤BMI≤95th (Must 1991)	16.9	BMI≥95th (Must 1991)	7.5

NR non representative

population under 15 years of age rose from 8.5% in 1990 to 11.3% in 2000 (PAHO, 2007) while in Chile prevalence of obesity in first graders increased from ~5% in 1990 to ~19% in 2005 (Kain et al. 2003; Vio et al. 2008).

Prevalence of Obesity in Adolescents

In the case of adolescents, representative national data were available for most of the countries, except for Argentina, Chile, Peru, and Paraguay (Table 6.5). Most of this information comes from national nutritional surveillance systems and it was available through governmental web sites. For Argentina, Chile, and Peru we present the latest estimates from specific samples; for Paraguay we were unable to find valid data. Estimates were derived from study samples with different age ranges and used different definitions of obesity what, as in school age children, makes them difficult to compare. Nonetheless, overall, the obesity distribution in adolescents of the region indicated that the highest prevalence were observed in countries of the Southern Cone followed by Brazil and the Andean sub region, thus confirming the picture observed at earlier ages.

What Do We Know About Key Risk Factors?

At the individual level, obesity has an undeniable genetic component. However, genetic predisposition cannot explain differences in obesity prevalence within and between populations. Modifiable factors involved in the large increase in childhood obesity observed in the last decades can be grouped into three main groups of causes. First, there are contextual factors such as cultural, environmental and socio-economic factors (i.e., low education level of mothers, poverty, accelerated urbanization, etc.) that have dramatically changed the living conditions of the population promoting positive energy balance. Second, there are behavioral factors associated with increased energy intake (i.e., raise in soda and snack consumption, enlarged portion sizes, parental feeding styles that promote overeating, etc.) and decreased physical activity (i.e., TV viewing, decreased exercise, etc.). Finally, there are developmental factors mainly related to early nutrition such as poor nutrition of the mother, obesity in pregnant women, low birth weight, duration of breastfeeding and child malnutrition (Albala et al. 2002; WHO/PAHO 2007; World Health Organization (WHO) 2003). For more details on determinants of childhood obesity please refer to the corresponding chapters of Part II of this book.

Urbanization and Socio-Economic Conditions

The economic growth, the achievements in education and the rapid urbanization have produced dietary changes and a progressive decrease of physical activity during work and leisure time, primary causes of the explosion of obesity in the region (Uauy et al. 2008). The urbanization process began earlier in Argentina, Chile, Uruguay Venezuela and Brazil, with more than 75% of the population living in urban settlements previous to the 1970s. Nowadays urban living is a common phenomenon in the whole region reaching 76.4% in the Andean Sub Region, 85.6% in Brazil and 88.1% in the Southern Cone (Table 6.1). On the one hand, this process had positive effects in increasing access to drinking water and sanitation, better literacy rates and education and more access to housing and health services. On the other hand, urbanization produces dramatic changes in lifestyles increasing sedentarism and turning to diets rich in fat, animal products, sugar and salt coupled with low

Table 6.5 Prevalence of excess weight in adolescents of the south region of Latin America, by country

Andean sub region	Age (years)	Year	Sample	Definition	% Overweight	Definition	% Obesity
Bolivia (Perez-Cueto et al. 2009)	12–18	2005–2007	National	BMI (IOTF)	13.2	BMI (IOTF)	2.5
Colombia (Instituto colombiano de bienestar familiar (ICBF) 2006)	10–17	2005	National	85th ≤ BMI ≤ 95th (CDC 2000)	10.3		
Ecuador (Yépez 2005)	12–18	2006	National	85th ≤ BMI ≤ 95th	13.7	BMI ≥ 95th	8.5
Peru (based on Pajuelo (2003))	10–15	2003	NR	85th ≤ BMI ≤ 95th (Must 1991)	18.2	BMI ≥ 95th (Must 1991)	5.0
Venezuela (Instituto Nacional de Nutrición Gobierno Bolivariano de Venezuela)	7–14	2005	National	WHZ ≥ 90th (NCHS/WHO 1978)	19.3		
Southern Cone							
Argentina (Poletti and Barrios 2007)	10–15	2007	NR	BMI (IOTF)	17.1	BMI (IOTF)	4.5
Chile (Bustos et al. 2010)	10–18	2006	NR	85th ≤ BMI ≤ 95th (CDC 2000)	18.2	BMI ≥ 95th (CDC 2000)	9.8
Uruguay (Pisabarro et al. 2000)	12	2000	National	85th ≤ BMI ≤ 95th (Must 1991)	18.7	BMI ≥ 95th (Must 1991)	4.8
Brazil (Instituto Brasileiro de Geografia e Estatística 2006)	10–19	2002–2003	National	BMI (IOTF)	16.7	BMI (IOTF)	2.3

NR non representative data

consumption of cereals, legumes, and other fiber-rich foods, such as vegetables and fruits. All these changes promote a positive energy balance that is reflected in an increase in obesity prevalence.

Data from different countries in the region confirm that obesity increases with urbanization. For example, in Colombia in 2005 for the 10–17 years old age group, overweight was 7.2% in rural regions while reached 11.6% in urban regions (Instituto colombiano de bienestar familiar (ICBF) 2006). In Peru, several studies published by Pajuelo (Pajuelo 2003; Pajuelo et al. 2000; Pajuelo et al. 2001) show that in 2000 overweight and obesity were at least twice times higher in urban than rural children (9.8% vs. 21.4% overweight, and 2.2% vs. 12.4% obesity). Recent reports of Bolivia national estimates also confirm that childhood obesity is higher in the urban areas (Perez-Cueto et al. 2009).

The socio-economic distribution of obesity depends on the level of development of the countries. At initial stages of the nutrition transition, excess weight tends to concentrate in groups of high socio-economic status (SES). As the transition moves into further stages, obesity starts to affect medium and low SES groups. Finally, in a post-transitional situation, obesity is concentrated in low SES groups (Monteiro et al. 2004). This trend is consistent with what is observed in Latin America. Data from countries facing early stages of the transition such as Bolivia, Ecuador, and Peru indicate that overweight and obesity is more frequent in high than low SES groups (OPS Ecuador 2007; Perez-Cueto et al. 2009; Yépez 2005; Yépez et al. 2008) while in countries in more advanced stages such as Brazil, Uruguay or Chile there is no clear association between SES and obesity or obesity tends to be higher among low SES children. In Brazil, the 2004–2005 follow-up of the 1993 Pelotas Cohort Study showed that obesity was more prevalent among high SES adolescents than in those with low SES (Matijasevich et al. 2009). However, the opposite situation was observed in the case of women from the 1982 Pelotas Cohort Study. In this study, 18 years old women with high SES had lower prevalence of obesity than women from low SES. The same situation has been described by Monteiro et al. (2007), who in the last years observed a decrease in the prevalence of obesity among females of higher income and an increase in females of low income. Unfortunately, the observed trend in Brazil, where the obesity epidemic is shifting toward poor people, is being observed in other Latin American countries.

Sedentary Behavior

WHO reports that sedentary lifestyle is one of the main contributory factors to increasing obesity rates (World Health Organization (WHO) 2002). According to the WHO report, 30–60% of the population of the Latin American region does not achieve the minimum recommended levels of physical activity (World Health Organization (WHO) 2003). The rapid urbanization of the countries of the region has contributed to achieving these alarming rates of physical inactivity. The expansion of the cities has led to an increase in the amount of time spent commuting to work or school. On the one hand, insecurity and the reduction of public spaces and parks contribute to decreasing active recreational exercise time as well as increasing the time spent watching TV or in front of a computer. On the other hand, technical appliances that are increasingly more accessible to all population, save time but also decrease physical activity (Vio et al. 2008).

Although it is very difficult to have comparable measurements of physical activity among countries, all the available data evidence a high prevalence of sedentary behavior in the Region. The last two national surveys done in Chile (Ministerio de Salud-Instituto Nacional de Estadísticas 2004, 2007) demonstrated that 90% or more of the population can be defined as sedentary. Only 8.6% of the interviewed performed at least 30 min of exercise three times per week in 2000 and 10.8% in 2006. Women were more inactive than men in their leisure time, particularly if they belonged to low SES groups. In both surveys the main reasons to be inactive were: lack of time (33%), no interest

(23.3 to 25.2%), health reasons (19.5 to 20.1%) and lack of places to exercise (14 to 9%). In Argentina, the National Survey 2007 (Ministerio de Salud. Presidencia de la Nacion Argentina, 2007) showed that only 18.6% of the women between 10 and 49 years performed three or more sessions of moderate or vigorous physical activity per week. The 2004 National Health Survey conducted in Colombia reported that 12.5% of adolescents (12–17 years) and 23.5% of adults (18–69 years) regularly practice vigorous PA. In the group of adolescents, 42.9% do not exercise at all, being the same situation observed in 79% of the adults. In Brazil, during 2002–2003 a survey to identify risk factors in the population 15 years and older was conducted in 15 state capitals of the country. The highest proportion of individuals classified as insufficiently active was found in Paraiba (54.5%) and the lowest in Para (28.2%). The National Health Survey conducted in Bolivia in 2003 (Gutiérrez Sardán et al. 2004) showed up that 41% women and 74% of men reported exercising at least 10 min during leisure time in the last week. In Peru, the 2006 Food and Nutrition Survey of the National Institute of Health indicated that 40% of the assessed population practiced little physical activity (Ministerio de Salud. Instituto Nacional de Salud (INS), Centro Nacional de Alimentación y Nutrición (CENAN) (2006)).

Dietary Factors

Presently, dietary factors are important risk factors for the main causes of death and disease in South American countries. As income increases, so does overall energy intake and total fat, especially saturated fat. With the exception of Venezuela and Bolivia, the availability of total calories and calories from fat, has increased in the last two decades in the entire region. The largest increase took place in Peru (20%) followed by Ecuador, Brazil and Colombia (Table 6.6). The consumption of cereals, legumes and other fiber-rich foods such as vegetables and fruits remain stable or decline in the same period (Albala et al. 2003; Popkin 1993). According to the FAO food balance sheets a decrease in the consumption of cereals and pulses was observed in Chile and Brazil between 1979 and 1999. A decrease in the consumption of fruits and vegetables has been also observed in Chile (Albala et al. 2003; Uauy et al. 2001). Trends in household food expenditure by income quintile in Chile in the last decade show a decrease in the consumption of bread while sweetened soft drinks have doubled or tripled in all socio-economic groups (Albala et al. 2002). In Table 6.7, we present the last available data on dietary components for the South American countries. Bolivia, Peru, Paraguay and Ecuador (i.e., the least urbanized countries) show the highest consumption of tubers, roots, fruits and vegetables while more urbanized countries such as Brazil, Chile, Colombia, and Uruguay present higher consumption of meats, cereals, and sugar than the rest of the countries of the region.

Breastfeeding

The duration of breastfeeding is a crucial factor in child nutrition. Several studies have shown that maintaining exclusive breastfeeding for 6 months is associated with lower infant morbidity and mortality as well as with a faster postpartum recovering (Kramer and Kakuma 2002). Furthermore, exclusive breastfeeding appears to be a protective factor against obesity and overweight in children (Bergmann et al. 2003; Scanferla de Siqueira and Monteiro 2007; Simon et al. 2009). WHO appraisals for South America, made by Léuer and De Onis, estimate that 40% of women exclusively breastfed for at least 6 months (de Onis and Blossner 2000; Lauer et al. 2004). These values are consistent with the prevalence described in Table 6.8. In all countries breastfeeding rates at 4 months are under 50%, with the exception of Peru and Chile.

Table 6.6 Dietary energy, protein, and fat consumption in the south region of Latin America, by country 1980–2002 (FAO 2007)

	Kcal/day			Fats g/person/day			Proteins g/day		
	1979–1981	2001–2003	Difference (%)	1979–1981	2001–2003	Difference (%)	1979–1981	2001–2003	Difference (%)
Argentina	3,210	2,980	−7.2	116	100	−13.8	107	94	−12.2
Bolivia	2,130	2,220	+4.2	52	58	+11.5	55	57	+3.6
Brazil	2,680	3,060	+14.2	65	93	+43.1	63	83	+31.7
Chile	2,670	2,860	+7.1	60	85	+41.7	71	80	+12.7
Colombia	2,290	2,580	+12.7	47	65	+38.3	49	60	+22.5
Ecuador	2,360	2,710	+14.8	60	99	+65	50	57	+14
Paraguay	2,580	2,530	−1.9	70	87	+24.3	75	69	−8
Peru	2,130	2,570	+20.7	38	48	+26.3	54	67	+24.1
Uruguay	2,850	2,850	0	103	86	−16.5	86	86	0
Venezuela	2,760	2,350	−14.9	78	68	−12.8	70	62	−11.4

Table 6.7 Share of dietary components in total energy consumption of countries of the south region of Latin America, 2001–2003 (% kcal/person/day) (FAO 2007)

	Vegetal oils	Animal fats	Cereals	Sugar	Meat and offal	Milk, eggs and fish	Roots and tubers	Pulses	Fruits and vegetables
Argentina	10.1	2.4	33.1	14.9	17	9.5	3.7	0.3	5.0
Bolivia	8.7	1.8	38	12.9	11.7	3.0	8.3	1.0	10.1
Brazil	10.5	1.8	30.5	18	12.2	7.5	4.4	5.1	4.6
Chile	8.8	1.2	40.2	15.8	13	7.0	3.7	1.3	4.8
Colombia	10.7	2.2	33.3	18.6	6.5	8.3	7.4	2.6	8.3
Ecuador	18.6	3.1	30.8	16.4	7.8	7.3	2.6	1.5	10.0
Paraguay	13.3	3.0	29.5	9.2	8.6	7.1	13.8	4.0	4.1
Peru	5.3	3.2	40.5	14.5	4.3	5.4	13.3	2.6	6.7
Uruguay	6.4	2.0	40.5	11.4	14.8	11.5	4.4	0.9	4.4
Venezuela	14.4	1.6	36.2	15.5	8.2	6.5	6.7	1.9	6.7

Table 6.8 Prevalence of early life obesity risk factors in countries from the south region of Latin

	LBW %2000–2002 (WHO 2008)	Stunting <5 %	Breastfeeding at 4 months % (WHO 2008)	Obesity in women % (WHO 2008)
Argentina	7	8.2	25.9	17.5
Bolivia	9	32.5	34	11.2
Brazil	10	7.1	40	13.8
Chile	5	2.1	59.4	29.3
Colombia	9	16.2	34	10.5
Ecuador	16	29	42	14.6
Paraguay	9	10.9	22.1	35.7
Peru	11	31.3	73	23
Uruguay	8	13.9		18
Venezuela	7	12.8	11	

LBW low birth weight

Maternal Obesity

It has been proposed that mothers who are obese at the time of their pregnancy and during the breastfeeding period maintain higher concentrations of glucose and free fatty acids what in turn affects fetal metabolism, tissue growth, and hormonal regulation and possibly inducing lasting epigenetic changes (Lawlor et al. 2008; Plagemann 2008). These changes would define permanent changes in appetite control, neuroendocrine function, fuel metabolism and energy partitioning during early development potentially leading to greater adiposity and risk of obesity in later life. If this hypothesis is substantiated it would imply that the obesity epidemic will progress through generations irrespective of other changes (Ebbeling et al. 2002). This should be a matter of concern for the region considering that presently in all the countries maternal obesity is higher to 10% and in some countries such as in Chile, Paraguay, and Peru is even close to 30% (Table 6.8).

Low Birth Weight and Stunting

Low birth weight (LBW, birth weight below 2,500 g) and stunting (height-for-age below 2 SD of the mean) are still prevalent in some countries of the region, particularly in those that are just initiating the nutrition transition (Table 6.8). Several studies have demonstrated that birth weight is positively associated with body mass index at age 25–30 years (Stein et al. 2005; Victora et al. 2008). However, the association is stronger for lean mass than for fat mass; thus the link with BMI may represent an association between birth weight and lean mass rather than with adiposity. In Brazil, it has been demonstrated that early malnutrition leading to stunted linear growth is accompanied by an increased risk of obesity later on, as consumption of energy dense foods and inactivity during work and leisure have become common (Sawaya and Roberts 2003). In Table 6.8 it is possible to observe that the prevalence of stunting is inversely associated with the degree of development of the country. The highest estimates are observed in countries such as Ecuador, Bolivia and Peru in which almost one third of the children under five years are stunted. Also, besides Brazil, these countries have the highest prevalence of LBW (Table 8).

Conclusions

Obesity is increasing in the whole region at an alarming speed. Obesity constitutes the first nutrition problem in Chile, Argentina and Uruguay (Pisabarro et al. 2000) and one of the most important public health issues in almost all countries of the region. Countries at early stages of the nutrition transition have the challenge of simultaneously dealing with high rates of childhood obesity as well as stunting and LBW. This is compounded to the actual epidemic of obesity in women what further exacerbates the problem (Kain et al. 2003; Uauy et al. 2008). In most of these countries the prevalence of overweight and obesity in children is higher at higher SES but this is likely to change as countries improve their economic conditions (Peña and Bacallao 2000). The increasing urbanization with cities becoming larger and less secure discourages outdoor activities and recreational games for children that have been replaced by more hours watching television. Besides, urban life brings the people closer to fast food, cheaper, palatable and more accessible than traditional food. Thus, as countries move further into the nutrition transition it is likely that childhood obesity will increase if no action is taken. Urgent and effective actions are

needed to tackle the obesity epidemic. Comprehensive actions implemented at all levels and with the participation of all sectors of the community are needed to ensure healthy eating and physical activity in children and their families.

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