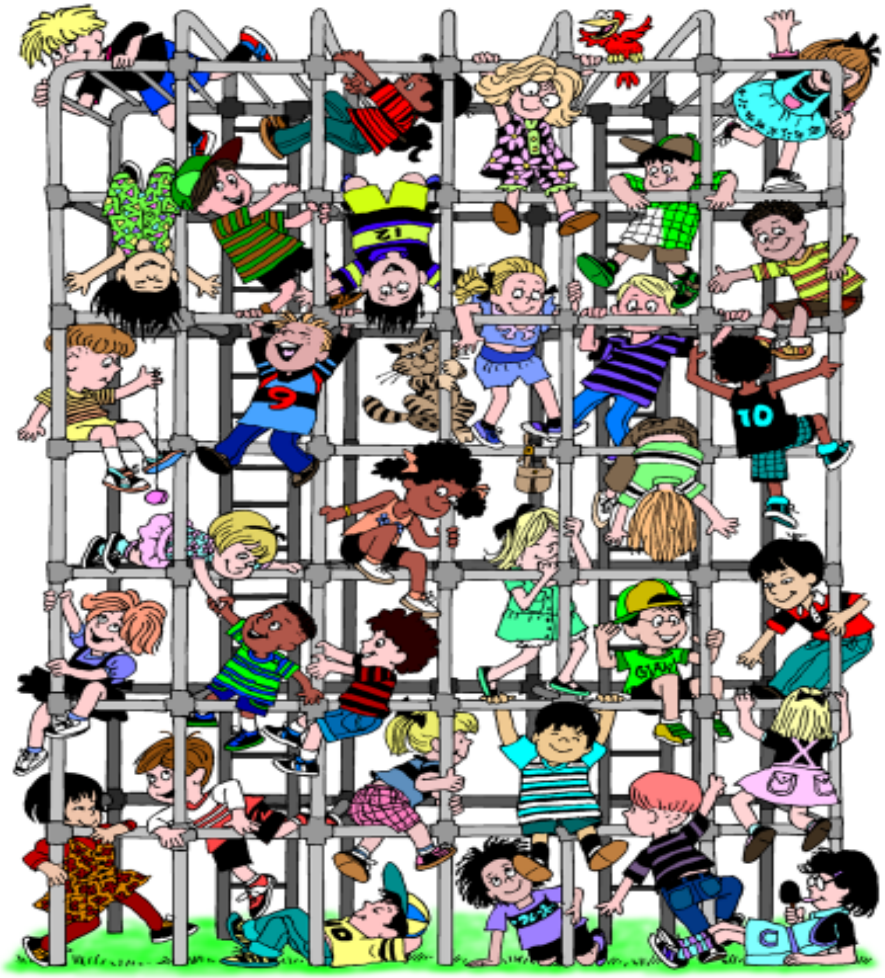
Dietary Intake and Physical Activity Summary Report

The Missouri School-Age Children's Health Services Program

School Year
2001-2002

Division
of
Community
Health



Missouri Department of Health and Senior Services

Dietary Intake and Physical Activity Summary Report
Missouri School-Age Children's Health Services Program:
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PREFACE

The Division of Community Health is pleased to present the second published report on nutritional data collected on school-age children who attend schools that participate in the Missouri School-Age Children's Health Services Program (MSCHS). The MSCHS supports population-based health services for school-age children. The Section for Maternal, Child and Family Health administers the MSCHS through contracts with schools, school districts, and local public health agencies. Federal funding through the Title V Maternal and Child Health Block Grant supports the efforts of the Division to contract with the Harvard University School of Public Health to use the Harvard Food Frequency Questionnaire (FFQ) survey in Missouri. To support this project, the Division has worked with Harvard to customize and validate the FFQ for use among Missouri students.

The Division wishes to to acknowledge and thank the following individuals for their contributions:

- Ms. Rita Arni and staff of the Nutrition Policy and Education Unit, Division of Community Health, for their expertise in dietary assessment.
- Ms. Dana Schmitz and the staff of the Office of Surveillance, Evaluation and Planning, Division of Community Health, for developing the surveillance system, providing technical assistance to the MSCHS contractors, quality control of the data analysis, and authorship of this report.
- Ms. Helaine Rockett and the staff of the Harvard University School of Public Health for analysis of the data and leadership in standardized dietary intake assessment.
- All of the administrators, school nurses, and teachers in the MSCHS participating schools for their commitment to improving the dietary health of their students.

In a very real sense, this report is early fruit of the promise of federal, state and local collaborations and public-private partnerships to improve the nutritional health status of all Missourians.

Paula F. Nickelson, Director
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Background: Many acute and chronic diseases, such as rickets, diabetes, high blood pressure, heart disease, anemia and obesity, are linked to improper dietary intake and inadequate physical activities in both adults and children. As the prevalence of overweight and obesity increase in our youth, future generations of Americans are at greater risk of developing these life-threatening diseases. Important tools in monitoring the health status of our children are anthropometric measurements and the Harvard Food Frequency Questionnaire (FFQ) which measures a variety of food intake and physical activities among school children. The data collected by using the tools provide a basis for the identification of inadequate nutrient intake, lack of physical activity, and prevalence of obesity which is important in designing intervention strategies and programs aimed at modifying and improving school children's dietary intake and physical activity.

Data collection: During the 2001-2002 school year, through the Missouri School-Age Children's Health Services Program, the Missouri Department of Health and Senior Services collected dietary intake information as assessed by the Harvard FFQ from a total of 22,347 children, with 16,777 children's records included in the analysis after passing exclusion criteria of improbable caloric intake. This involved a combination of 313 non-public schools and public school districts (one or more schools submitted data within the district). Height and weight measurements were collected from 26,757 children within these same participating schools with 22,274 records included in the analysis. Of those records excluded, 4,413 were from children measured in previous years who were determined to be overweight or underweight, so were remeasured in the current year to assess their progress. However, these records are included in the FFQ analysis. In addition, 70 records did not pass exclusion criteria of improbable height and weight for age and sex. ***Figures 1*** and ***2*** illustrates the age distribution.

Figure 1. *Percent distribution of food frequency records among school-age children (n=16,777).*

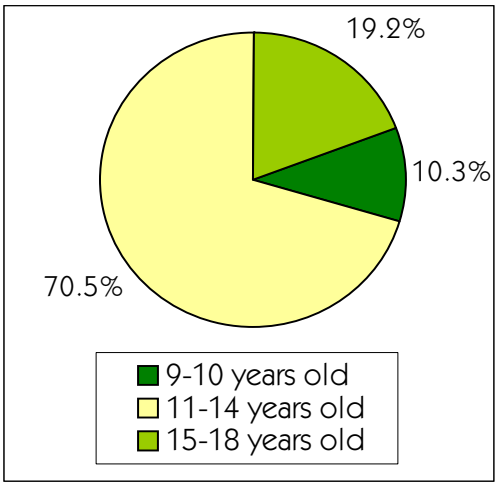
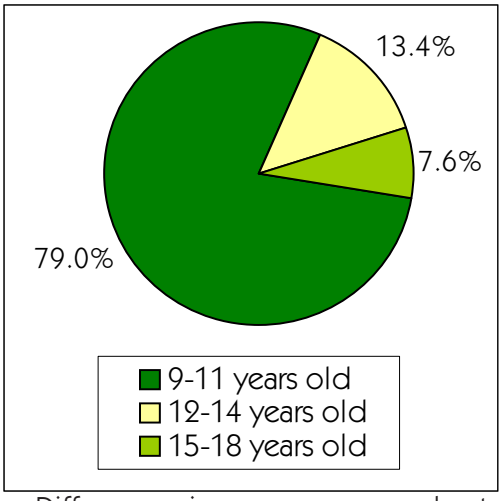
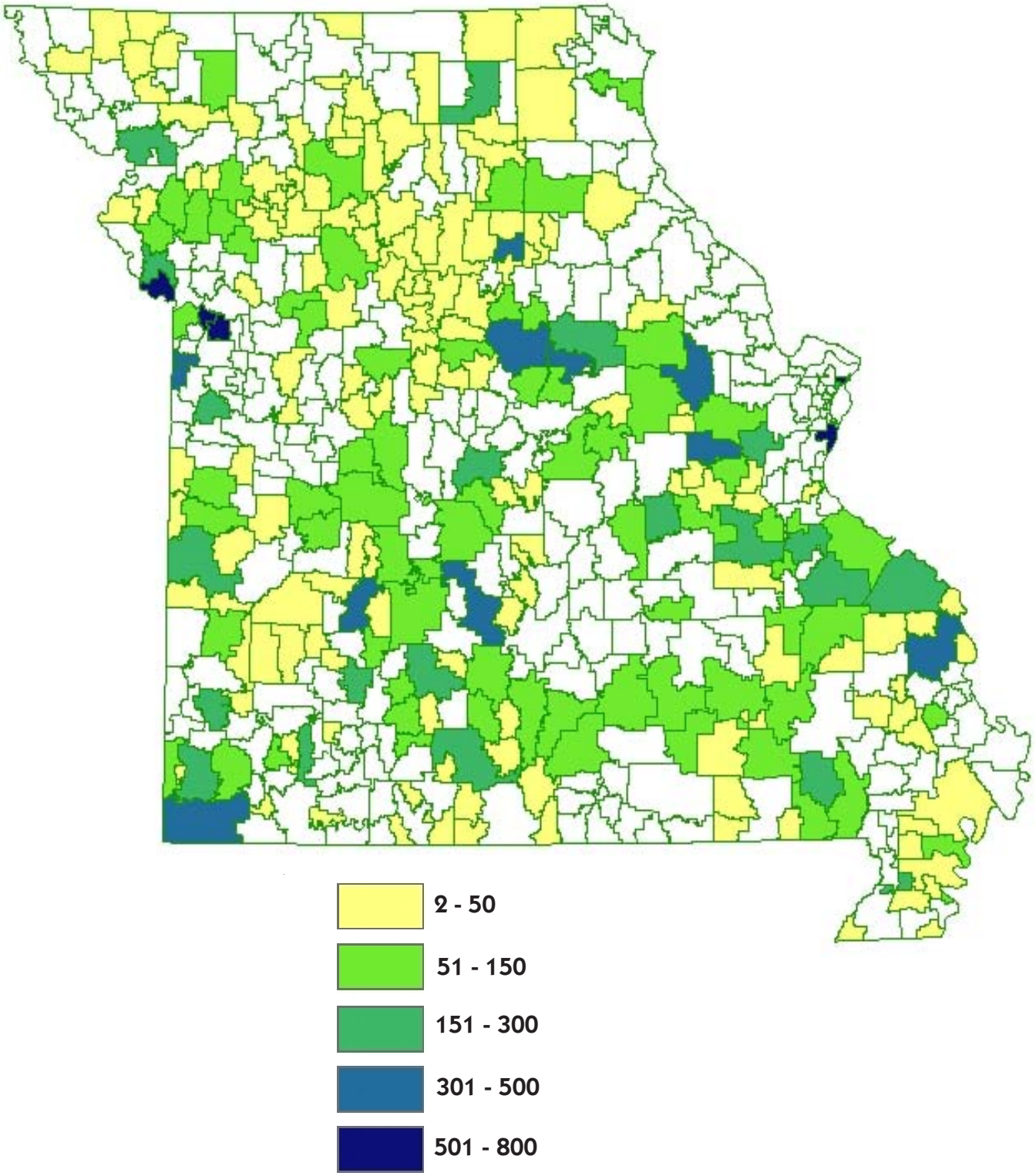


Figure 2. *Percent distribution of height and weight measurements collected among school-age children (n=22,274).*



Note: Differences in age groups are due to the source of the data reporting: the FFQ analysis is completed by the Harvard School of Public Health, and the height and weight data is analyzed by the Centers for Disease Control and Prevention (CDC).

Figure 3. *Number of children participating in the Missouri School-Age Children's Health Services Program by Missouri public school district in school year 2001-2002*.*



***Note:** Non-public school participation was reported in accordance with the public school district in which the school was located.

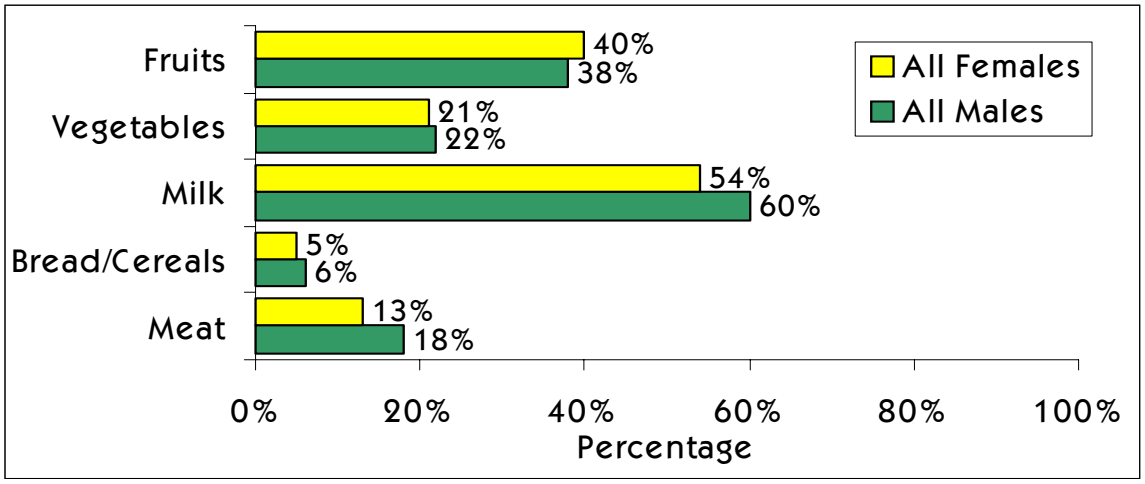
Frequency of intake by food group: The mean frequency in which students ate foods from the five Food Guide Pyramid Food Groups is displayed in ***Table 1***. Students' mean intake of foods from the Milk and Fruits categories were comparable to the minimum recommended number of servings as advised by the Food Guide Pyramid. In comparing the mean intake of foods from the other Food Groups, the students, regardless of age or gender, did not consume enough foods found in the Meat, Breads/Cereals, and Vegetables Groups. The highest mean frequency of intake was from foods in the Sweets and Fats Groups.

Table 1. *Mean frequency of intake per day of Food Guide Pyramid Food Groups by sex and age.*

	Minimum Recommended Number of Servings	9-10 yr old Males n=73	9-10 yr old Females n=92	11-13 yr old Males n=6,488	11-13 yr old Females n=6,781	14-18 yr old Males n=1,693	14-18 yr old Females n=1,650	All Males n=8,254	All Females n=8,523
Meat	*2.0*	1.2	0.9	1.2	1.1	1.6	1.3	1.3	1.1
Bread/ Cereals	*6.0*	2.3	2.3	2.3	2.4	3.1	3.1	2.5	2.5
Milk	*2.0*	2.2	2.2	2.6	2.4	2.6	2.1	2.6	2.3
Vegetables	*3.0*	2.3	2.2	2.0	2.0	2.4	2.3	2.1	2.1
Fruits	*2.0*	2.1	2.6	2.2	2.3	2.1	2.1	2.2	2.3
Sweets	*minimal*	2.7	2.3	3.0	2.8	3.8	3.5	3.1	2.9
Fats	*minimal*	3.2	3.0	3.4	3.4	4.5	4.1	3.6	3.5

Source: Harvard Food Frequency Questionnaire

Figure 4. *Percent of all students whose frequency of intake by food group is comparable to the minimum recommended servings in the Food Guide Pyramid (n=8,254 males, n=8,523 females).*



Source: Harvard Food Frequency Questionnaire

Table 1 indicates that male students consistently consumed higher frequencies of foods from the Meat Group than females. Older students (14-18 years old) of both genders more frequently consumed foods from the Meat, Bread/Cereals, Sweets, and Fats Food Groups than their younger counterparts.

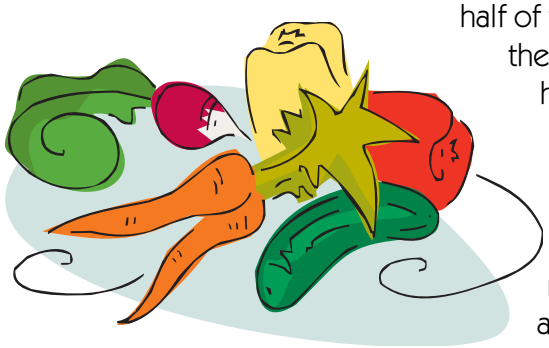
Figure 4 indicates that foods from the Milk and Fruits Food Groups were frequently consumed at the same level as the minimum recommended servings in the Food Guide Pyramid. Foods from the Bread/Cereals Group were the least frequently consumed by both male and female students.

Table 2. *Percent of calories from the top two ranked foods contributing to selected nutrients.*

		Males				Females			
		#1 Ranked Food	%	#2 Ranked Food	%	#1 Ranked Food	%	#2 Ranked Food	%
9 to 10 year olds	Calories	Milk	12.24	Cold Breakfast Cereal	5.07	Milk	11.08	Cold Breakfast Cereal	5.26
	Carbo-hydrate	Milk	10.24	Soft Drinks	6.87	Milk	8.97	Soft Drinks	6.35
	Protein	Milk	19.39	Chicken or Turkey, Fried	6.38	Milk	18.46	Chicken or Turkey, Fried	6.86
	Fat	Milk	11.40	French Fries	6.81	Milk	10.42	French Fries	7.27
	Iron	Cold Breakfast Cereal	34.97	Steak or Roast Beef	3.77	Cold Breakfast Cereal	36.31	Spaghetti or Other Pasta+Sauce	3.36
	Calcium	Milk	45.41	Cold Breakfast Cereal	8.99	Milk	43.63	Cold Breakfast Cereal	9.77
11 to 13 year olds	Calories	Milk	11.65	French Fries	5.00	Milk	10.73	French Fries	5.00
	Carbo-hydrate	Milk	9.60	Soft Drinks	7.88	Milk	8.71	Soft Drinks	7.22
	Protein	Milk	19.17	Chicken or Turkey, Fried	6.49	Milk	18.26	Chicken or Turkey, Fried	6.69
	Fat	Milk	10.82	French Fries	7.19	Milk	9.95	French Fries	7.15
	Iron	Cold Breakfast Cereal	33.24	Steak or Roast Beef	3.61	Cold Breakfast Cereal	33.05	Bread, Toast, or Rolls	3.57
	Calcium	Milk	45.04	Cold Breakfast Cereal	8.48	Milk	42.94	Cold Breakfast Cereal	8.58
14 to 18 year olds	Calories	Milk	8.07	French Fries	6.30	Milk	6.17	French Fries	5.99
	Carbo-hydrate	Soft Drinks	11.50	Milk	6.29	Soft Drinks	11.11	French Fries	8.51
	Protein	Milk	13.85	Hamburgers, Meatballs, or Meatloaf	7.00	Milk	11.56	Chicken or Turkey, Fried	7.73
	Fat	French Fries	8.68	Milk	7.90	French Fries	8.51	Cheese	6.42
	Iron	Cold Breakfast Cereal	30.64	Bread, Toast, or Rolls	4.35	Cold Breakfast Cereal	30.52	Bread, Toast, or Rolls	5.26
	Calcium	Milk	37.26	Cheese	9.13	Milk	31.07	Cheese	10.12

Source: Harvard Food Frequency Questionnaire

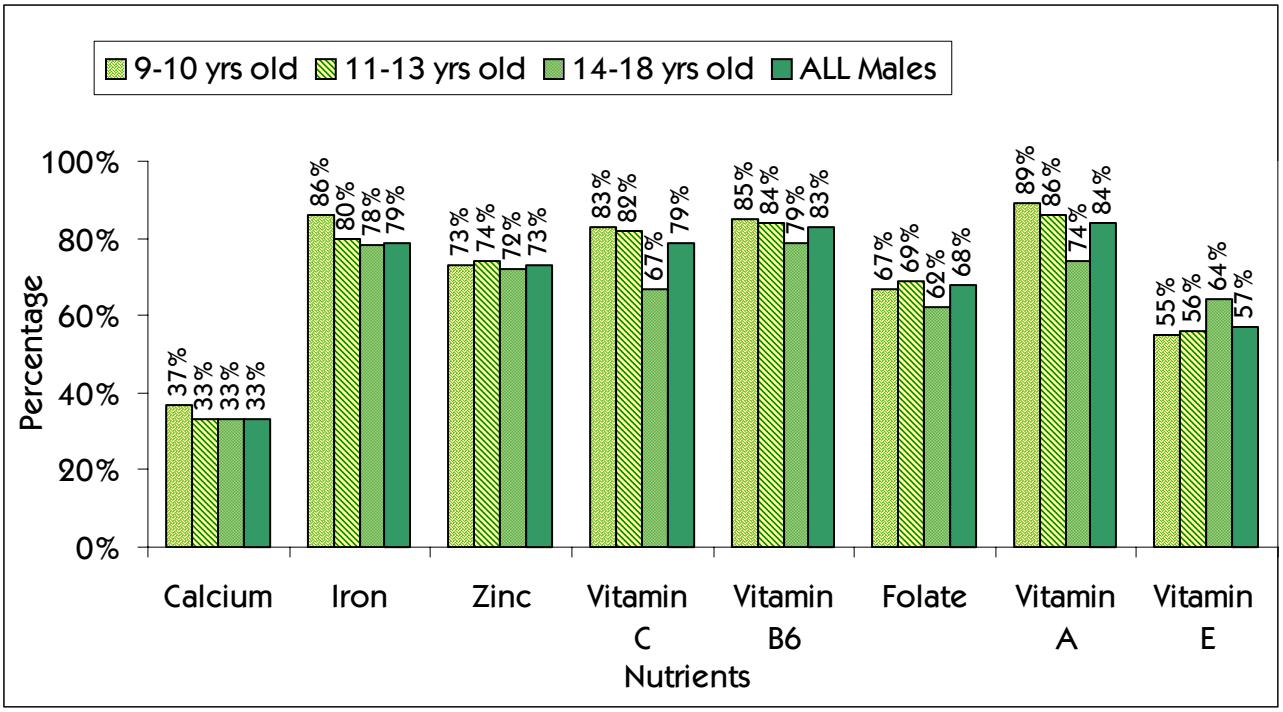
Top foods contributing to various nutrients: The top foods contributing to the various nutrients and the percent contributing to total calories were very similar for both male and female students. Food intake contributing to iron varied between boys and girls in the two younger age groups; boys in both younger age groups consumed steak or roast beef as the second-ranked food item whereas 9 to 10 year old girls consumed spaghetti or other pasta plus sauce and 11 to 13 year old girls consumed bread, toast or rolls. There was also some shift in food choices between these two younger age groups and their older counterparts. The second-ranked food contributing to calcium was cold breakfast cereal whereas in the diets of 14-18 year olds, cheese was the second-ranked food (milk remained the top-ranked food). Also for foods contributing to total calories, the 9-10 year olds consumed cold breakfast cereal the second most (milk the top-most), but the two older age groups consumed french fries as the second most common food contributing to total calories. In addition, the 9-10 year olds and 11-13 year olds had soft drinks as the second-ranked food contributing to carbohydrates whereas the 14-18 year olds had soft drinks as the top-ranked food. For the two younger age groups, milk contributed the most to total fat and french fries second, and in the older children the top food contributing to fat was french fries and then milk or cheese (for males and females, respectively). These differences between the younger and older students seems to indicate a shift to poorer food choices as children get older.



Nutrient intake by students: Nutrient intake was assessed using the Dietary Reference Intakes (DRIs). The DRIs is a set of four nutrient-based reference values for use in assessing and planning diets. The DRIs are released periodically for selected nutrients by the Food and Nutrition Board of the Institute of Medicine, National Academies of Sciences. The DRIs replace and expand the *Recommended Dietary Allowances (RDAs).* The DRIs are made up of the following reference values: Estimated Average Requirement (EAR), Recommended Dietary Allowance (RDA), Adequate Intake (AI), and Tolerable Upper Intake Level (UL). EAR is used to assess the adequancy of diets of groups of people; the EAR exceeds the requirement for half of the group, and falls below the requirement for the other half. The RDA is a recommended intake for individuals; the RDA represents the level of intake sufficient to meet the nutrient requirement for almost all healthy individuals in a particular life stage and gender group. The AI was developed for those situations in which a RDA could not be determined scientifically; the AI is at a level that is thought to meet or exceed the requirements of almost all healthy individuals in a particular life stage and gender group, based upon the science available. The UL is the level of average daily nutrient intake that is likely to create no risk of adverse health effects for almost all individuals.

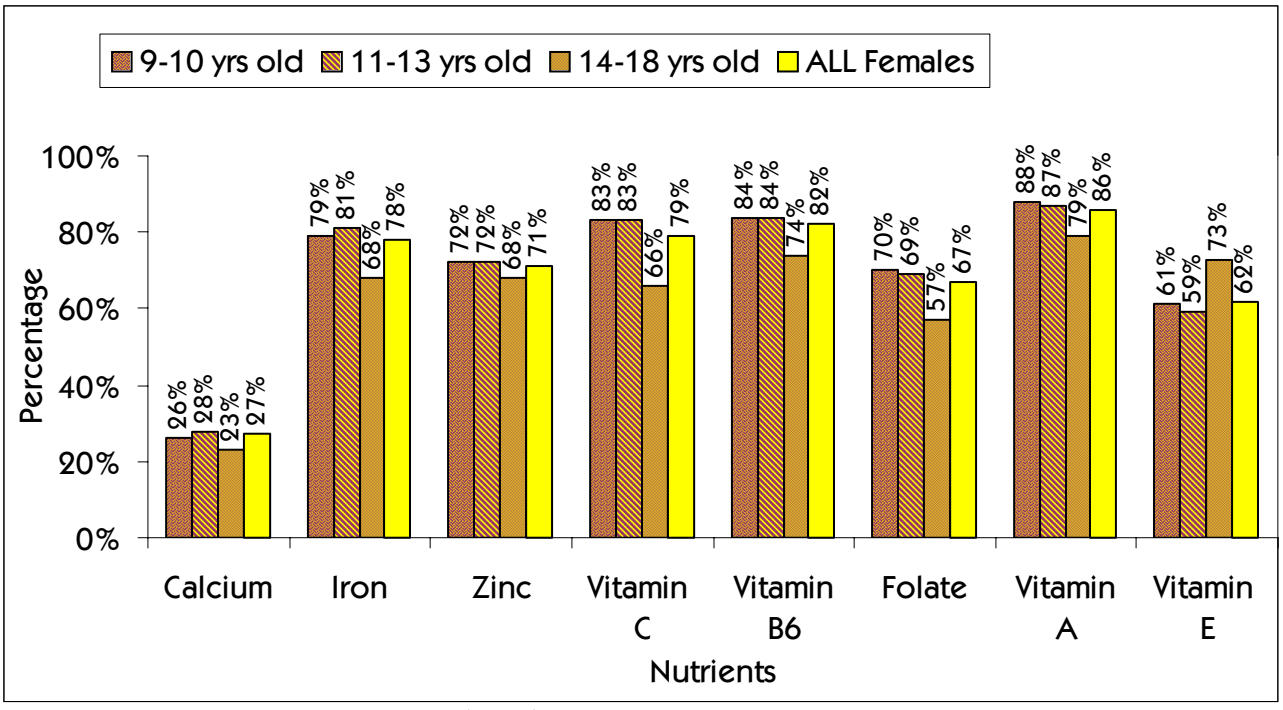
Figures 5 and ***6*** present the percent of students who met the recommended levels (EAR or AI) of various nutrients. In general, students were more likely to not meet the recommended levels for calcium, vitamin E, and folate, with fewer than 70 percent of the students meeting the recommended amounts. Overall, males and females presented very similar patterns in nutrient intake with the exception of calcium which was 5-11 percent lower and vitamin E which was 3-9 percent higher in the female population than the male counterparts. Also, iron intake was 10 percent lower in the 14-18 year old females compared to males of the same age. The 14-18 year old age group consistently had the lowest percent of students meeting nutrient intake requirements compared to their younger counterparts except for intake of vitamin E, which was higher than the other age groups.

Figure 5. *Percent of male students meeting the Estimated Average Requirement (EAR) or Adequate Intake (AI).*



Source: Harvard Food Frequency Questionnaire

Figure 6. *Percent of female students meeting the Estimated Average Requirement (EAR) or Adequate Intake (AI).*



Source: Harvard Food Frequency Questionnaire

Height and weight measurements: The Body Mass Index (BMI) was calculated for each student and was subsequently used to determine the nutritional status of the student population. The percent underweight, the percent overweight and the percent at-risk for becoming overweight were determined by comparing the students' BMI to age-based and sex-specific national norms. Underweight is defined as a BMI below the 5th percentile for age. Overweight is defined as a BMI at or above the 95th percentile by age, while at-risk for overweight is a BMI between the 85th and less than the 95th percentile for age. ***Figures 7***, ***8***, ***9***, and ***10*** present the prevalence rates by age, race and ethnicity (underweight not included due to the small number of children in this category), consecutive school years, and an overall map of Missouri indicating overweight prevalence rates by county.

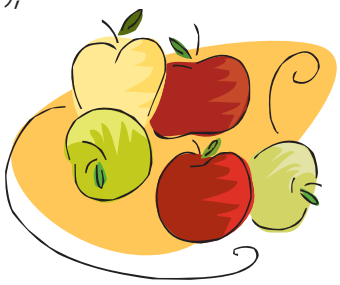
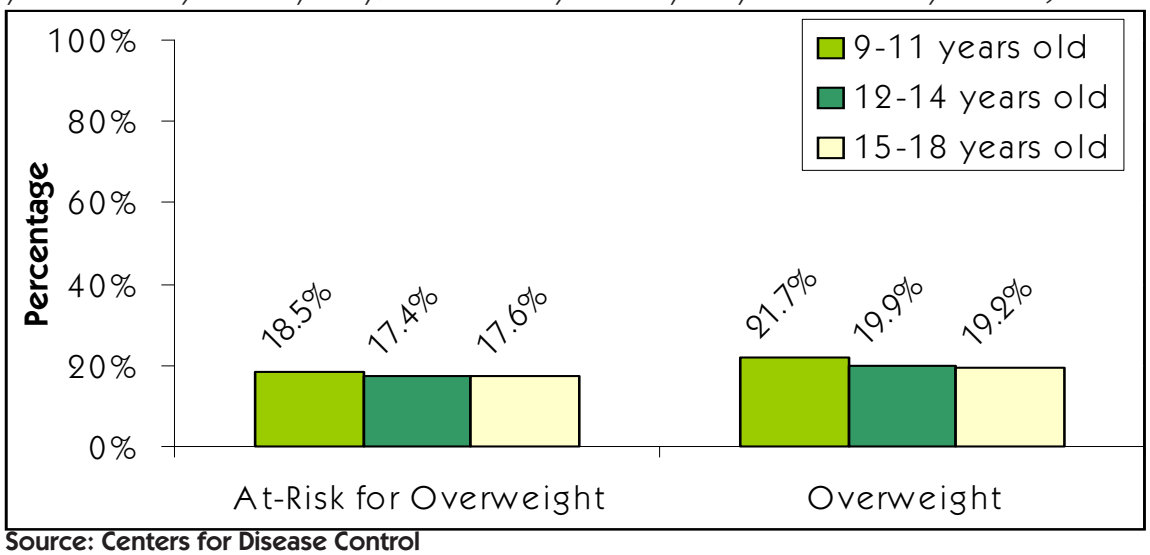
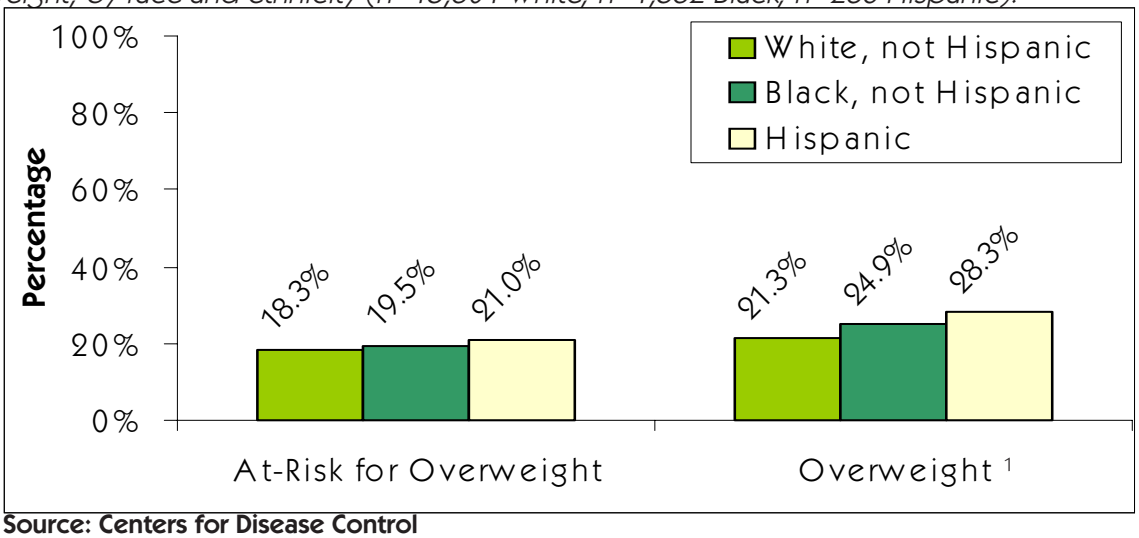


Figure 7. *Percent of children who were found to be overweight and at-risk for overweight, by age (n=17,369 for 9-11 years old; n=2,953 for 12-14 years old; n=1,668 for 15-18 years old).*



Source: Centers for Disease Control

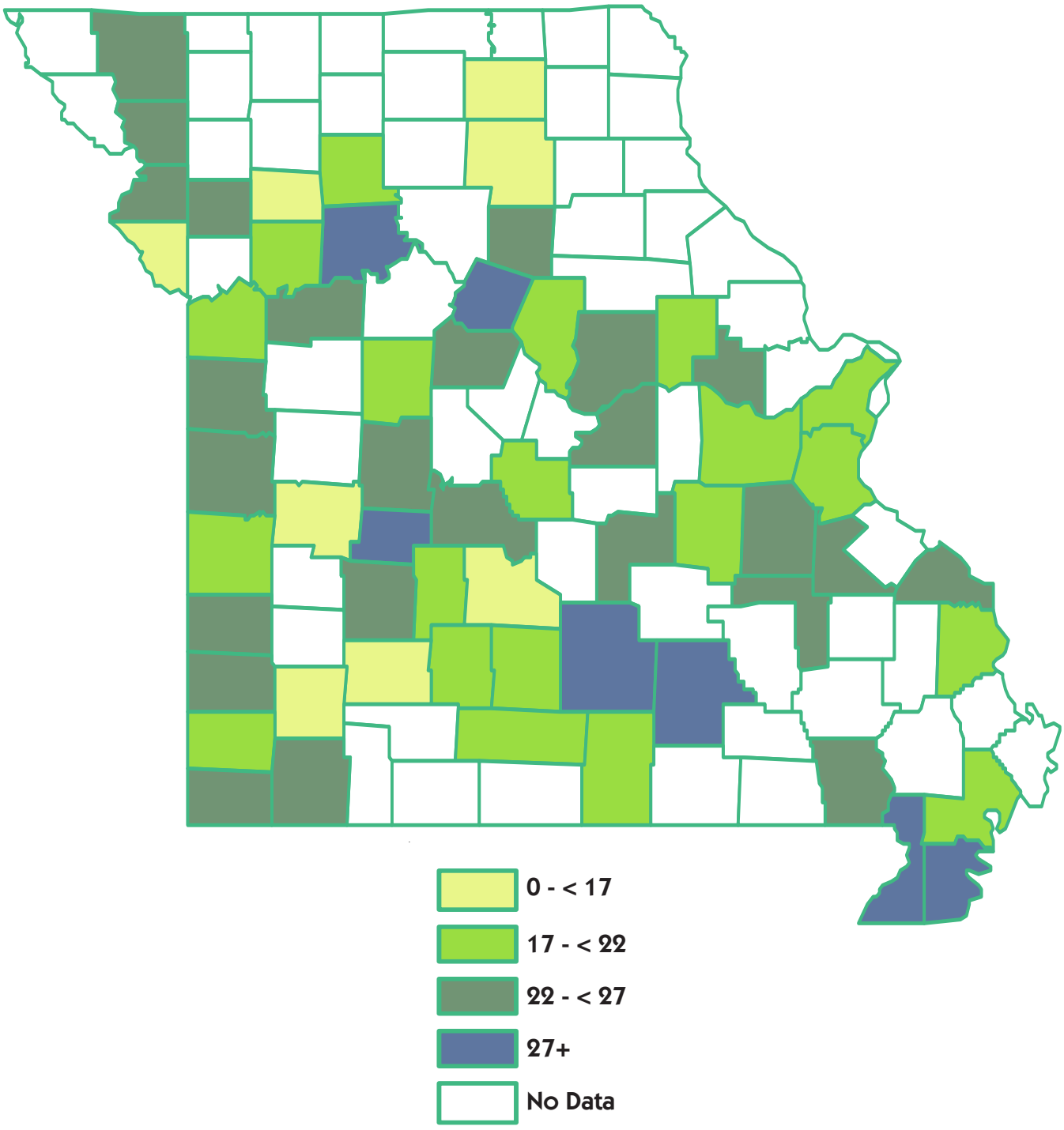
Figure 8. *Percent of 9-11 year old children who were found to be at-risk for overweight and overweight, by race and ethnicity (n=15,304 White; n=1,532 Black; n=286 Hispanic).*



Source: Centers for Disease Control

[1]Statistically significant at the 95% confidence level using exact binomial confidence intervals.

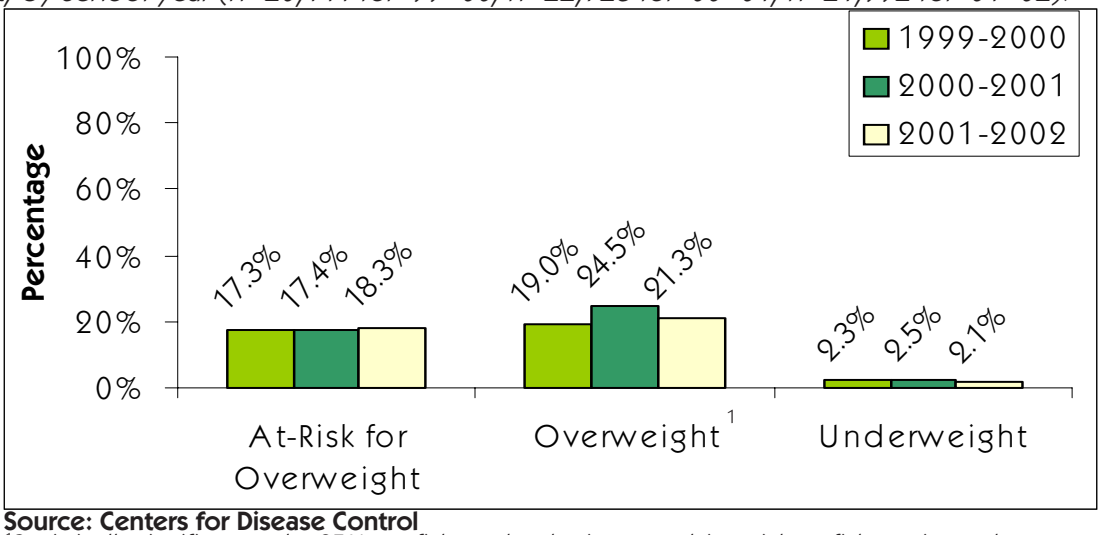
Figure 9. *Percent of children participating in the Missouri School-Age Children's Health Program who were found to be overweight by county in school year 2001-2002*.*



*Overweight defined as greater than or equal to 95th percentile BMI-for-age according to CDC Growth Charts, 2000. Percentages are not calculated if less than 100 records are available for analysis.

Source: Centers for Disease Control

Figure 10. *Percent of children who were found to be overweight, at-risk for overweight or underweight, by school year (n=20,141 for '99-'00; n=22,728 for '00-'01; n=21,992 for '01-'02).*



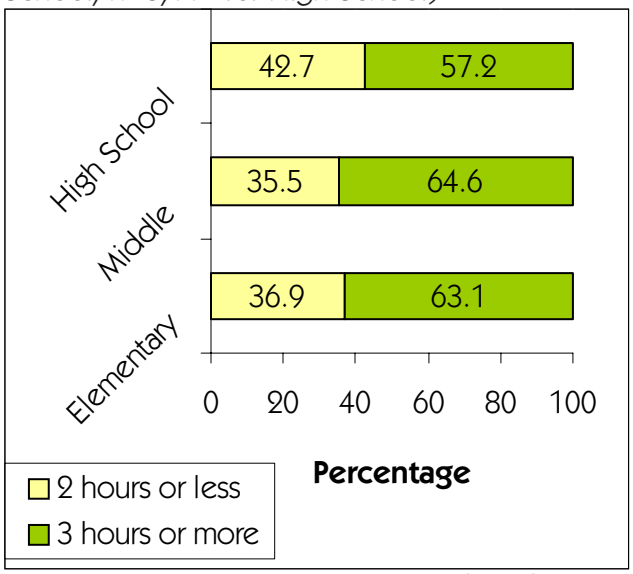
Source: Centers for Disease Control
[1]Statistically significant at the 95% confidence level using exact binomial confidence intervals.

The percentage of children who were at-risk for overweight and those who were overweight were very similar for each of the age groups, with the youngest age group having a slightly higher prevalence rate (***Figure 7***). In comparing the top three most predominant race and ethnic origins represented in Missouri, the prevalence rates for overweight and at-risk for overweight was highest in the Hispanic population and lowest in the White, non-Hispanic population (***Figure 8***). This was statistically significant in the overweight category (confidence interval [CI] 20.6 percent to 21.9 percent for Whites and 23.2 percent to 33.9 percent for Hispanics). When the confidence intervals for the two percentages do not overlap, we can be 95 percent confident that the observed differences in rates are statistically significant. The prevalence of overweight was also statistically higher in the Black, non-Hispanic compared to the White, non-Hispanic population (CI 20.6 percent to 21.9 percent versus CI 22.7 percent to 27.1 percent for Blacks).

Figure 10 shows the three-year trend of the nutritional health indices of at-risk for overweight, overweight, and underweight. It should be noted that the data from school year 2000-2001 contains height and weight measurements from children measured in previous years who were determined to be overweight or underweight and were remeasured in 2000-2001 to assess their progress. Therefore, the rate of overweight and underweight will be slightly inflated due to these additional measurements. In comparing the rate of at-risk for overweight at baseline (1999-2000) to the current year, there was a 1 percent increase in the rate. There was a 2.3 percent increase in the rate of overweight in this same time period, which was statistically significant (CI 18.5 percent to 19.5 percent for year 1999-2000 and CI 20.7 percent to 21.8 percent for year 2001-2002). The rate of underweight remained relatively constant.

Responses to physical activity questions: Students were asked to answer questions on the FFQ regarding participation in physical activities. Questions were divided into those applicable to elementary, middle, and high school students and inquired about such activities as television viewing, participation in sports, and attendance in physical education classes.

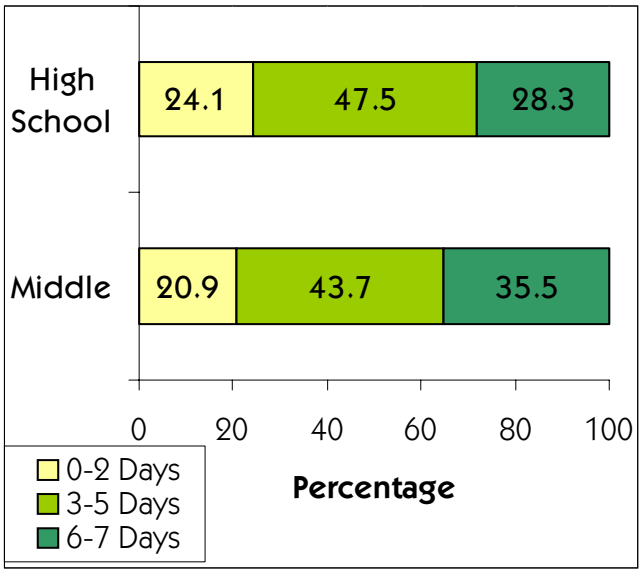
Figure 11. *Time spent by students watching television on an average school day (n=17,509 for Elementary School; n=787 for Middle School; n=3,112 for High School).*



Source: Harvard Food Frequency Questionnaire

All students were asked about their television viewing habits during an average school day. ***Figure 11*** shows the percentage of children who watched two hours or less, and three hours or more of tv. Elementary and middle school students appeared to have similar viewing habits whereas there was a lower percentage of high school students watching three or more hours of television. ***Figure 12*** indicates the frequency of participation by older students in high intensity sports such as basketball, soccer, running, swimming laps, tennis, or fast bicycling. More of the middle school children joined in these type of activities on a greater number of days compared to the high school students which had a greater number in the 0-2 days and 3-5 day ranges.

Figure 12. *Participation by middle and high school students in past 7 days in exercise or sports such as basketball, soccer, running, swimming laps, tennis, or fast bicycling (n=781 for Middle School; n=3,120 for High School).*



Source: Harvard Food Frequency Questionnaire

Middle school students were also asked to report the number of sports teams that they participated in regardless of whether they were run by the school or another organization. More than half the students reported playing on one team (61.6 percent) and the rest did not play on any sports teams. These students were also asked if they participated in any other organized physical activities such as dance, gymnastics, or swimming. The majority of the students (60.9 percent) did not participate in any of these type of activities (data not shown).

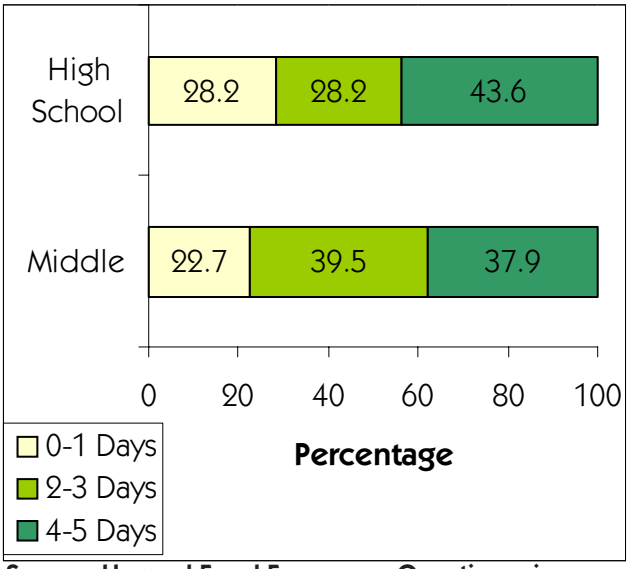
High school students were also asked about participation in sports, but were asked to distinguish between number of sports teams played on that were run by the school and those run by other organizations. A higher percentage of the students indicated playing on teams sponsored by the schools (55.5 percent) than other organizations (44.8 percent). Of the students that played for school teams, 27.1 percent played on one team, 16.2 percent played on two teams, and 12.1 percent played on three or more teams. Of the students who played on teams

sponsored by other organizations, 28.0 percent played on one team, 11.0 percent played on two teams, and 5.8 percent played on three or more teams (data not shown).

Middle school and high school students were also surveyed regarding physical education (PE) classes. ***Figure 13*** graphically demonstrates the number of days students normally attended PE class. In general, more high school students indicated that they attended PE class 4-5 days per week (43.6 percent) whereas more middle school students indicated attending 2-3 days per week (39.5 percent), followed closely by students attending 4-5 days (37.9 percent).

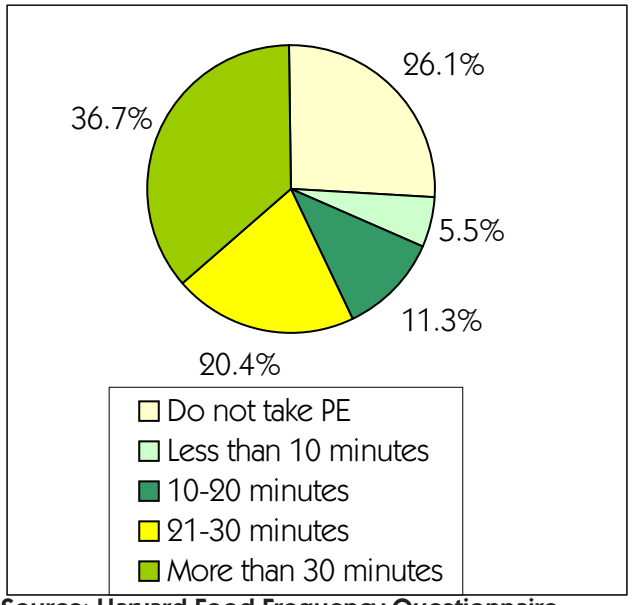
In ***Figure 14***, the amount of time actually spent exercising or playing sports during physical education class is shown. Over one-third of the high school students indicated they spent more than 30 minutes in activity (36.7 percent); one-fifth of the students spent between 21-30 minutes in activity. Approximately one out of every four students indicated that they did not take a PE class (26.1 percent).

Figure 13. *Number of days students attended physical education class in an average school week (n=778 for Middle School; n=3,097 for High School).*



Source: Harvard Food Frequency Questionnaire

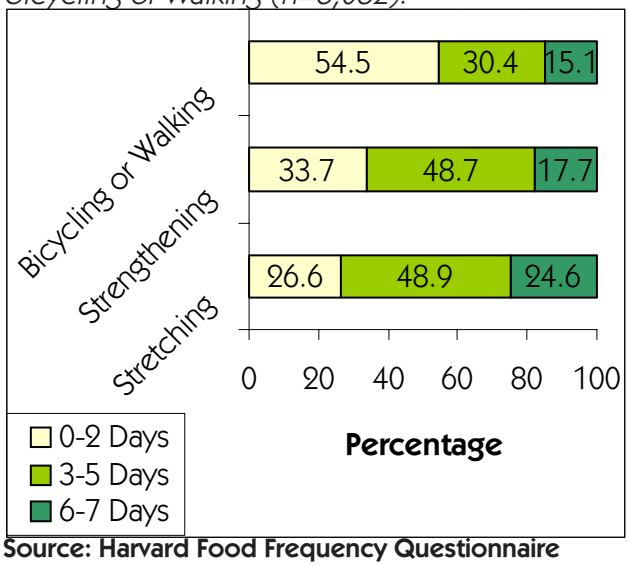
Figure 14. *Time spent by high school students actually exercising or playing sports during physical education class (n=3,081).*



Source: Harvard Food Frequency Questionnaire

Finally, high school students were also asked to indicate the number of days per week they spent on cardiovascular activities such as bicycling or walking, and days spent on strengthening, or stretching exercises. The results indicate that students spent a greater number of days stretching or strength training than on cardiovascular activities.

Figure 15. *Number of days high school students did stretching or strengthening exercises, or moderate cardiovascular exercise such as bicycling or walking (n=3,082).*



Source: Harvard Food Frequency Questionnaire

Discussion of results: This is the second edition of this report, with physical activity results being added in this edition. Many of the same trends reported in the previous school year still hold true in the 2001-2002 school year. Nutrient intake was assessed using the Estimated Average Requirement, the most appropriate measurement to use when assessing the diets of groups of people.

Since milk is the most common food contributing to the intake of many nutrients, focusing interventions with strategies that increase the intake of milk might be particularly effective. The students' intake of folate and zinc were also relatively low compared to the other nutrients. Interventions which encourage the intake of foods high in folate and zinc such as fruits, vegetables, whole grains, beans, and red meats would also be beneficial.

Calcium intake was lower than the intake of any of the other nutrients. It should be noted however that the RDA and EAR are not established for calcium and therefore Adequate Intake (AI) was used as a reference. Due to the limiting nature of using AI in assessing the adequacy of groups, the percent of individuals with intakes less than the AI are reported here but this proportion cannot be interpreted as having "inadequate" intakes. Also, even though students average intake of foods from the Milk Group (major source of calcium) in the Food Guide Pyramid was above the minimum, the recommended number of servings is three for children 9 to 18 years old[1,6]. Therefore, the minimum number of servings on the Food Guide Pyramid does not necessarily assure adequate nutrient intake according to dietary guidelines.

In regard to dietary intake, students, regardless of age or sex, more frequently consumed foods high in fats and sugars than any other food group. Foods from the Milk Food Group were the most frequently consumed at the same level as the Food Guide Pyramid recommendations. Also in regard to foods contributing to various nutrients, milk was the primary food contributing to calories, protein, fat, calcium, and carbohydrates (except for the 14-18 year old children in which soft drinks were the top calorie and carbohydrate contributor). For both males and females of any age group, cold breakfast cereal was the top food contributing to iron in the students' diets. These results indicate that children are not eating enough variety of foods to meet the Food Guide Pyramid recommendations. Interventions should be developed which address this issue and promote a healthy variety of food choices and minimize the consumption of foods high in sugar and fat.

In regard to the anthropometric measurements of the children, there was a statistically significant rise in the percent of students who were overweight in the current school year compared to the 1999-2000 school year. This trend corresponds to national studies, which have shown a continual increase in the number of overweight children and teens over the past two decades[2]. Missouri data also shows a higher prevalence of overweight in the Black and Hispanic populations. These populations have also been shown in a study at the national level to have the fastest growing overweight prevalence rates[3].

In assessing physical activity, several questions were asked in order to evaluate the amount and type of activities the students were involved in. Evidence of inactivity was apparent in the fact that more than half of the students spent more than three hours per day watching television. Also, more than half of the high school students reported spending less than two days per week engaging in moderate cardiovascular activities such as bicycling or walking. In addition, 26 percent of the students reported they were not taking a PE class at the time of the survey. However, there was evidence that many of the students were active on a regular basis.

More than 75 percent of students engaged in sports such as basketball, soccer, running, swimming laps, tennis, or fast bicycling on at least three days out of the week. Also, more than half of them reported playing on a sports team, and for high school students, this was more often on teams sponsored by the school. Approximately 40 percent of the students reported attending PE class 4-5 days out of the typical school week and more than half of the students who attended PE class spent at least 20 minutes actually exercising or playing sports.

It has been recommended that elementary, middle, and high school students engage in physical activity daily from a variety of activities. Adolescents should engage in three or more sessions per week which require at least 20 minutes of moderate to vigorous exertion[4]. It is also recommended that elementary school-age children accumulate at least 30 to 60 minutes of age-appropriate activities on most days of the week (dietary guidelines recommend 60 minutes of moderate physical activity)[5,6]. From the results reported here, the data indicates that the schools, through physical education classes and sports teams that they sponsor, have a great influence on the amount of time students engage in physical activity. Therefore schools have the opportunity, through changes in these programs, to make a difference in reducing the trend toward higher childhood overweight rates.

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