

A survey on lifestyle and attitudes on fruit and vegetable consumption and participation in physical activity in a sample of secondary school and university students from Palermo, Western Sicily

Enza Sidoti¹, Gabriele Paolini², Giuseppe Tringali¹

¹Department of Sciences for Health Promotion "G. D' Alessandro", University of Palermo, Italy; ²School Administrative Services, "G. Salvemini", Palermo, Italy

Correspondence to: Enza Sidoti, University of Palermo, Faculty of Sciences of Education, Department of Sciences for Health Promotion "G. D' Alessandro", Polyclinic, Via del Vespro 133, Palermo 90127, Italy. Email: esidoti@unipa.it

Abstract

Background: Fruit and vegetable (F&V) consumption, and physical activity (PA), are thought to be some of the most important protective factors that can improve long-term health quality of life. Many epidemiological studies indicate, in fact, that F&V consumption and PA are health-promoting and are correlated with the beneficial effects and positive outcomes such as preventing some chronic diseases. Evidence, however, indicates that large proportions of adolescents are not consuming the minimum servings of F&V as recommended by experts and a high percentage of them have sedentary habits.

Objective and method: The purpose of this research was to investigate knowledge and behaviors in a sample of secondary school, (250), and university students, (200), referred to F&V consumption and PA. The instrument used for the survey was a questionnaire containing 19 items with multiple choice answers. Data were codified, descriptive analysis and χ^2 tests were computed through *Openstat and Statistica software*.

Results: Only 24,2% of the individuals identified welfare as including healthy eating, and this attitude seemed to be associated with the students' families educational level. Educational level was also positively associated with the awareness of the importance of a healthy diet for well-being and with PA practice. The percentage of students having knowledge of the expert recommendations on PA and eating guidelines about F&V consumption was about one third of the entire population. Students who met the expert recommendation for daily servings of fruit and vegetables were 27,8%, while only 17,8% practiced regular PA. The principal source of information was university/school, (48,0% and 57,0%).

Conclusions: Healthy dietary and PA habits are far from the optimal in our sample of students. Because of the importance for the prevention of many diseases and long term health, there is a need for interventions that target the youth and promote correct dietary habits and avoidance of physical inactivity. In particular, F&V intake and PA practice should be implemented by means of educational interventions in opportune settings, especially targeting schools, families and communities.

Key words: nutrition, fruit and vegetable consumption, physical activity, life styles, health education.

Introduction

Several studies and reports [1-5] have shown that there is a statistical association among the educational level of individuals and their weight-condition. Fruit and vegetable (F&V) consumption and physical activity (PA) are correlated with normal weight, (positively) and with being overweight (negatively) [6-8]. Furthermore, F&V intake is statistically associated with a lower Body Mass Index (BMI) [9]. Epidemiological studies highlighted that F&V are health-promoting and act as a protective factor against cardiovascular disease risk, epithelial (but not hormone-related) cancers and precocious aging of the skin [10-14].

Healthy people 2010 recommended five or more servings of F&V daily (at least 2 daily servings of fruit and 3 daily servings of vegetables with at least one serving of nutrient-rich vegetables) [15]. With regards to PA, current guidelines recommend at least 30 minutes of moderate PA on five or more days/week or at least 20 minutes of vigorous PA on three or more days/week [16]. The benefits of a regular PA are well established. PA has favorable effects on decreasing the risk of many chronic diseases and conditions such as coronary heart disease, type II diabetes, blood pressure, lipid values and body fat accumulation. Regular PA has positive effects on mental health

and psychological perception of well being. F&V intake and PA in combination have been demonstrated to improve quality of life, long-term health and to reduce the risk of developing of limitations in daily living, disability and diseases [17, 18].

The majority of adolescents are not meeting these recommendations [19]. Reports indicate that only 20,0% of children and adolescents eat five or more servings of F&V per day [20]. In the States, children do not consume the recommended servings and about 50,0% boys and girls 12-19 years of age were consuming less than one serving of F&V per day [21, 22]. Intake of F&V has been shown to decrease as children grow older, but controversial findings were reported in white and Afro-American girls as well as in different ethnic groups [23, 24].

Childhood diet may influence the development of diseases later in life. In addition, low milk consumption and the increase in soft drink consumption are raising concerns for the risk of osteoporosis and obesity [25-27]. Concerning the burden of diseases in Europe, 4,4% could be attributed to low F&V consumption [28]. A study among over twenty thousand children in Central and Eastern European countries highlighted an association between respiratory symptoms and low F&V intake [29]. Sedentary habits and decreased PA have been reported to be associated with unhealthy food consumption. Important modifications to life style choices of young people in particular, have seen a decrease of time dedicated to organized PA, and, on the contrary, an increase in hours spent watching TV, playing video games or using PCs, [30]. A series of surveys conducted in different Italian Regions reported about 20,0% of children, 6-10 years of age, were overweight and 4,0% were obese [31]. According to a survey on a sample of primary school children in Pavia, northern Italy, 31,3% of the pupils did not practice any organized PA. Prevalence of obesity in this group was nearly double in comparison with the group of children, in the same school, regularly practicing PA [32].

Similar figures were reported worldwide and showed that in many countries of the world children and adolescents are not meeting the minimum suggested consumption recommendation and low percentages of adolescents are engaged in regular PA [33]. Dietary intake patterns and PA attitude are established in the childhood, thus, there is the need to develop effective programs and policies that will increase the consumption of F&V and time dedicated to PA. As evidence of the benefits for health grow, experts have

directed their efforts towards understanding the determinants of life style and behaviors in youth and on attempts to change children's habits. This has been done with the short term goals of increasing correct F&V consumption and body care attention and long term goal of establishing healthful life style patterns to prevent chronic diseases in adulthood [34]. Results reported by different Authors also indicated that individual behaviours concerning nutrition and sedentary or active physical engagement are largely influenced by different variables such as age, gender, social, economical, cultural factors and differences in settings [35, 36].

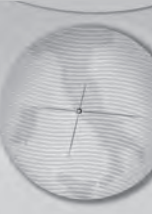
Objectives and methods

The research aimed:

- to obtain data and some personal information on knowledge and practice in a sample of adolescents from secondary school and university, referred to PA and F&V consumption;
- to highlight the association among variables such as age, gender and socio-cultural factors of individuals and families with F&V consumption and regular PA.

The sample

The statistical method used to choose the individuals in the sample was a two stage cluster sampling procedure. This way of clustering offered the possibility to analyze the differences between secondary school and university students, to grant statistical reliability of the obtained results. The first stage selected six faculties and five secondary schools in the city of Palermo. In the second stage 200 students from the university, (group A) and 250 from secondary schools, (group B) were selected at a random. The geographical position and the size of the districts, (*geographical cluster sampling or area sampling*) where the criteria of choice for individuals in group B. One school was selected among the ones in the center of the city, two from the outskirts, and two from the suburbs. Each school contributed 50 students. Group B students were selected from different sections of each school among those regularly frequenting the last curricular year. The social context for attending the schools was defined as medium in all cases. Schools were contacted and informed about the objectives of the survey. The geographical position was not considered as a natural factor for grouping students in Group A. Faculties represented were equally divided among scientific and human sciences: Biology, Mathematic, Engineering, Science of Education, Philosophy, Political Sciences. Students of



Medicine were excluded. Individuals were recruited by randomly drawing from the list of students who regularly attended the University of Palermo, Scientific and Human Sciences Faculties, (100+100) and half of each group (50) were selected from freshmen and those in their third year of study, to complete the total of 200 individuals. None of the students refused to cooperate in the project. The total sample of the survey consisted of 450 individuals.

The survey was conducted in February and March, 2008.

The questionnaire

Nutritional and physical activity information as well as data regarding personal life style and behaviors from students and their parents were obtained by administering a questionnaire during a face to face interview, applying a time-use approach [37]. The questionnaire consisted of 19 items with multiple choice answers, reconstructing the preceding three weeks, and tried to screen for the attitude and behaviors of students referred with respect to nutrition and PA habits and intra-familial life style. The questionnaire was comprised of two sections: the first, to obtain personal information from students and their families, and the second, to check their knowledge and consequent behaviors concerning F&V consumption and to assess personal habits in regularly, or not, performing, strong, moderate or any kind of PA. The educational level of the family referred to university degrees of any family members.

The questionnaire was prepared drawing from the already existing literature [38], and was pilot tested in a different context [39, 40], with the consequent result showing a good level of understanding, acceptability and reliability. Some control items for coherency control were provided. Ethical permission for the study was obtained before collecting the data and after perusal of the results by the University Ethic Committee and by the School Authority. The

interviewers all received special training on how to conduct interviews in order to ensure uniformity of behavior. The administration of the questionnaires was carried out by well trained university students, provided with information regarding the way they should collect data, to minimize the negative effects that can cause a potential distortion in the answers, without interfering with the individuals but being sure about the right understanding of the questions. Interviewers explained to all the individuals that participation in the investigation was voluntary and the collected data would only be used for this study and presented in a cumulative form.

Participants were assured of the confidentiality of their answers and provided informed consent.

Statistical analysis

The answers to questionnaires were numerically codified and data were analyzed using *Statistica* and *OpenStat* software in the whole population and subgroups. Standard descriptive statistics were computed to describe the sample. χ^2 tests were performed to confirm statistical association among observed variables. A p-value <0,05 was considered significant.

Results

Table 1 shows the distribution of students according to their gender and level of education. The number of males and females students, was well balanced, both for the overall number of students, (48,9% and 51,1%); for university (48,5% and 51,5%) and secondary school students, (49,2% and 50,8%). The observed differences were not considered significant (test not shown in the table).

The distribution of students with regards to how they determined "welfare" is presented in Table 2. University students considered welfare as associated with "healthy dieting" for a 41,5%, while secondary school students considered welfare to be mostly associated with "being loved", (31,6%). Concerning overall opinions,

Table 1. Educational level of participants by gender.

	University		Secondary School		Total	
	n	%	n	%	n	%
Male	97	48,5	123	49,2	220	48,9
Female	103	51,5	127	50,8	230	51,1
Total	200	100,0	250	100,0	450	100,0

Table 2. Answers to the question "Welfare is.." by educational level.

"Welfare" is	University		Secondary School		Total		χ^2 test
	n	%	n	%	n	%	p value
<i>Relax</i>	31	15,5	37	14,8	68	15,1	<0,05
<i>Good at School</i>	12	6,0	42	16,8	54	12,0	
<i>Being loved</i>	35	17,5	79	31,6	114	25,3	
<i>Healthy dieting</i>	83	41,5	26	10,4	109	24,2	
<i>Other</i>	39	19,5	66	26,4	105	23,3	
Total	200	100,0	250	100,0	450	100,0	

Table 3. Answers to the question "Welfare is..." by families' educational level.

"Welfare" is	0 degree		≥1 degrees		Total		χ^2 test
	n	%	n	%	n	%	p value
<i>Relax</i>	58	21.2	10	5.6	68	15.1	<0,05
<i>Good at school</i>	41	15.0	13	7.3	54	12.0	
<i>Being loved</i>	81	29.7	33	18.6	114	25.3	
<i>Healthy dieting</i>	25	9.2	84	47.5	109	24.2	
<i>Other</i>	68	24.9	37	20.9	105	23.3	
Total	273	100.0	177	100.0	450	100.0	

the three classes were, more or less, equally represented: "healthy dieting", (24,2%), "being loved", (25,3%) and "other", (23,3%).

The level of education and the way students perceived welfare were significantly associated, (χ^2 , $p < 0,05$): educational level of individuals had a positive influence on what welfare was.

Table 3 crossed data concerning the idea of students on "welfare" according to the educational level of their families, (0 degree versus ≥ 1). Students with higher familiar educational level associated welfare with "healthy dieting for a 47,5% versus a 9,2% (0 degree). Items as "relax" and "being loved", were mostly associated with no degree, (21,2% and 29,7%). χ^2 test highlighted a significant association between the way students intended welfare and educational level of their families, ($p < 0,05$). A higher educational level of families seemed to play a positive influence on the consideration of what welfare was.

Table 4 showed data crossing educational levels of families versus different level of PA, (No, Some, Regular). Among Group A students, the majority of individuals practicing regular PA belonged to families with at least one degree, (79,3% versus

20,7%). The opposite was observed with respect to the non-practice of PA, (25,9% versus 74,1%). Among Group B students, those who did not practice any PA, (83,2%), came from a family with no degrees. Similar observations were drawn overall from the individuals in the sample. A χ^2 test was applied to check for an association between the two depicted variables. Educational level of families was shown to be significantly associated with PA both for university, secondary school students and the overall study population, ($p < 0,001$).

Distribution of data according to F&V intake and PA is showed in Table 5. F&V consumption increased with PA, while sedentary habits were associated with a decreased intake.

72,4% and 35,4% of group A, 41,2% and 42,9% of Group B, practiced, respectively, regular or moderate PA, and had the recommended serving portions of F&V per day (52,5% and 38,9% in the whole sample). χ^2 test highlighted a strong association between F&V intake and PA practice, ($p < 0,001$). This result was valid both for the two subgroups and the overall study population.

In females it seemed that more as they grow

Table 4. Physical Activity of the participants by educational level.

Degrees/PA	University						Secondary school					
	No		Some		Regular		No		Some		Regular	
	n	%	n	%	n	%	n	%	n	%	n	%
0 degree	43	74,1	60	53,1	6	20,7	84	83,2	52	53,1	28	54,9
≥1 degrees	15	25,9	53	46,9	23	79,3	17	16,8	46	46,9	23	45,1
Total	58	100,0	113	100,0	29	100,0	101	100,0	98	100,0	51	100,0
Degrees/PA	Total						Statistical tests					
	No		Some		Regular		χ^2 test description		p value			
	n	%	n	%	n	%						
0 degree	127	79,9	112	53,1	34	42,5	χ^2 Degrees/ PA - University		<0,001			
≥1 degrees	32	20,1	99	46,9	46	57,5	χ^2 Degrees/ PA - Secondary School		<0,001			
Total	159	100,0	211	100,0	80	100,0	χ^2 Degrees/ PA - Total		<0,001			

Table 5. Fruit and Vegetables consumption according to Physical Activity level.

F&V/PA	University						Secondary school					
	No		Some		Regular		No		Some		Regular	
	n	%	n	%	n	%	n	%	n	%	n	%
Rarely	36	62,1	6	5,3	0	0,0	83	82,2	9	9,2	0	0,0
1 serving/day	17	29,3	14	12,4	0	0,0	16	15,8	13	13,3	11	21,6
3 serving/day	4	6,9	53	46,9	8	27,6	2	2,0	34	34,7	19	37,3
5 serving/day	1	1,7	40	35,4	21	72,4	0	0,0	42	42,9	21	41,2
Total	58	100,0	113	100,0	29	100,0	101	100,0	98	100,0	51	100,0
F&V/PA	Total						χ^2 test description		p value			
	No		Some		Regular		χ^2 F&V/ PA - University		<0,001			
	n	%	n	%	n	%	χ^2 F&V/ PA - Secondary school		<0,001			
Rarely	119	74,8	15	7,1	0	0,0	χ^2 F&V/PA - Total		<0,001			
1 serving/day	33	20,8	27	12,8	11	13,8						
3 serving/day	6	3,8	87	41,2	27	33,8						
5 serving/day	1	0,6	82	38,9	42	52,5						
Total	159	100,0	211	100,0	80	100,0						

older and increase their educational level (52,0% and 28,0% university vs school, $p < 0,05$) the more they cared for how their body looked (data not reported). Motivation in boys and girls, however, was reported differently. In fact, when asked to indicate the benefits of a regular PA, 68% of girls from both schools and university reported the benefit to be "preventing weight increase". The benefits reported by male students, more so than girls, were almost equally divided between "best results in competition" (33,0%), "health maintaining" (27,0%), "preventing heart diseases" (21,0%), as well, "body weight increase" (19,0%). (Data not reported).

Table 6 showed the importance given to F&V and PA versus families' educational level. χ^2 highlighted a strong association among families' educational level and the importance that students attributed to F&V intake and PA, ($p < 0,001$). This

conclusion was valid for both of the two groups and the overall study population.

When asked to indicate the source of information about healthy lifestyles and correct alimentary habits (Table 7), students indicated they had learned these mainly at school/university (48,0%) or from their family (37,0%). A similar conclusion was drawn with respect to the source of information regarding correct PA, (57,0% from school, 32,0% from parents).

Discussion

Reported results seemed to indicate that the recommended goals in F&V consumption in our sample of secondary school and university students were far from the standards laid out in the nutrition guidelines. If this outcome is applied to the corresponding universe of adolescents and young adults, it means that only about ¼ of this

Table 6. Importance of Fruit and Vegetables consumption and Physical Activity by families' educational level.

Educational level	University								P
	Fruit and Vegetables				Physical Activity				
	Important	Not important	Important	Not important	Important	Not important	Important	Not important	F&V
	n	%	n	%	n	%	n	%	
0 degree	17	23,0	92	73,0	23	25,0	86	79,6	<0,001
≥1 degrees	57	77,0	34	27,0	69	75,0	22	20,4	PA
Total	74	100,0	126	100,0	92	100,0	108	100,0	<0,001
	Secondary School								P
	Fruit and Vegetables				Physical Activity				
	Important	Not important	Important	Not important	Important	Not important	Important	Not important	F&V
	n	%	n	%	n	%	n	%	
0 degree	24	33,3	140	78,7	9	14,5	155	82,4	<0,001
≥1 degrees	48	66,7	38	21,3	53	85,5	33	17,6	PA
Total	72	100,0	178	100,0	62	100,0	188	100,0	<0,001
	Total								P
	Fruit and Vegetables				Physical Activity				
	Important	Not important	Important	Not important	Important	Not important	Important	Not important	F&V
	n	%	n	%	n	%	n	%	
0 degree	41	28,1	232	76,3	32	20,8	241	81,4	<0,001
≥1 degrees	105	71,9	72	23,7	122	79,2	55	18,6	PA
Total	146	100,0	304	100,0	154	100,0	296	100,0	<0,001

Table 7. Source of information for individuals having correct knowledge of recommendation and considering important Fruit and Vegetables and Physical Activity.

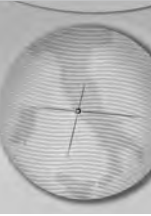
Source	Fruit and Vegetables		Physical Activity	
	n	%	n	%
Family	54	37,0	49	32,0
School	70	48,0	88	57,0
Other	22	15,0	17	11,0
Total	146	100,0	154	100,0

group meets the expert recommendation of five or more daily servings of F&V.

This result agrees with the conclusions of previous authors. Only a minority of children and adolescents, about 17,0-20,0%, have been found to meet F&V intake recommendations with more than half consuming less than one servings of F&V per day [19-22]. Concerning PA, our findings reported 35,0% of youth were not engaged in any PA, while a total of 65,0% of youth were actively practicing some kind of moderate or vigorous PA. These estimates are in agreement with the other results which show that 72,0% of Florida middle school youth participate in vigorous physical activity as well as 61,0% of high school students [7]. Results reported by different authors indicated also that individual behaviours in nutrition and sedentary or active physical engagement are largely influenced by

different variables such as age, gender, social, economical, cultural factors and different settings [1, 2, 35, 36]. Levels of F&V consumption as well as levels of PA have been shown to decrease with age and vary in different ethnic groups, but literature reported contrasting findings on these arguments [24]. It is not abnormal to observe that younger people act as they most prefer. In our study school students were more likely to address themselves, as related to the concept of "welfare", to immediately gratifying targets, while older students seemed to be more concerned about health and to have a better understanding of the relationship between health and nutrition behaviour and the importance of a healthy diet and better quality of life. Consequently students should receive information to increase their awareness as early in their education as possible.

Families' educational level is also an important



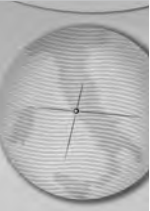
factor which positively influences students' F&V intake and their awareness about the importance of improving the quality of their lives: one of the ways experts say could be obtained through healthy dieting (welfare). This result highlights that families with a lesser educational level should be helped with counselling activities. Families' educational level was shown to have a direct correlation with PA, too. About 1/3th of the individuals, (35,0%) does not practice any PA: this percentage decreases with a higher families' educational level. PA, instead, showed a direct association with F&V intake. Thus, it may be sustained that working on one of the two aspects, nutritional or physical, could mean improve the other one. Information and knowledge about experts recommendation on correct serving per day of F&V consumption were generally low and largely influenced by educational levels. It was demonstrated that girls were more informed (52,0%) and consequently taking care of their bodies, motivated by "preventing weight increase", while boys (33,0%) were much more likely to be concerned with obtaining "best results in competition". Results were comparable with data reported by other surveys [38]: girls (69,0%) were much more actively attempting to control their weight than boys (29,0%). Cultural variables of the families, were associated with the awareness of the reasons why F&V and PA are important. Families, in fact, are assumed to be a good reference point and increasing information and awareness of the families can, thus, help adolescents to improve the quality of their life. Parent and caregivers of adolescents need to be educated about the importance of F&V consumption and on the different ways to enhance their acceptability and how to make them more palatable. The increase availability of fast food which contain little fruits or nutrient rich vegetables and the increased consumption of sweetened fruit drink or sodas contribute to a replacement of F&V from an adolescent's diet. Nutrient rich vegetable consumption is generally uncommon and omitted from adolescents' diet even in educational institutions such as schools. Students of middle and high school have access to snack bars and school food stores selling foods high in fat and calories. The sources of lunch meals are responsible of short term changes in dietary habits of school children [25, 41-43]. In spite of different initiatives and epidemiological surveillance activity [44], in fact, most of the children and adolescent fails in meeting Healthy People 2010 recommendations.

Increasing the proportion of adolescents meeting

recommended dietary and PA guidelines has been identified as an important strategy to contrast the epidemic increase in obesity, especially in western countries [43]. This study highlighted the need of increasing the knowledge and monitoring of students' consequent behaviours related to dietary habits and PA practice. School and university students, both indicated the school and the family as the best source of information and the most utilized means of raising awareness of the importance of correct dieting and regular PA.

Policymakers need to be active in promoting interventions that target children and their families, through school and community based educational programs. School based interventions have been the forefront of activities and school-based programs, have in fact been largely activated across all levels. Programs aimed at increasing knowledge and modifying behaviors related to nutrition, healthy dieting and PA, however, up to today have had modest results and were associated with improvements in behaviors however, only in the short term. Schools need to have evidence and reference data on methods and strategies suitable in gaining attention and enhancing long term retention of the acquired knowledge. School-based intervention programs are, nevertheless, strongly requested and considered fundamental for developing a deep rooted culture of alimentary education and the avoidance of sedentary habits, thus, activating preventive actions early in life and mainly during the development age. School lunches contribute significantly to correct dietary practice and eating behavior that are consistent with recommended dietary guidelines especially in F&V consumption. Adequate and different school lunches programs should be directed to favorably influence in short term alimentary education and increasing F&V consumption and in long term promotion of health benefits and quality of life. Community based programs should be directed at developing environmental initiatives that are able to establish occasions and choices for healthy eating and PA. This should also be provided through increasing attention to agricultural policies, supporting more affordable markets in term of prices and availability, providing adequate funding for food services in schools, tax barriers to school food stores and snack bars selling high fat food and sweetened drinks, together with more traditional practices of health and nutrition education in different community settings for targeted specific groups.

Results presented in this work, have their limits and cannot be considered exhaustive: dietary data



may have been subjected to recording errors and underreporting; other factors other than cultural, not assessed, may have influenced reported data; findings may not be generalized to school and university students of other geographical area; investigation would need to be repeated again, to monitor the attitude of young people regarding knowledge and behaviors referred to F&V consumption and PA. Further research is required to determine the most favorable age, optimal

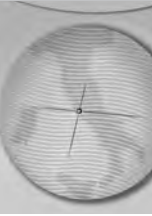
length of time, need of boosters and appropriate evaluation of long term effectiveness of the different programs and interventions. School, at last, as educational agency, aided by the efforts of all healthcare providers and by families and communities, is called to provide a fundamental contribution to the establishment of healthy lifestyles in the areas of nutrition and prevention of sedentary habits.

References

- 1) Cho H, Nadow M. Understanding barriers to implementing quality lunch and nutrition education. *J Commun Health* 2004;29:421-35.
- 2) Ball K, Mishra GD, Crawford D. Social factors and obesity: an investigation of the role of health behaviors. *Int J Obes Relat Metab Disord* 2003;27:394-03.
- 3) Chauliac D, deBeco J. Nutritional habits of adolescents in Paris suburbs. *Arch Pediatr* 1996;3:227-34.
- 4) Sidoti E, Tringali G. The forgotten breakfast. 43° National Congress of Italian Society of Hygiene and Public Health. October 1-4, Bari, 2008.
- 5) Giordani C. Italian Ministry of Health Report. Rome, 2002.
- 6) Story M, Neumark-Sztainer D, Sherwood N, Stang J, Murray DM. Dieting status and its relationship to eating and physical activity behaviors in a representative sample of US adolescents. *J Am Diet Assoc* 1998;98:1127-35.
- 7) Zapata LB, Bryant CA, McDermott RJ, Hefelfinger JA. Dietary and physical activity behaviors of middle school youth: the Youth Physical Activity and Nutrition Survey. *J Sch Health* 2008;78:9-18.
- 8) Nystrom AA, Schmitz KH, Perry CL, Lytle LA, Neumark-Sztainer D. The relationship of weight related perceptions, goals and behaviors with fruit and vegetable consumption in young adolescents. *Prev Med* 2005;40:203-8.
- 9) Field AE, Gillman MW, Rosner B, Rockett HR, Colditz GA. Association between fruit and vegetable intake and change in body mass index among a large sample of children and adolescents in the United States. *Int J Obes Relat Metab Disord* 2003;27:821-6.
- 10) Romero-Corral A, Montori VM, Somers VK et al. Association of bodyweight with total mortality and with cardiovascular events in coronary artery disease: a systematic review of cohort studies. *Lancet* 2006;368:666-78.
- 11) Hung HC, Joshipura HJ, Jang R, et al. Fruit and vegetable intake and risk of major chronic diseases. *J Natl Cancer Inst* 2004;96:1577-84.
- 12) IARC. Fruit and vegetables. International Agency for Research on Cancer. Lyon, 2003.
- 13) Temple NJ, Gladwin KK. Fruit, vegetables and the prevention of cancer: research challenges. *Nutrition* 2003;9:467-70.
- 14) Maynard M, Gunnell D, Emmett P, Frankel S, Davey Smith J. Fruit, vegetables and antioxidants in childhood and risk of adult cancer: the Boyd Orr cohort. *J Epidemiol Commun Health* 2003;27:218-25.
- 15) United States Department of Health and Human Services. Healthy People 2010. Washington, D.C. U.S. Government Printing Office 2000.
- 16) Centers for Diseases Control and Prevention. Physical

activity for everyone: Recommendations. Available from: <http://www.cdc.gov/nccdphp/dnpa/physical/recommendations/index.htm>. [Accessed on September 18, 2008].

- 17) US Department of Health and Human Services. Physical activity and health. A report of the Surgeon General. Washington DC: US Department of Health and Human Services, 1996.
- 18) Brotnahan J, Steffen L, Lytle L. The relation between physical activity and mental health among Hispanic and non-Hispanic white adolescents. *Arch Pediatr Adolesc Med* 2004;158:818-23.
- 19) Pesa JA, Turner LW. Fruit and vegetable intake and weight control behaviors among youth. *Am J Health Behav* 2001;25:3-9.
- 20) Reynolds KD, Franklin FA, Binkley D, Raczinski JM, Harrington KF, Kirk KA. Increasing the fruit and vegetable consumption of fourth-graders: results from the high 5 project. *Prev Med* 2000;30:309-19.
- 21) Neumark-Sztainer D, Wall M, Perry C, Story M. Correlates of fruit and vegetable intake among adolescents. Findings from Project EAT. *Prev Med* 2003;37:198-208.
- 22) Neumark-Sztainer D, Story M, Hannan PJ, Croll J. Overweight status and eating patterns among adolescents: where do you stand in comparison with the Healthy People 2010 objectives? *Am J Pub Health* 2002;92:844-51.
- 23) Lytle LA, Seifert S, Greenstein J, McGovern P. How do children's eating patterns and food choices change over time? Results from a cohort study. *Am J Health Prom* 2000;14:222-8.
- 24) Striegel-Moore RH, Thompson DR, Affenito SG, et al. Fruit and vegetable intake: few adolescent girls meet national guidelines. *Prev Med* 2006;42:223-8.
- 25) Cullen KW, Zakeri I. Fruits, vegetables, milk and sweetened beverages consumption and access to a la carte/snack bar meals at school. *Am J Pub Health* 2004;94:463-7.
- 26) Ludwig D, Peterson K, Gortmaker SL. Relation between consumption of sugar-sweetened drinks and childhood obesity: a prospective, observational analysis. *Lancet* 2001;357:505-8.
- 27) Johnson RK, Frary C, Wang MQ. The nutritional consequences of flavored-milk consumption by school aged children and adolescents. *J Am Diet Assoc* 2002;102:853-6.
- 28) World Health Organization. The World Health Report. OMS Geneva 2002.
- 29) Antova T, Pattenden S, Nikiforov B, Leonardi GS, Boeva B, Fletcher T. Nutrition and respiratory health in children in six Central and Eastern European Countries. *Thorax* 2003;58:231-6.
- 30) Cincinato L, Bufacchi T, Brattoli L. Il rapporto tra obesità e l'uso della TV nell'età evolutiva: attuali prospettive e linee di intervento. [Relationship between overweight/obesity and TV in the evolutionary age: actual perspectives and guidelines for intervention] *Difesa Sociale* 2002;81:129-34.
- 31) Bescianini S, Gargiulo L, Gianicolo E. Excess of weight in infancy and adolescence. Italian National Institute of Statistics



(ISTAT) Conference, Rome, 2002.

32) Arpesella M, Campostrini S, Gerzeli S, et al. Obesity, nutritional aspects and life style from a survey on a sample of primary school pupils in the Pavia province (Northern Italy). *Ital J Pub Health* 2008;5:12-7.

33) Knai C, Pomerleau J, Lock K, McKee M. Getting children to eat more fruit and vegetables: a systematic review. *Prev Med* 2006;42:85-95.

34) World Health Organization. Health Behavior in School-aged Children (HBSC) Study. WHO, Copenhagen, 2004.

35) Xie B, Gilliland FD, Ly YF, Rockett HR. Effect of ethnicity, family income, and education on dietary intake among adolescents. *Prev Med* 2003;36:30-40.

36) Quan T, Salomon J, Nitzke S, Reicks M. Behaviors of low income mothers related to fruit and vegetable consumption. *J Am Diet Ass* 2000;100:567-70.

37) Pentland WE, Harvey AS, Lawton MP, McColl MA. Ed. Time use research in the social sciences. Springer, 1999.

38) Brender ND, Kann L, McManus T, Kinchen SA, Sundberg EC, Ross JG. Reliability of 1999 Youth Risk Behavior Survey questionnaire. *J Adolesc Health* 2000;31:336-42.

39) La Licata R, La Marca G, Di Pietra A, Mammina C, Tringali G.

Implementation of a school-based childhood obesity prevention program in Palermo: a preliminary epidemiological study. *Annals of Nutrition & Metabolism*, 9th European Nutrition Conference. Roma, 2003.

40) La Licata R, Mandirà MG, Sidoti E, Tringali G. "Nutritional care" project for the obesity prevention in the age of development. *Acta Med Medit* 2004;20:59-62.

41) Wildey MB, Pampalone SZ, Pelletier RL, Zive MM, Elder JP, Sallis JF. Fat and sugar levels are high in snacks purchased from student stores in middle schools. *J Am Diet Ass* 2000;100:319-22.

42) Harnack L, Snyder P, Story M, Holliday R, Lytle L, Neumark-Sztainer D. Availability of a la carte food items in junior and senior high schools: a needs assessment. *J Am Diet Ass* 2000;100:701-3.

43) Cullen KW, Eagan J, Baranowski T, Owens E, de Moor C. Effect of a la carte and snack bar foods at school on children's lunchtime intake of fruits and vegetables. *J Am Diet Ass* 2000;100:1482-6.

44) Grunbaum JA, Kann L, Kinchen SA. Youth Risk Behavior Surveillance. U.S.A. 2001. *MMWR* 2002;51:1-64.