

Screen time in Mexican children: findings from the 2012 National Health and Nutrition Survey (ENSANUT 2012)

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Abstract

Objective. To provide descriptive information on the screen time levels of Mexican children. **Materials and methods.** 5 660 children aged 10-18 years from the 2012 National Health and Nutrition Survey (ENSANUT 2012) were studied. Screen time (watching television, movies, playing video games and using a computer) was self-reported. **Results.** On average, children engaged in 3 hours/day of screen time, irrespective of gender and age. Screen time was higher in obese children, children from the northern and Federal District regions of the country, children living in urban areas, and children in the highest socioeconomic status and education categories. Approximately 33% of 10-14 year olds and 36% of 15-18 year olds met the screen time guideline of ≤ 2 hours/day. **Conclusions.** 10-18 year old Mexican children accumulate an average of 3 hours/day of screen time. Two thirds of Mexican children exceed the recommended maximal level of time for this activity.

Key words: children; sedentary lifestyle; television, computer, video games; Mexico

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Resumen

Objetivo. Describir los hallazgos sobre el tiempo frente a una pantalla en niños y adolescentes mexicanos. **Material y métodos.** Una muestra representativa de 5 560 niños y adolescentes (10-18 años) respondió la Encuesta Nacional de Salud y Nutrición 2012 (ENSANUT 2012). El tiempo frente a pantalla incluyó ver televisión, películas, videojuegos y computadora. **Resultados.** Los niños y adolescentes pasan en promedio tres horas diarias frente a una pantalla. El porcentaje frente a pantalla fue mayor en obesos, pertenecientes a las regiones del norte y D.F., aquéllos que viven en áreas urbanas y de nivel socioeconómico y educativo alto. Aproximadamente 33% de los niños y 36% de los adolescentes cumplen con las recomendaciones internacionales de tiempo frente a pantalla (≤ 2 horas/día). **Conclusiones.** Los niños y adolescentes pasan en promedio tres horas diarias frente a una pantalla. Dos tercios de los participantes exceden las recomendaciones internacionales sobre tiempo ocupado en esta actividad.

Palabras clave: niños; adolescentes; estilo de vida sedentario; televisión computadora y videojuegos; México

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The emergence of an obesity epidemic in Mexico has highlighted the importance of studying the behaviors that contribute to obesity which include excessive caloric intake and a lack of physical activity.^{1,2} Historically, research in the physical activity sciences focused on engagement in moderate-to-vigorous physical activity (MVPA), which is defined as activities where the energy expenditure level is at least three times greater than while at rest.³ Thus, physical activity has traditionally been assessed in a dichotomous manner such that someone was considered to be either "active" (above the MVPA threshold) or "sedentary" (below the MVPA threshold).

Physical activity research conducted in the last couple of decades has evolved. Physical activity energy expenditure is now considered along a continuum that ranges from light intensity activities to activities that are extremely vigorous.^{4,5} Recent research has emphasized that being "active" and "sedentary" are two distinct behaviors. Specifically, youth who engage in sufficient MVPA (e.g., 60 minutes per day), and by historical definitions would be considered quite "active", may engage in a limited amount of light intensity activities outside of their MVPA, and subsequently may also be quite "sedentary".⁵ Indeed, several studies have reported that the amount of time youth spend in MVPA is poorly correlated to the amount of time they engage in light intensity activities and their sedentary behavior level.⁶⁻⁸ Other studies have shown that excessive engagement in sedentary behavior predicts obesity and other physical and psychosocial health outcomes independent of MVPA.⁹⁻¹²

The type of sedentary behavior that has been studied the most is screen time.^{5,13} Screen time refers to a composite measure of how much time someone spends watching television, using a computer, and playing video games. Compared to other sedentary behaviors, such as sitting in the classroom, the amount of screen time that different children engage in is more variable and is under greater voluntary control. A recent systematic review of 232 studies reported that excessive screen time in children and adolescents is associated with obesity, decreased fitness, lowered self-esteem, poor social behaviors, and decreased academic achievement.¹³ In light of this evidence, public health guidelines from several countries recommend that school-aged children and adolescents accumulate no more than 2 hours of screen time per day.¹⁴⁻¹⁶ Data from Canada indicate that less than 20% of 11-15 year olds achieve this guideline and that the average daily screen time in adolescents is in excess of 6 hours.¹⁷ Findings from Columbia indicate that 44% of 5-12 year olds watch television and play video games for 2 hours/day or less.¹⁸ Data on 10-19

year olds from the 2006 National Health and Nutrition Survey (ENSANUT 2006) indicate that 60% of girls and 47% of boys in Mexico have average daily screen time levels of less than 2 hours.¹⁹ The purpose of this study was to provide current descriptive information on the screen time levels of Mexican children, based on the ENSANUT 2012.

Materials and methods

Design and participants

ENSANUT employed a probabilistic multistage stratified cluster sampling design. For the 2012 cycle data from 50 528 households (89 000 people) was collected between October 2011 and May 2012. A detailed paper describing the methodology of the ENSANUT is published elsewhere.²⁰ Data from 5 643 children aged 10-18 years was collected on screen time, representing 20 660 264 individuals. Data were collected at the participants' homes using a computer-assisted interview (10-14 year old children had help from a relative while responding). All participants or their parent/guardian provided informed consent prior to participating. The National Public Health Institute Ethics Review Board of Mexico approved the study protocol.

Screen time

Screen time was defined as time spent viewing television, videos, or playing video games. Information on the number of hours per day children spent engaging in screen time was self-reported by the child participants during their interview. The screen time question included in the interview were based on the Youth Activity Questionnaire developed and validated in adolescents aged 10 to 14 from low and middle income populations in Mexico City.²¹ In the ENSANUT 2012, two questions were asked to assess screen time, one for weekday use and one for weekend use. These questions asked participants to report how many hours they usually spend in front of a screen, including watching television, movies, playing video games, and using a computer. A weighted average based on weekday and weekend use was used to calculate average daily screen time. Participants were then classified as meeting (average screen time ≤ 2 hours/day) or exceeding (average screen time > 2 hours/day) screen time recommendations based on guidelines for other countries (e.g., U.S., U.K., Canada).¹⁴⁻¹⁶ At present, Mexican and/or global screen time guidelines do not exist.

While screen time was assessed in the ENSANUT 2006, the questions that were used were different than

those used in 2012. Because of this comparability issue, we were not able to examine trends in screen time use.

Sociodemographic variables

Geographic areas

Differences in screen time were considered based on whether participants lived in an urban ($\geq 2\,500$ residents) or rural ($< 2\,500$ residents) area and based on the region of the country they lived in. ENSANUT is representative of four geographic areas including: North (Baja California, Southern Baja California, Coahuila, Durango, Nuevo León, Sonora, Sinaloa, Tamaulipas and Zacatecas), Central (Aguascalientes, Colima, Guanajuato, Hidalgo, Jalisco, México, Michoacán, Nayarit, Querétaro, San Luis Potosí and Tlaxcala), Federal District (DF, in Spanish), and South (Campeche, Chiapas, Guerrero, Morelos, Oaxaca, Puebla, Quintana Roo, Tabasco, Veracruz and Yucatán).

Socioeconomic status (SES) and education

A socioeconomic status (SES) index was constructed by combining eight variables that assessed the household properties and available services including: construction materials of the floor, ceiling, and walls; sleeping rooms; water accessibility; vehicle ownership; household goods (refrigerator, washing machine, microwave, stove, boiler); and electrical goods (television, radio, telephone, and computer). The index was divided into tertiles and used as a proxy for low, medium, and high SES. Education level was stratified into three groups according to the highest level of education obtained: 1) primary or less, 2) secondary, and 3) high school or higher.

Anthropometric measurements

Weight and height were measured to the nearest 0.1 kg and 0.1 cm during the household interview by trained research staff using SECA electronic scales and SECA stadiometers, respectively. The body mass index (BMI) was calculated as kg/m^2 . Children were classified as being non-overweight, overweight, or obese according to the age- and gender-specific BMI cut-points endorsed by the International Obesity Task Force.²²

Statistical analysis

The sample design characteristics (sample weights, cluster and strata variables) were taken into consideration for all analyses. All analyses were stratified by age group (10-14 year olds, 15-18 year olds). Means, interquartile

ranges, and percentages were used to describe the screen time levels and covariates of the sample. Screen time was described within the entire sample and by socio-demographic and anthropometric characteristics. The odds ratio for high screen time was determined using logistic regression models. Initially, bivariate logistic regression models were run separately for each socio-demographic variable. This was followed by a single multivariate model that simultaneously included all of the sociodemographic variables.

Results

Descriptive information on the sample of 10-14 and 15-18 year old children included in ENSANUT 2012 are provided in table I. In total, 3 401 children aged 10-14 years old and 2 259 children aged 15-18 years old were studied. Approximately half of the sample were male and about 30% were either overweight or obese. Aside from education status, the socio-demographic characteristics were comparable in 10-14 and 15-18 year olds.

Table II contains the average daily screen time values. On average, Mexican children engaged in about 3 hours per day of screen time, irrespective of gender and age. Average screen time levels were 17 minutes higher in obese 10-14 year olds than in non-overweight 10-14 year olds; this difference was 39 minutes for 15-18 year olds. Irrespective of age, screen time levels were higher in children from the northern and D.F. regions of the country than in children from the central and southern regions of the country. Children living in urban areas had daily screen time levels that were about 1 hour greater than children living in rural areas. Children in the highest SES and education categories has screen time levels that were about 1 hour greater than children in the lowest SES and education categories.

The proportion of the children in ENSANUT 2012 who met the screen time guidelines (e.g., ≤ 2 hours/day) is shown in table III for 10-14 year olds and in table IV for 15-18 year olds. Approximately 33% of 10-14 year olds and 36% of 15-18 year olds met this guideline. The percentage who engaged in ≤ 2 hours/day of screen time was lower in: obese than non-overweight, children from the DF and northern areas than children from the central and southern areas of the country, children from urban areas than children from rural areas, and children from higher SES and education strata than children from lower SES and education strata. These observations were consistent for 10-14 year olds and 15-19 year olds.

Tables III (10-14 year olds) and IV (15-18 year olds) also contain the odds ratios for the regression models that were used to predict meeting the screen time guidelines. The multivariate models indicated that urban/rural area,

Table I
SOCIODEMOGRAPHIC AND ANTHROPOMETRIC CHARACTERISTICS OF CHILD PARTICIPANTS. MÉXICO, ENSANUT 2012

	10-14 year olds			15-18 year olds		
	N	N	% (95% CI)	n	N	% (95% CI)
Total	3 401	11 270 763	100	2 259	9 389 501	100
Gender						
Boys	1 749	5 787 535	51.3 (48.5-54.2)	1 098	4 734 872	50.4 (46.7-54.1)
Girls	1 631	5 483 229	48.7 (45.8-51.5)	1 161	4 654 629	49.6 (45.9-53.3)
BMI classification						
Non-overweight	2 235	7 576 485	67.9 (65.3-70.5)	1 492	6 451 157	70.2 (70.2-70.2)
Overweight	716	2 406 895	21.6 (19.3-24.0)	499	1 916 116	20.3 (20.3-20.3)
Obese	390	1 170 982	10.5 (8.9-12.4)	229	885 103	9.5 (9.5-9.5)
Region of country						
North	913	2 103 153	18.7 (17.1-20.3)	593	1 711 582	18.2 (16.2-20.4)
Central	1 146	1 724 486	31.9 (29.5-34.5)	803	2 785 054	29.6 (26.5-33.0)
DF	164	3 846 466	15.3 (12.9-18.0)	107	1 798 749	19.2 (15.6-23.5)
South	1 157	3 846 466	34.1 (31.7-36.6)	756	3 094 116	33.0 (29.9-36.2)
Urban/rural area						
Rural	1 254	3 399 247	30.2 (27.9-32.6)	849	2 473 396	26.4 (23.8-29.1)
Urban	2 126	7 871 516	69.8 (67.4-72.1)	1 410	6 916 105	73.6 (70.9-76.2)
Socioeconomic status						
Low	1 197	3 682 280	32.7 (29.9-35.5)	759	2 595 335	27.7 (24.5-31.1)
Medium	1 194	3 814 485	33.8 (31.3-36.5)	769	3 180 178	33.9 (30.4-37.5)
High	989	3 773 997	33.5 (30.8-36.3)	731	3 613 988	38.4 (35.0-42.0)
Education level						
Primary or less	1 819	5 681 279	50.4 (47.7-53.1)	80	334 558	3.6 (2.4-5.2)
Secondary	1 561	5 589 484	49.6 (46.9-52.3)	2 023	8 176 357	87.1 (83.8-89.8)
High school or higher	not applicable	not applicable	not applicable	156	878 585	9.3 (6.8-12.6)

n= sample size

N= weighted sample size

% (95% CI)= prevalence (95% confidence interval)

SES, and education were the independent predictors of screen time in 10-14 year olds. Within 15-18 year olds, BMI category and region of country were the independent predictors of screen time.

Discussion

The objective of this study was to provide current descriptive information on the screen time levels of Mexican children. The key findings are that: 1) the average

10-18 year old Mexican child engages in about 3 hours of screen time per day, and 2) only a minority (<35%) of Mexican children engage in ≤2 hours per day of screen time, which equates to meeting the screen guidelines for school-aged children that have been recommended by several expert groups.¹⁴⁻¹⁶

Differences in the methods and questions used to assess screen time make it difficult to directly compare the findings from ENSANUT 2012 to those reported previously in Mexico (based on ENSANUT 2006) and

Table II
AVERAGE DAILY SCREEN TIME VALUES IN MEXICAN CHILDREN. MÉXICO, ENSANUT 2012

	10-14 Year Olds* (n=3 401)	15-18 Year Olds* (n=2 259)
Gender		
Boys	2:56 (1:51)	3:01 (1:55)
Girls	2:59 (1:53)	2:56 (1:59)
BMI classification		
Non-overweight	2:55 (1:53)	2:54 (1:59)
Overweight	2:59 (1:44)	3:01 (1:46)
Obese	3:12 (1:55)	3:33 (2:01)
Region of country		
North	3:19 (1:59)	3:37 (2:09)
Central	2:52 (1:42)	2:55 (1:44)
DF	3:35 (1:53)	3:15 (2:00)
South	2:34 (1:50)	2:30 (1:52)
Urban/rural area		
Rural	2:19 (1:50)	2:19 (1:44)
Urban	3:14 (1:48)	3:12 (1:59)
Socioeconomic status		
Low	2:21 (1:50)	2:23 (1:45)
Medium	3:05 (1:47)	3:02 (2:02)
High	3:26 (1:48)	3:20 (1:55)
Education level		
Primary or less	2:41 (1:44)	2:23 (1:45)
Secondary	3:14 (1:56)	3:02 (2:02)
High school or higher	not applicable	3:20 (1:55)

* Data presented as mean hours:minutes per day (standard deviation)

to those reported in other countries. ENSANUT 2006 used six questions to assess screen time, as compared to only two questions used in ENSANUT 2012. In addition, ENSANUT 2006 used a <2 hour / day cut-point to define excessive screen time vs. the cut-point of ≤2 hours used in the present study. As a large proportion of children have daily screen time values of 2 hours, this apparently subtle cut-point difference is in fact quite meaningful. Based on the <2 hour / day cut-point, 60% of 10-19 year old girls and 47% of 10-19 year old boys in ENSANUT 2006 were low screen time users.¹⁹ In the present study, based on ENSANUT 2012, <35% of 10-18 years olds had appropriate screen time levels.

While the screen time levels in Mexican children are high, they do not appear to be as high as those

observed in many other countries. For instance, a recent study based on data from the 2006 Health Behaviour in School-Aged Children Survey, an international study of over 200 000 children aged 11-15 years from 39 (mostly developed) countries across Europe and North America, reported that only 23% of children engaged in ≤2 hours per day of screen time.²³ The prevalence value was below 30% in all regions studied (Canada and U.S., Nordic countries, British Isles, Central Europe, Baltic countries, Eastern Europe, and Southern Europe).²³ As the Mexican population continues to progress through the nutrition²⁴ and physical activity²⁵ transitions and adopt lifestyle behaviors that are more typical of those seen in more developed countries, screen time levels in Mexican children may increase above the levels reported here for the year 2012. The less developed regions of the country may also catch-up with the North and DF, as has been observed with other risk factors for obesity and non-communicable chronic diseases.

Our finding that screen time levels were higher in obese children than in non-overweight children is consistent with previous findings in children from Mexico¹⁹ and several other countries.⁹⁻¹¹ As demonstrated here for the 15-18 year old age group, others have shown that screen time predicts obesity independent of sociodemographic covariates, and also of other behaviors like diet and MVPA.^{9-11,19} This reiterates the notion that engagement in excessive screen time is a distinct and separate behavior from engaging in insufficient MVPA. Thus, in the battle to address the obesity epidemic, distinct interventions and policies will be needed for sedentary behavior and MVPA.⁵

In developed countries SES and education level are negatively associated with screen time such that children from the most disadvantaged and uneducated homes have the highest screen time levels.²⁶ In the present study, the opposite pattern was observed for Mexican children as the lowest SES and education groups had the lowest screen time levels. This opposite pattern was not unexpected, and is in fact consistent with what is known about obesity. In developed countries SES and education tend to be negatively associated with obesity while in developing countries like Mexico SES and education tend to be positively associated with obesity.^{2,27-29}

Mexican children from urban areas accumulated about 1 hour per day more screen time than Mexican children from rural areas. This urban / rural gradient is consistent with previous findings in a representative sample of 5-12 years olds from Colombia.¹⁸ While this observation may in part reflect SES differences between people living in urban and rural areas, it is important to note that the urban / rural differences persisted after controlling for SES in the multivariate analyses. Children

Table III
PROPORTION OF 10-14 YEAR OLD MEXICAN CHILDREN MEETING SCREEN TIME GUIDELINES (≤ 2 HOURS/DAY)
AND RELATIONSHIPS BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS
AND MEETING SCREEN TIME GUIDELINES. MÉXICO, ENSANUT 2012

	N	% ≤ 2 hours/day of screen time*	Bivariate model OR (95% CI) [‡]	Multivariate model OR (95% CI) [‡]
Gender				
Boys	1 749	33.0 (29.7-36.5)	1	1
Girls	1 631	33.0 (29.5-36.7)	1.00 (0.80-1.24)	1.06 (0.84-1.33)
BMI classification				
Non-overweight	2 235	35.3 (32.3-38.6)	1.62 (1.06-2.47)	1.23 (0.78-1.93)
Overweight	716	29.3 (24.3-34.8)	1.22 (0.76-1.96)	1.13 (0.68-1.87)
Obese	390	25.2 (18.5-33.4)	1	1
Region of country				
North	913	27.5 (23.7-31.6)	0.52 (0.39-0.67)	0.88 (0.67-1.83)
Central	1 146	32.6 (28.1-37.5)	0.66 (0.51-0.87)	0.90 (0.67-1.21)
DF	164	20.2 (14.0-28.1)	0.35 (0.21-0.55)	0.64 (0.39-1.06)
South	1 157	42.1 (37.9-46.5)	1	1
Urban/rural area				
Rural	1 254	49.2 (44.5-53.9)	2.75 (2.17-3.49)	1.83 (1.40-2.38)
Urban	2 126	26.0 (23.2-29.0)	1	1
Socioeconomic status				
Low	1 197	48.9 (44.3-53.4)	3.45 (2.61-4.67)	2.36 (1.69-3.28)
Medium	1 194	29.1 (25.3-33.3)	1.50 (1.10-2.05)	1.34 (0.96-1.85)
High	989	21.5 (17.8-25.7)	1	1
Education level				
Primary or less	1 819	36.6 (33.2-40.1)	1.39 (1.10-1.74)	1.33 (1.05-1.67)
Secondary	1 561	29.4 (25.9-33.1)	1	1
High school or higher	not applicable	not applicable	not applicable	not applicable

* Data presented as % (95% confidence interval)

‡ Data presented as odds ratio (95% confidence interval). Odds ratios from the multivariate model were adjusted for the other sociodemographic variables listed in the table

from urban areas likely have greater access to screen time technology (e.g., more options for buying televisions and more television channels available). Adolescents living in urban areas may also be exposed to more social and physical disorder in their neighborhood than children from rural areas are, and other studies have shown that increased neighbourhood disorder is related to increased engagement in screen time.³⁰

A key limitation of this study that warrants recognition is the fact that the screen time data were self-

reported using two questions. A previous reliability and validity study of similar screen time questions (that focused on television use) that was conducted in 10-14 year olds from Mexico City noted that the reproducibility of responses provided to screen time questions asked six months apart is modest ($r=0.53$) and that simple question measures of screen time are modestly correlated ($r=0.51$) to responses obtained using a more in depth 24-hour recall.²¹ Another important limitation is that we assessed all screen time

Table IV

PROPORTION OF 15-18 YEAR OLD MEXICAN CHILDREN MEETING SCREEN TIME GUIDELINES (≤ 2 HOURS/DAY) AND RELATIONSHIPS BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND MEETING SCREEN TIME GUIDELINES. MÉXICO, ENSANUT 2012

	N	% ≤ 2 hours/day of screen time*	Bivariate Model OR (95% CI)†	Multivariate Model OR (95% CI)†
Gender				
Boys	1 098	34.4 (29.6-39.6)	1	1
Girls	1 161	37.8 (32.8-43.1)	1.60 (0.86-1.56)	1.22 (0.90-1.66)
BMI classification				
Non-overweight	1 492	39.2 (34.5-44.2)	2.29 (1.42-3.67)	2.10 (1.31-3.38)
Overweight	499	31.1 (24.6-38.5)	1.69 (0.99-2.85)	1.43 (0.84-2.43)
Obese	229	21.6 (15.0-30.1)	1	1
Region of country				
North	593	24.1 (19.8-28.9)	0.33 (0.23-0.46)	0.37 (0.25-0.54)
Central	803	31.2 (25.5-37.5)	0.47 (0.33-0.67)	0.51 (0.35-0.74)
DF	107	33.0 (20.7-48.2)	0.51 (0.26-1.01)	0.61 (0.30-1.22)
South	756	49.0 (43.4-54.6)	1	1
Urban/rural area				
Rural	849	48.0 (43.1-53.0)	0.50 (0.37-0.68)	0.72 (0.51-1.01)
Urban	1 410	31.8 (27.1-37.0)	1	1
Socioeconomic status				
Low	759	45.8 (40.0-51.8)	2.16 (1.49-3.14)	1.34 (0.85-2.12)
Medium	769	37 (30.2-44.5)	1.50 (1.0-2.24)	1.28 (0.80-2.03)
High	731	28.3 (22.8-34.4)	1	1
Education level				
Primary or less	80	51 (32.6-69.1)	2.22 (0.71-6.96)	1.47 (0.45-4.83)
Secondary	2 023	35.9 (32.0-40.1)	1.20 (0.49-2.89)	1.04 (0.44-2.47)
High school or higher	156	31.9 (16.7-52.3)	1	1

* Data presented as % (95% confidence interval)

† Data presented as odds ratio (95% confidence interval). Odds ratios from the multivariate model were adjusted for the other sociodemographic variables listed in the table

measures together and did not measure individual screen time behaviors (e.g., television, computer use, video games).

In conclusion, 10-18 year old children in Mexico accumulate an average of 3 hours/day of screen time. The majority of Mexican children (about 65%) exceed the currently recommended maximal level of screen. Interventions and policies within Mexico aimed at addressing obesity should include components that focus on screen time.

Declaration of conflict of interests. The authors declare that they have no conflicts of interest.

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