

## Obesity and Overweight among Students in Arabic Secondary Schools in Erbil City

Kareema A. Hussein, PhD\*

\*Assistant Professor, Pediatric Nursing Department, College of Nursing, Hawler Medical University

### المستخلص

**الهدف:** تهدف الدراسة للتعرف على و تيرة زيادة الوزن والبدانة في سن المراهقة وتقدير تأثير السلوكيات الاجتماعية والديموغرافية والصحية التي تسبب السمنة لدى لمراهقين.

**المنهجية:** اجريت دراسة وصفية مقطعية لثلاثة مدارس عربية عامة في مدينة أربيل. من الفترة ١ / تشرين الاول/ ٢٠١٠ إلى ٣٠ / كانون الثاني / ٢٠١١. تم اختيار عينة عشوائية منهجية من ٤٦١ طالب وطالبة.

**النتائج:** أظهرت الدراسة أن خصائص المراهقين حسب نوع الجنس والسن تقريبا ( ١٢٢, ٤٦,٢% و ١٤٦, ٠,٠٠٧٤%) من المراهقين من الذكور والإناث و اعمارهم بين سن (١٧ - ١٨، ٩، و ١٥ - ١٦,٩) سنة على التوالي . استخدم الارتباط المتعدد لتحليل لانحدار و أظهرت الدراسة أن الإناث بدلالة احصائية (٠,٠٠٦)، ومشاهدة التلفزيون أثناء تناول الطعام بدلالة احصائية ( ٠,٠٤١) تنبئ من حالة السمنة في هذه الدراسة.

**التوصيات:** أوصت الدراسة بأن المراهقين بحاجة الى ملصقات جدارية في أماكن مختلفة من المدرسة عن الأطعمة الغنية بالمواد الغذائية المختلفة ونصائح صحية للتغذته المدرسية ورسالة اخبارية للوالدي اضافة الى تقديم التسهيلات لممارسة الرياضة البدنية في المدارس وبرامج تثقيفية في سن مبكرة لان الأسرة لها دورها للتحكم في زيادة الوزن لديهم.

### Abstract

**Objective(s):** The aim of the study was to identify the prevalence of overweight and obesity in adolescence and to estimate the effect of socio- demographic and health behaviors that predicting obesity in adolescents.

**Methodology:** A cross-sectional descriptive study was being carried out at three public Arabic secondary schools in Erbil city from October 1<sup>st</sup> 2010 to January 30th 2011. A systematic randomly sample size of 461 students was selected.

**Results:** In this study, the age of (46.2%, 122) of males students were ranged between (17- 18.9) years old compared to females students (74.1%, 146) their age ranged between (15 -16.9) years old. About (3.4%, 9) of males adolescents having overweight while all female adolescents were recorded as normal weight with significant association between weight status and gender (p-value= 0.006). There were (0.5%, 1) overweight that watching TV during eating but (3.1%, 8) was did not watching TV during eating with significant association between weight status and watching TV during eating (p- value= 0.041).

**Recommendation:** This study recommended placing posters throughout the school showing foods rich in various nutrients, healthy food tips in the school news letter for parents and educational activities with more orientation about their diet and physical exercise at early ages involving the whole family to control the excess of weight.

Keywords: anthropometric measure weight status, adolescent, physical inactivity, fast food.

**Keywords:** overweight, obesity, normal weight, adolescents, secondary school

**Introduction:**

**A**dolescent is a critical stage in the adoption of behavior relevant to health <sup>(1)</sup>. A comparison of adolescents in 28 countries found that USA adolescents eat more junk food than teenagers in most other countries <sup>(2)</sup>. More than 60% of adolescents eat too much fat and less than 20% eat the recommended five or more serving of fruits and vegetables each day <sup>(3)</sup>. Children and adolescents are increasingly engaging in sedentary behavior, spending less time exercising outdoors and more time watching television and playing video games <sup>(4)</sup>. The Third National Health and Nutrition Examination Survey (1988-1994) indicates that 20% of US children aged 8 to 16 years participated in 2 or fewer physical activity/ week, and more than 26% watched at least 4 hours of TV/ day and 67% watched at least 2 hours/ day <sup>(5)</sup>. Over the past three decades, the obesity rate has more than doubled for adolescents aged 12-19 years <sup>(6)</sup>.

From 1991 to 2001, obesity has rocketed to epidemic proportions, with the percentage of Americans who are obese increasing by 74%. This figure translates into 44.3 million adults who are at increased risk for such obesity-related illnesses as cardiovascular disease, diabetes, arthritis and asthma <sup>(7)</sup>. In addition, approximately 15% of children and adolescents between the ages of 6 and 19 years are overweight <sup>(8)</sup>.

The physical activity and eating behaviors that affect weight are influenced by many sectors of society, including families, community organizations, health care providers, government agencies, the media, and schools. The involvement of all of these sectors will be needed

to reverse the epidemic <sup>(9)</sup>. The aim of the study are to identify the prevalence of overweight and obesity in adolescent and to estimate the effect of socio- demographic and health behaviors that predicting obesity and over weight in three public Arabic secondary schools in Erbil city.

**Methodology:**

**Study design and sample size:** A cross-sectional descriptive study was carried out in three public Arabic secondary schools in Erbil city, two schools for boys and one for girl, from October 1<sup>st</sup> 2010 to January 30<sup>th</sup> 2011. Among the total number of 1914 students, 461 (246 males and 197 females) students with systematic random sampling was selected.

**Materials and population:** In this study the sample were selected from three public secondary schools in Erbil city: Al- Zahra females' secondary school with total number of 630 students, Al – Takee males' secondary school with total number of 645 students and Al- Akhwaa males' secondary school with total number of 639 students.

Informed consent and official permissions has been obtained from the schools that have agreed to take part in the study. A questionnaire was designed that composed of questions covering socio-demographic characteristics and anthropometric mea-sures.

**Anthropometric measures:** Height and weight were measured by standard scales and standardized stadiometer. Body mass index (BMI) was calculated by dividing weight (in kilograms) by height (in cubic meter). Weight, height are measured in a private area and BMI are presented in Table (1).

**Table 1.** Distribution of Body Mass Index (BMI) by weight status

| List | Weight status | Body Mass Index( BMI) |
|------|---------------|-----------------------|
| 1    | Underweight   | < 18                  |
| 2    | Normal weight | 18-24.9               |
| 3    | Overweight    | 25-30                 |
| 4    | Obese         | >30                   |

**WHO, 2007**

**Procedure:** Nursing master students are well trained by the researcher to interview the stu-

dents participated in the study. The interview was based on participants self- completed the

questionnaire sheet. After informed consent of each student, with the help of interviewers, they instructed how to complete the questionnaire sheet and returned it.

**Statistical methods:** All data entry and data analysis were performed using Statistical Package of Social Sciences (SPSS V 18.) BMI for age and sex was measured according to the World Health Organization (WHO, 2007) standard of calculation of BMI-for-age, both boys and girls, age ranges between 15-19 years, z-scores 2007 WHO reference was used, as shown in (Table2). Therefore, the whole data are divided firstly into two groups: those <20 years old and those

>20 years old. Those with no ages recorded were excluded from the study (22 records). Another (1 record) was also excluded because the length of the student was (65cm) that was affecting the whole means and standard deviation of BMI as well as z-scores. For significant statistical association between factors and weight status, chi-square test was performed; Fishers' exact test was also used when using of chi-square is inappropriate. For those with significant associations at  $p$ -value  $\leq 0.05$ , multiple logistic regressions were used to predict factors of overweight and obesity.

**Table 2.** Distribution of Weight status by Z-scores

| List | Weight status | Z-scores                  |
|------|---------------|---------------------------|
| 1    | Underweight   | < -2 Standard deviation   |
| 2    | Normal weight | -2 - 2 Standard deviation |
| 3    | Overweight    | 2.01-3 Standard deviation |
| 4    | Obese         | >3 Standard deviation     |

WHO, 2007

### Results:

The assessing the association between different social -behaviors and weight status in this study, the weight status classified into four main categories, underweight normal weight, overweight and obese, respectively (table 2).

In this study, the age of (46.2%, 122) of males students were ranged between (17- 18.9) years old compared to females students (74.1%, 146) their age ranged between (15 -16.9) years old. That of the lowest frequency of males students (0.8%, 2) ranged between (21- 22.9) years old and of females adolescent (3.7%, 7) were ranged between (19 - 20.9) years old. There were a significant association between weight status with father's and mother's occupation ( $p$ -value 0.019, 0.031), respectively and (2.7%, 7) of parents were overweight and having chronic disease (cancer 5%). While no association was noted between weight status and living students with their parents ( $X^2=0.449$ ,  $df$  (2) and  $p$ -value=0.799), average family income ( $X^2=1.22$ ,  $df$  (1) and  $p$ -value=0.259) as well as weight status of the parents ( $X^2=2.64$ ,  $df$  (3) and  $p$ -value=0.449).

**Table 3.** Association between weight status and gender

| Weight status | Gender        |                 | Total<br>F (%) | $X^2$<br>(df) | P-value |
|---------------|---------------|-----------------|----------------|---------------|---------|
|               | Male<br>F (%) | Female<br>F (%) |                |               |         |
| Normal weight | 255<br>96.6%  | 197<br>100.0%   | 452<br>98.0%   | 6.850<br>(1)  | 0.006   |
| Overweight    | 9<br>3.4%     | 0<br>0.0%       | 9<br>2.0%      |               |         |
| Total         | 264<br>100.0% | 197<br>100.0%   | 461<br>100.0%  |               |         |

$X^2$  = chi-squared test, F = frequency,  $df$  = degree of freedom, % = percent, P -value = probability value

Table (3) shows that (3.4%, 9) of males students having overweight while all female adolescents were recorded as normal weight with significant association between weight status and gender (p-value= 0.006).

**Table 4.** Association between weight Status and eating fast food in restaurant

| Weight Status | Eating fast food |                  |                  | Total  | $\chi^2$<br>(df) | P-value |
|---------------|------------------|------------------|------------------|--------|------------------|---------|
|               | NO               | < 3days/<br>week | >3 days/<br>week |        |                  |         |
|               | F (%)            | F (%)            | F (%)            |        |                  |         |
| Normal weight | 128              | 219              | 87               | 434    | 0.762(2)         | 0.683   |
|               | 94.1%            | 94.8%            | 96.7%            | 95.0%  |                  |         |
| Overweight    | 8                | 12               | 3                | 23     |                  |         |
|               | 5.9%             | 5.2%             | 3.3%             | 5.0%   |                  |         |
| Total         | 136              | 231              | 90               | 457    |                  |         |
|               | 100.0%           | 100.0%           | 100.0%           | 100.0% |                  |         |

$\chi^2$ = chi-squared test, F = frequency, df= degree of freedom, %=percent, P -value=probability value

Table (4) shows that although (5.2% , 12) of overweight students eating fast food in restaurant less than three days/ week and ( 5.9% ,8 ) of them didn't eat fast food but no significant association between weight status and eating fast food in restaurant was found (p-value=0.683).

**Table 5.** Association between weight Status and bringing home-made food to the school

| Weight Status | Bringing home-made<br>food to school |        | Total  | $\chi^2$<br>(df) | P-value |
|---------------|--------------------------------------|--------|--------|------------------|---------|
|               | NO                                   | Yes    |        |                  |         |
|               | F (%)                                | F (%)  |        |                  |         |
| Normal weight | 430                                  | 20     | 450    | 0.898(1)         | 0.346   |
|               | 98.2%                                | 95.2%  | 98.0%  |                  |         |
| Overweight    | 8                                    | 1      | 9      |                  |         |
|               | 1.8%                                 | 4.8%   | 2.0%   |                  |         |
| Total         | 438                                  | 21     | 459    |                  |         |
|               | 100.0%                               | 100.0% | 100.0% |                  |         |

$\chi^2$ = chi-squared test , F = frequency, df= degree of freedom ,%=percent, P - value=probability value

Table (5) shows that (4.8%, 1) of overweight bringing home-made food to school while (1.8%, 8) did not bringing home-made food to school, but with no significant association between weight status and bringing home-made food to school at (p-value= 0.346).

**Table 6.** Association between weight Status and Watching TV during eating

| Weight Status | Watching TV during eating |        | Total<br>F (%) | $\chi^2$<br>(df) | P-value |
|---------------|---------------------------|--------|----------------|------------------|---------|
|               | NO                        | Yes    |                |                  |         |
|               | F (%)                     | F (%)  |                |                  |         |
| Normal weight | 248                       | 202    | 450            | 4.081 (1)        | 0.041   |
|               | 96.9%                     | 99.5%  | 98.0%          |                  |         |
| Overweight    | 8                         | 1      | 9              |                  |         |
|               | 3.1%                      | 0.5%   | 2.0%           |                  |         |
| Total         | 256                       | 203    | 459            |                  |         |
|               | 100.0%                    | 100.0% | 100.0%         |                  |         |

$\chi^2$ = chi-squared test , F = frequency, df= degree of freedom ,%=percent, P\_ value=probability value

Table (6) shows that there were (0.5%, 1) overweight that watching TV during eating but (3.1%, 8) did not watch TV during eating with significant association between weight status and watching TV during eating ( $p$ -value= 0.041).

**Table 7.** Association between weight Status and Duration of Watching TV and playing Games

| Weight status | Duration of watching TV, Playing Games |                      |                      |                      |                      |                   | Total        | $\chi^2$<br>(df) | P-value |
|---------------|--|----------------------|----------------------|----------------------|----------------------|-------------------|--------------|------------------|---------|
|               | <1<br>Hour/<br>Day                     | 1-2<br>Hours/<br>Day | 3-4<br>Hours/<br>Day | 5-6<br>Hours/<br>Day | 7-8<br>Hours/<br>Day | > 8 Hours/<br>Day |              |                  |         |
| Normal weight | 60<br>98.4%                            | 157<br>98.1%         | 126<br>96.9%         | 64<br>100.0%         | 15<br>93.8%          | 28<br>100.0%      | 450<br>98.0% | 4.253<br>(5)     | 0.514   |
| Overweight    | 1<br>1.6%                              | 3<br>1.9%            | 4<br>3.1%            | 0<br>0.0%            | 1<br>6.3%            | 0<br>0.0%         | 9<br>2.0%    |                  |         |
| Total         | 61<br>100%                             | 160<br>100%          | 130<br>100%          | 64<br>100%           | 16<br>100%           | 28<br>100%        | 459<br>100%  |                  |         |

$\chi^2$ = chi-squared test , F = frequency, df= degree of freedom ,% =percent, P - value=probability value

In this study, (6.3% ,1) of overweight students were sitting watching TV and playing games between 7-8 hours /day with no significant association between weight status and duration of sitting watching TV, Playing ATARI... etc ( $p$ -value= 0.514), (Table 7).

**Table 8.** Association between weight status and performing physical exercise last week

| Weight Status | Physical exercise |               | Total         | $\chi^2$<br>(df) | P-value |
|---------------|-------------------|---------------|---------------|------------------|---------|
|               | NO                | Yes           |               |                  |         |
|               | F (%)             | F (%)         | F (%)         |                  |         |
| Normal weight | 176<br>97.2%      | 276<br>98.6%  | 452<br>98.0%  | 1.022(1)         | 0.324   |
| Overweight    | 5<br>2.8%         | 4<br>1.4%     | 9<br>2.0%     |                  |         |
| Total         | 181<br>100.0%     | 280<br>100.0% | 461<br>100.0% |                  |         |

$\chi^2$ = chi-squared test , F = frequency, df= degree of freedom ,% =percent, P - value=probability value

This study shows that only (1.4%, 4) of overweight students were performing physical exercise versus (2.8%, 5) with no significant association between weight status and performing physical exercise ( $p$ -value 0.324), (Table 8).

**Table 9.** Association between Weight Status by attending lessons of physical exercise at school

| Weight Status | Attending Physical Exercise lessons |               | Total         | $\chi^2$<br>(df) | P-value |
|---------------|-------------------------------------|---------------|---------------|------------------|---------|
|               | NO                                  | Yes           |               |                  |         |
|               | F (%)                               | F (%)         | F (%)         |                  |         |
| Normal weight | 279<br>96.9%                        | 173<br>100.0% | 452<br>98.0%  | 5.514(1)         | 0.016   |
| Overweight    | 9<br>3.1%                           | 0<br>.0%      | 9<br>2.0%     |                  |         |
| Total         | 288<br>100.0%                       | 173<br>100.0% | 461<br>100.0% |                  |         |

$\chi^2$ = chi-squared test, F = frequency, df= degree of freedom, % =percent, P - value=probability value

Table (9) shows that no overweight students were attending lessons of physical exercise that shows significant association between weight status and attending lessons of physical exercise ( $p$ -value=0.016).

**Table 10.** Association between weight Status and Previous learning of importance of physical exercise

| Weight Status | Learning importance of Physical Exercise |        |            | Total  | X <sup>2</sup> (df) | P-value |
|---------------|--|--------|------------|--------|---------------------|---------|
|               | NO                                       | Yes    | Don't know |        |                     |         |
|               | F (%)                                    | F (%)  | F (%)      |        |                     |         |
| Normal weight | 218                                      | 234    | 218        | 452    | 1.585(2)            | 0.327   |
|               | 97.3%                                    | 98.7%  | 97.3%      | 98.0%  |                     |         |
| Overweight    | 6  | 3      | 6          | 9      |                     |         |
|               | 2.7%                                     | 1.3%   | 2.7%       | 2.0%   |                     |         |
| Total         | 224                                      | 237    | 224        | 461    |                     |         |
|               | 100.0%                                   | 100.0% | 100.0%     | 100.0% |                     |         |

X<sup>2</sup>= chi-squared test, F = frequency, df= degree of freedom, % =percent, P - value=probability value

Table (10) shows that there were no significant association between weight status and previous learning of importance of physical exercise ( $p$ -value=0.327), and only (2.7%, 6) were overweight and did not learning or knowing previous important of physical exercise.

**Table 11.** Multiple logistic regressions of gender and Attending physical exercise lessons

| Risk factors                        | $\beta$ | SE     | P-value |
|-------------------------------------|---------|--------|---------|
| Gender –Being male                  | -17.448 | 2638.2 | 0.995   |
| Attending physical exercise lessons | -17.289 | 2774.4 | 0.995   |

$\beta$ = Multiple logistic regression, SE= Standard Error , P - value=probability value

Table (11) multiple logistic regression analysis showed that neither gender-being male ( $p$ -value= 0.995) and attending physical exercise lessons ( $p$ -value= 0.995) were regarded as predictors of weight status in this study.

**Discussion:**

The present study found that there was no association between weight status and living with parents ( $X^2=0.449$ , df (2) at p-value=0.799), and with average family income ( $X^2=1.22$ , df (1) at p-value=0.259) as well as with weight status of the parents ( $X^2=2.64$ , df (3) at p-value=0.449), these results were not in agreement with a study mentioned that the parental obesity has generally been found to prospectively predict onset of offspring obesity in adulthood<sup>(10)</sup>. And theoretically, children of obese parents are at greater risk of becoming obese because of both shared genetic factors and within-family environmental factors<sup>(11)</sup>. Students from low-income households are more likely to be overweight or obese than their more affluent counterparts<sup>(12)</sup>.

The study indicate that males adolescents were overweight more than females, with significant association between them (Table 3), that was in agreement with a study stated that the obesity and overweight prevalence in youths aged (12-17) has increased dramatically from (5% to 13%) in boys and from 5% to 9% in girls between 1966-70 and 1988-91 in the USA. World Health Organization indicates that the obesity and overweight rate in USA has more than tripled for adolescents age ranged from 12 to 19 (from 4.6% to 17.6%)<sup>(10)</sup>.

No significant association was found between weight status and: eating fast food restaurant, and (5.2%, 12) of adolescent were overweight eating fast foods in restaurant for < 3 days /week. A study in USA stated that about 75% of students reported eating a fast food in restaurant during the past week<sup>(9)</sup>. In France study of 891 adolescent, increases the frequency of fast food restaurant use were associated with an excess weight gain of 0.72 kg (1.6 lb) over and above the average weight gain<sup>(11)</sup>. Eating away from home is becoming more common, and fast food restaurant use in particular is growing even more rapidly. Away-from-home foods are

higher in fat and energy compared with foods eaten at home<sup>(12)</sup>.

In our study, there was no significant association between weight status and bringing home-made food to the school, while (1.8%, 8) of them were overweight. On the other hand, this study found that there were significant association between weight status and watching TV during eating. It is well observed that the activity most often paired with watching television is eating: Youth report eating 14 % of the time that they spend watching television<sup>(10)</sup>. But in the present study, no significant association was found between weight status and duration of sitting watching TV, playing ATARI, etc. Youth (ages 8 to 18) spend an average of six hours / day using media, and they often use more than one medium at a time<sup>(13)</sup>. If only one medium were used at a time (i.e., youth were not multi-tasking), this estimate would increase to a total of eight hours / day<sup>(14)</sup>. Other study stated that the school-age youth spend an average of three hours / day watching television<sup>(15)</sup>.

This study added that there was no significant association between weight status and performing physical exercise last week and attending lessons of physical exercise at school as well as with previous learning of importance of physical exercise. During the past four decades, the obesity rate more than tripled for adolescents' ages 12 to 19 (from 4.6% to 17.6%)<sup>(1-2)</sup>. Regular physical activity can reduce the risk for obesity and help people live longer with healthier life<sup>(3, 5)</sup>.

**Recommendations:**

The study recommended to:

1. Continue to research the long-term health benefits that result from eating a healthy diet.
2. Research innovative, cost effective ideas to provide nutritious snacks during the school day.
3. Place posters throughout the school showing foods rich in various nutrients.
4. Healthy food tips in the school news letter for parents.

5. Provide facilities and environment for physical exercise in the schools.
6. Educational activities and more orientation about their diet and physical exercise at early ages involving the whole family to control the excess of weight.

**Reference:**

1. Institute of Medicine. **Preventing Childhood Obesity: Health in the Balance.** [Internet] 2005. Available at www.iom.edu.
2. Foehr U. **Media Multitasking among American Youth: Prevalence, Predictors and Pairings.** Menlo Park, CA: Kaiser Family Foundation, December 2006.
3. Stettler, N., Tershakovec, A. M., Zemel, B. S., Leonard, M. B., Boston, R. C., Katz, S. H., and Stallings, V. A. **Early risk factors for increased adiposity: A cohort study of African American subjects followed from birth to young adulthood.** American Journal of Clinical Nutrition .2000. 53, 1543S–1551S.
4. Salbe, A. D., Weyer, C., Harper, I., Lindsay, S., Ravussin, E., and Tataranni, P. A. **Assessing risk factors for obesity between childhood and adolescence: II. Energy metabolism and physical activity.** Pediatrics, 2002. 110, 307–314.
5. Ogden C, Carroll M and Flegal K. **“High Body Mass Index for Age Among US Children and Adolescents, 2003–2006.”** Journal of the American Medical Association. May 2008 .299(20): 2401–2405,.
6. Maffeis, C., Talamini, G., and Tato, L. **Influence of diet, physical activity, and parents’ obesity on children’s adiposity: A four-year longitudinal study.** International Journal of Obesity. 1998. 22, 758–764.
7. Austin SB, Melly SJ, Sanchez BN, Patel A, Buka S, Gortmaker S, **“Clustering of Fast Food Restaurants Around Schools,”** American Journal of Public Health. 2005; 95: 1575–1581.
8. Gamble M. and Cotugna N. **“A Quarter Century of TV Food Advertising 9. Targeted at Children.”** American Journal of Health Behavior. August 1999 . 23(4): 261–267.
9. Batada A, Seitz M, Wootan M. **“Nine out of 10 Food Advertisements 11. Shown During Saturday Morning Children’s Television Programming Are for Foods High in Fat, Sodium, or Added Sugars, or Low in Nutrients.”** Journal of the American Dietetic Association. April 2008. 108(4): 673–678.
10. Batada A, Seitz M, Wootan M, et al. **“Nine out of 10 Food Advertisements 11. Shown During Saturday Morning Children’s Television Programming Are for Foods High in Fat, Sodium, or Added Sugars, or Low in Nutrients.”** Journal of the American Dietetic Association, 108(4): 673–678, April 2008.
11. French SA, Harnack L, Jeffery RW. **Fast food restaurant use among women in the pound of prevention study: dietary, behavioral and demographic correlates.** Int J Obes Relat Metab Disord 2000; 24: 1353 – 1359.
12. Putnam J, Allhouse J, Kantor LS, **“ U.S. Per Capita Food Supply Trends: More Calories, Refined Carbohydrates, and Fats,”** FoodReview. Vol. 25, Issue 3. Economic Research Service, USDA, 2002.
13. Roberts D, Foehr U and Rideout V. 4. Generation M: **Media in the Lives of 8–18 Year-Olds.** Menlo Park, CA: Kaiser Family Foundation, March 2005.
14. Foehr U. 7. **Media Multitasking among American Youth: Prevalence, Predictors and Pairings.** Menlo Park, CA: Kaiser Family Foundation, December 2006.
15. Faith, M. S., Rha, S. S., Neale, M. C., & Allison, D. B. (1999). **Evidence for genetic influences on human energy intake: Results from a twin study using measured observations.** Behavior Genetics, 29, 145–154.
16. WHO (World Health Organization) 2000. **Obesity: Preventing and managing the global epidemic.** Report of a WHO consultation Geneva: WHO.



