WOMEN'S SPORTS FOUNDATION
equal play.

December 2009

# Her Life Depends On It II

## Sport, Physical Activity, and the Health and Well-Being of American Girls and Women

A Women's Sports Foundation Research Report

WOMEN'S SPORTS FOUNDATION
equal play.


## Women's Sports Foundation Acknowledgments

This report is an update of the original report released in 2004. The overall framework of the original report remains intact here and all credit must be extended to the co-authors of the original report. Those individuals included Don Sabo, Ph.D., Director, Center for Research on Physical Activity, Sport and Health, D'Youville College, Buffalo, NY.; Kathleen E. Miller, Ph.D., Research Scientist, Research Institute on Addictions, State University of New York at Buffalo; Merrill J. Melnick, S.U.N.Y., College at Brockport, Department of Physical Education and Sport; and Leslie Heywood, Ph.D., Professor of English and Cultural Studies, S.U.N.Y.-Binghamton.

The 2009 update was co-authored by Ellen J. Staurowsky, Ed.D., Professor and Graduate Chair, Department of Sport Management and Media, Ithaca College, Ithaca, NY; Kathleen E. Miller Ph.D., Research Scientist, Research Institute on Addictions, University of State University of New York at Buffalo; Sohaila Shakib, Ph.D., Associate Professor and Faculty Athletics Representative, Department of Sociology, California State University-Dominiquez Hills; Mary Jane De Souza, Ph.D., Professor and Co-Director, Women's Health and Exercise Laboratories, The Pennsylvania State University; Gaele Ducher, Ph.D., Research Fellow, Center for Physical Activity and Nutrition Research, Deakin University; Noah Gentner, Ph.D., Assistant Professor, Georgia Southern University; Nancy Theberge, Ph.D., Professor, Departments of Kinesiology and Sociology, University of Waterloo; and Nancy I. Williams, Ph.D., Associated Professor and Co-Director, Women's Health and Exercise Laboratories, The Pennsylvania State University.

The Women's Sports Foundation also thanks its national sponsor, Gatorade, for its corporate leadership in expanding the knowledge base critical to improving the physical, psychological and social well-being of American girls.

## Authors' Acknowledgments

We are grateful to the Women's Sports Foundation for making this report a reality. The guidance, insight, and support of Dr. Don Sabo from proposal throughout project completion has been nothing short of exemplary. A special note of acknowledgement and appreciation is extended, as well, to Dr. Marjorie Snyder of the Women's Sports Foundation for our work. The editorial expertise of Lucy Hadley White, the editorial and graphic skills of Deana Monahan, the research work of Sarah Hurd and Ruth Uselton, and the editorial assistance of Kelley Hubbell are much appreciated. Finally, special thanks to all the researchers who, over time and across a wide variety of disciplines, have contributed to the growing body of knowledge discussed in this report.

Published December 2009, by the Women's Sports Foundation®
Eisenhower Park, East Meadow, NY 11554
Info@WomensSportsFoundation.org
www.WomensSportsFoundation.org


© 2009, Women's Sports Foundation, All Rights Reserved

This report may be downloaded from www.WomensSportsFoundation.org. This report may be reproduced and distributed only in its entirety. Any material taken from this report and published or transmitted in any form, electronic or mechanical, must be properly attributed to *Her Life Depends On It II: Sport, Physical Activity, and the Health and Well-Being of American Girls and Women*, published by the Women's Sports Foundation.



Preferred citation: Staurowsky, E. J., DeSousa, M. J., Ducher, G., Gentner, N., Miller, K. E., Shakib, S., Theberge, N., & Williams, N. (2009). Her Life Depends On It II: Sport, Physical Activity, and the Health and Well-Being of American Girls and Women. East Meadow, NY: Women's Sports Foundation.

## About the Women's Sports Foundation

The Women's Sports Foundation—the leading authority on the participation of women and girls in sports—advocates for equality, educates the public, conducts research, and offers grants to promote sports and physical activity for girls and women.

Founded by Billie Jean King in 1974, the Women's Sports Foundation builds on her legacy as a champion athlete, advocate of social justice, and agent of change. We strive for gender equity and fight discrimination in all aspects of athletics.

Our work shapes public attitude about women's sports and athletes, builds capacities for organizations that get girls active, provides equal opportunities for girls and women, and supports physically and emotionally healthy lifestyles.

The Women's Sports Foundation is recognized worldwide for its leadership, vision, strength, expertise, and influence.

For more information, please call the Women's Sports Foundation at 800.227.3988 or visit www.WomensSportsFoundation.org.

December 2009

# Her Life Depends On It II

## Sport, Physical Activity, and the Health and Well-Being of American Girls and Women

# Her Life Depends On It II:
## Sport, Physical Activity, and the Health and Well-Being of American Girls and Women

## Executive Summary

In 2004, the Women's Sports Foundation published the first edition of *Her Life Depends On It* (Sabo et al.). At that time, it was clear that evidence-based research confirmed that regular physical activity and sport provides the critical foundation, in no small part, that allows girls and women to lead healthy, strong, and fulfilled lives. Now, five years later, *Her Life Depends On It II*, provides an updated, and even more comprehensive, review of the existing research on the links between sports and physical activity and the health and well-being of American girls and women. This expanded review of existing research and health information is co-authored by a team of experts from several related disciplines, including epidemiology, exercise physiology, kinesiology, psychology, and sociology. Some key contributions of this new report include the following:

- Research affirms, even more definitively than five years ago, that engagement in moderate and consistent levels of physical activity and sport for girls and women is essential to good health and well-being.

- Although more research needs to be done, early studies examining the connections between physical activity and academic achievement show there is a positive relationship between the two in girls and women.

- Females from lower economic backgrounds and females of color engage less in physical activity, have less access to sport and physical fitness programs, and suffer negative health consequences as a result.

- Emerging research in prevention and training practices show that gender-conscious approaches to physical training and conditioning for female athletes help to reduce the likelihood of anterior cruciate ligament (ACL) injuries and concussions.

This report could not issue at a more opportune and urgent time. Government leaders, policymakers, and health planners are struggling to reform the health care delivery system, to contain costs, and to initiate preventive strategies. Physical activity is increasingly recognized as a viable strategy for elevating the nation's health. In 1996, on the eve of the Olympic Games in Atlanta, the Surgeon General of the United States released a report on physical activity and health that was described by then United States Secretary of Health and Human Services, Donna Shalala, as representing a "passport to good health for all Americans" (p.3). The Centers for Disease Control and Prevention followed suit that same year, creating a unit designed to promote health through physical activity (Buchner & Schmidt, 2009). In 2004, the World Health Organization (WHO) put forward the Global Strategy on Diet, Physical Activity and Health, the goal of which was to promote and protect the health of the world's citizens by developing enabling environments for sustainable actions at individual, community, national and global levels. Taken together, these efforts were designed to reduce disease and death rates related to unhealthy diet and physical inactivity. Finally, in July of 2009, a national conference

was held in Washington, D.C., to establish the groundwork for America's first National Physical Activity Plan.

*Her Life Depends On It II* documents the important role physical activity can play in helping to prevent the daunting array of health risks for girls and women such as obesity, coronary heart disease, cancer, osteoporosis, Alzheimer's Disease and related dementias, illicit drug use, tobacco-related disease, sexual risk and teen pregnancy, and eating disorders. In addition to documenting the contributions of sport and physical activity to girls' and women's health and well-being, this version of *Her Life Depends On It* provides an overview of emerging research on several health risks that are associated with overtraining and athletic participation, as well as new studies that point to effective strategies designed to prevent injuries from happening.

Within the United States, the Institute of Medicine defined public health as the collective actions undertaken by a society "to assure the conditions for people to be healthy" (Committee for Assuring the Health of the Public in the 21st Century, 2002). The research compiled in our updated report strongly suggests that sport and physical activity provide conditions that help to ensure girls' health and well-being. Some findings identified in this report relate to:

- **Breast Cancer Risk:** Based on the findings from 23 studies examining the effect of moderate and vigorous physical activity during adolescence on cancer risk, those who had the highest physical activity during adolescence and young adulthood were 20% less likely to get breast cancer later in life (Lagerros et al., 2004).

- **Osteoporosis:** A study following pre-pubertal 10-year-old girls for 20 months found that an exercise program (engaged in three times a week for 12 minutes per session) led to an increase in bone mass. This result was not found for the girls who did not participate in the exercise program (MacKelvie et al., 2001; MacKelvie et al., 2002; MacKelvie et al., 2003; MacKelvie et al., 2004).

- **Smoking:** Female athletes who participated on one or two school or community sports teams were significantly less likely to smoke regularly than female non-athletes. Girls on three or more teams were even less likely to smoke regularly (Melnick et al., 2001).

- **Illicit Drug Use:** Two nationwide studies found that female school or community athletes were significantly less likely to use marijuana, cocaine, opiates, tranquilizers, prescription drugs, or "club drugs" like ecstasy or GHB (Ford, 2008; Miller et al, 2000; Pate et al, 2000; Yusko et al., 2008).

- **Sexual Risk:** Female athletes were less likely to have unprotected sex, sex with multiple partners, or sex under the influence of alcohol/drugs (Lehman & Koerner, 2004; Miller et al., 2002).

- **Depression:** Moderate levels of exercise and/or sports activity helped protect girls and women against depression (McKercher et al., 2009; Sanders et al., 2000).

- **Suicide:** Female high school/college athletes were less likely to consider, plan, or attempt suicide (Brown & Blanton, 2002; Brown et al., 2007; Sabo et al, 2005; Taliaferro et al., 2008a.).

- **Educational Gains:** According to Troutman and Dufur (2007), females who participated in high school sports were more likely to complete college than those who did not participate in sports.

The health benefits realized from the participation of girls and women in sport and physical activity vary by socioeconomic level and racial and ethnic group. Throughout the report, available findings document health risks and vulnerabilities for females of color as well as for girls and women living in urban and rural settings. A special addendum to the report is also available that integrates all of the findings related to these populations.

Despite this ever-expanding body of research, in general girls are still not afforded the degree of encouragement or opportunity extended to boys to participate in sports and fitness activities. Impediments to access remain an ongoing concern, complicated by recent trends that run counter to promoting physical activity, fitness, and sport programs in schools and communities. With schools cutting back on recess, a de-emphasis on physical education nationally, and persistent inequalities in school-sport programs and community-recreation programs, girls and women continue to encounter structural barriers to participation (Cheslock, 2007, 2008; Cooky, 2009; NASPE/AMA, 2006; National Federation of State High School Associations, 2008; National Parent Teacher Association, 2006; Sabo & Veliz, 2008).

While the research base illustrates the importance of physical activity in the lives of girls and women, it is also critical to examine a collection of issues related to performance—overtraining, lack of proper conditioning, poor equipment and unsafe facilities—that impact female athlete experience. In this report, we highlight the emerging areas of research that focus on protecting the health of female athletes and offer insights into the initiatives needed (steps that need to be taken) to ensure their health and safety. For example, a small proportion of female athletes may develop three interrelated conditions—eating disorders, amenorrhea, and osteoporosis—otherwise known as The Female Athlete Triad. Other emerging

areas of research focus on female athlete injuries to the head and body, among them tears to the anterior cruciate ligament (ACL) and concussions.

This report's user-friendly format provides a toolbox of information, analysis, and sources for parents interested in the health of their daughters; coaches interested in the well-being of female athletes; media interested in informing readers about strategies to achieve optimal health for females, both young and old, from every sector of society; health consumers; sport leaders and program heads; public health advocates; and public policy makers interested in reducing health care costs while emphasizing prevention and health promotion for female citizens. With increasing specificity and urgency, calls are being sounded across the United States for greater and better opportunities for all Americans to become more physically active. As those calls echo across the land it is imperative that the needs of girls and women be taken into account and met.

# Introduction

For centuries, noted healers and philosophers have expressed the belief that moderate and sustained physical activity over a life span is simply good for the mind, body, and soul. As early as 1859, the first female physician in the United States, Elizabeth Blackwell, wrote in a series of lectures, collected in the book *The Laws of Life, With Special Reference To The Physical Education of Girls*, that the first law of life was the law of exercise. Blackwell argued in compelling language that to neglect the physical education of girls is to rob them of both happiness and a life well lived.

It is salient that 150 years later, momentum is building to reverse this neglect. With obesity continuing to increase within the U.S. population, and health care costs associated with treating preventable diseases rising at alarming rates, the growing consensus that more attention must be paid to encouraging children and adults to become more physically active is influencing the public health agenda in a significant way. While estimates are that as much as 95% of health care spending goes towards medical care and biomedical research, "there is strong evidence that behavior and environment are responsible for over 70% of avoidable mortality … " Some of the most noted authorities on public health, including the Centers for Disease Control and Prevention, the World Health Organization, and the Surgeon General of the United States have called for the development of a National Physical Activity Plan.

As this consensus builds, it is critical that we consider the many ways that physical activity and sport favorably influence the health and well-being of America's girls and women. Getting more girls up and moving through exercise and sport, therefore, makes practical sense as a social and economic investment by the nation. This report discusses a variety of health problems and dangerous substance use for which physical activity and sport have been identified as a preventive factor. In this context, consider the following estimated costs of failing to invest in exercise and sport:

- **Cardiovascular Disease:** The estimated direct and indirect costs of cardiovascular disease and stroke in the United States in 2008 were $475.3 billion (American Stroke Association, 2009; American Heart Association, 2009).
- **Cancer:** The National Institutes of Health estimates the overall cancer-related costs in 2008 were $228.1 billion (National Institutes of Health, 2009).
- **Obesity-Related Diseases:** An increase in physical activity among children and adults would substantially reduce the $90 billion in U.S. health care expenditures spent treating obesity-related diseases (Li-Kelsey et al., 2009).
- **Diabetes:** The estimated cost of diabetes in the United States in 2007 was $174 billion (American Diabetes Association, 2008).

- **Osteoporosis:** Regular exercise beginning in childhood, and carried on through adolescence and young adulthood, helps to prevent osteoporosis. Expenses associated with the care and treatment of patients with osteoporosis and related fractures are estimated at $14 billion per year in the United States. The estimated expenses nationally for osteoporosis and related fractures are $14 billion per year (based on figures from hospitals and nursing homes) (National Institutes of Health, 2009).

- **Alzheimer's Disease:** The current annual cost of caring for persons with Alzheimer's disease is estimated at $148 billion (Alzheimer's Association, 2009).

- **Tobacco Use:** Cigarette smoking caused approximately $193 billion in health-related economic losses each year from 2000 to 2004 according to the Centers for Disease Control and Prevention (2009).

- **Alcohol Use:** The estimated annual cost of alcohol abuse to the U.S. economy in 1998 was $185 billion (Harwood, 2000).

- **Illicit Drug Use:** The estimated annual costs of drug abuse to the U.S. economy in 2002 were $180.8 billion, most of which were associated with drug-related crime (Office of National Drug Control Policy, 2004).

- **Sexually Transmitted Diseases:** In 2007, the Centers for Disease Control and Prevention estimated that nearly 19 million new cases of STDs occur each year and almost half of them infect young people aged 15 to 24. Healthcare costs associated with STDs are estimated to be $15.3 billion each year (Centers for Disease Control, 2008).

- **Teen Pregnancy:** Despite signs that both the rate of teen pregnancy and birth rates in general have declined in the United States since the early 1990s, one in three teenage girls becomes pregnant before they turn 20 years old. In 2004, there were about 420,000 children born to teens. The associated financial liabilities for items such as healthcare, foster care, criminal justice costs, public assistance, and lost tax revenues, are estimated at more than $9.1 billion annually (Hoffman, 2009).

This report is divided into eight sections. Section I focuses on several major diseases of later life for which physical activity in youth is a key preventive factor. Section II examines how sports and exercise influence patterns of substance use among female adolescents. Section III explores ways that athletic participation lowers young women's sexual risks and teen pregnancy rates. Section IV focuses on research of how sports and exercise interface with girls' mental health and psychological well-being. Section V discusses research linking sports, exercise and educational outcomes while Section VI examines patterns and trends in female participation in sports and fitness activities. Section VII provides an overview of

emerging research in three areas: the Female Athlete Triad, female athletes and injuries, and the use of energy drinks by female athletes. And finally, in Section VIII, research that gives voice to the experiences of girls and women as they engage in physical activity and navigate the sport system in the United States is highlighted.

# I. Prevention of Chronic Diseases in Later Life

A growing body of research supports the important public health conclusion that a physically active lifestyle lowers risk for heart disease, certain cancers, obesity, osteoporosis, and Alzheimer's disease. These diseases, which typically become chronic in middle age and among the elderly, are among the leading causes of death for women in the United States. The annual direct and indirect costs of sedentary lifestyles to chronic health conditions are reported to be $150 billion (Pratt, Macera & Wang, 2000). The findings gathered below testify to the fact that a public health strategy that encourages sports and exercise for girls when they are young, and offers real opportunities to stay physically fit, promotes the lifelong health of women.

## Heart Disease

### Background

Cardiovascular heart disease (CVD)—an umbrella term for a number of diseases impacting the heart—is the number-one killer of women. An estimated 41.3 million women have one or more types of cardiovascular disease and African-American women have the highest prevalence of CVD of all women. CVD includes high blood pressure, coronary heart disease (CHD), and stroke (American Heart Association, 2009). Coronary heart disease (where plaque hardens the arteries supplying blood to the heart muscle) causes chest pain and can lead to heart attack (National Heart, Lung and Blood Institute, 2007). The majority of women who experience CHD are post menopausal, and risk for heart attack among women increases with age (Crimmins et al., 2008; Dalleck et al., 2009). There is a general lack of awareness that CHD kills more women alone than all of the various cancers combined, in fact women tend to perceive they have a much lower risk of developing CHD than they actually do (Christian et al., 2007; NHLBI, 2007; Godfrey & Manson, 2008; Herrmann, 2008). This could be due in part to the fact that the bulk of scientific research on CVD after World War II focused on white men. As a result, heart disease came to be regarded falsely as a "man's illness." This, however, is far from the truth. Fewer women than men survive CVD, and more women than men die from a heart attack within the first year of its occurrence (Quinn 2008; American Heart Association, 2009). This gender difference in survival has been attributed to a number of factors including women being diagnosed with CVD at an older age; the presence of more pre-existing conditions among women (e.g., diabetes and hypertension); and women not receiving treatment as aggressive as that given men due to this lack of understanding that women are serious candidates for heart disease (Quinn & King 2005; Travis 2005; Colhoun, 2006; Dracup, 2007; Quinn, 2008). Research also finds that women and men present their symptoms differently; women are less likely to identify their discomfort as "chest pain," describing it in other ways. Clinicians may not recognize that women are having a heart attack, and women may not realize it themselves (Quinn, 2008). There is also some evidence that women are less likely to participate in cardio-rehabilitation programs (Sarrafzadegan et al., 2008). When women do suffer from CHD, they are more likely to report a significant decline in their quality-of-life, both physically and mentally (Norris et al., 2004; Torres et al., 2004; Espnes & Byrne, 2008; Ford et al., 2008; Sarrafzadegan et al., 2008). Women who suffer from CHD are more likely to report more intense feelings of burnout and difficulty coping with stress (Hallman et al., 2003).

- In 2006, 34.9% of all women in the United States had cardiovascular disease. The highest prevalence was among African-American women (45.9%), followed by white women (34.9%) and Mexican American women (32.5%) (American Heart Association, 2009).
- Stroke is the third-leading cause of death in women (Bushnell et al., 2006).
- Each year, 55,000 more women than men have a stroke (American Heart Association, 2009).
- Women with CHD are more likely than men with CHD to report feeling they have health-related

issues that lower quality-of-life. Women reported significantly more physically and mentally unhealthy days than men with CHD (Ford et al., 2008).

- Spanish-speaking Hispanics are significantly less likely to identify symptoms of cardiovascular risk factors than whites, African-Americans, and English-speaking Hispanics (DuBard et al., 2006).
- Estimates are 1 in 4 women die from heart disease, while 1 in 30 die of breast cancer (NHLBI, 2007).
- In 2006, 57% of women recognized heart disease as the leading cause of death among women, however, only 22% perceived it, correctly, as the greatest health threat facing women (Christian et al., 2007).
- According to the Nurses' Health study, 82% of CHD, 74% of CVD events, and more than 90% of diabetes cases in women could be prevented by improving lifestyle factors: not smoking, eating healthily, maintaining a healthy weight, and engaging in regular physical activity (Stampfer et al., 2000) .
- Within one year of their first incident, 42% of women, compared with 24% of men, die of heart attack (Godfrey & Manson, 2008).
- In 2005, 454,600 women died from CVD compared to 409,900 men (American Heart Association, 2009).
- A study of 51 women and 41 men found that women and men experienced and expressed chest pain differently. Women were more likely than men to report chest pain as pressure, throat discomfort, vomiting, and pain in the lower back. Men were also more likely to recognize they were experiencing symptoms of a heart attack than were women (Quinn & King 2005).
- More women than men have diabetes (American Heart Association, 2009).
- Women with diabetes are at much greater risk for heart disease than the non-diabetic population or men with diabetes (Colhoun, 2006).

## Facts and Research Findings

Research shows that physically active women are less likely to suffer from CVD. Physical activity is a lifestyle factor that can reduce many of the risk factors for CVD. While heart attack risk for women increases with age, physical activity throughout the lifespan helps reduce a women's risk for CVD (Crimmins et al., 2008). A physically active lifestyle during youth and early adulthood can help prevent the emergence of chronic disease later in life by establishing behavior patterns that continue into adulthood and keep the individual in better physical shape. Physical activity after menopause is particularly important, as menopause is linked to an increase in a number of risk factors for CVD such as weight gain and increases in blood pressures, lipids, and insulin sensitivity (Dalleck et al., 2009). Physical activity can mitigate these factors as it has been shown to reduce overweight, hypertension, cholesterol, and control diabetes (Kokkinos & Moutsatsos, 2004; Albright & Thompson, 2006; Sarrafzadegan et al., 2008; Dalleck et al., 2009). Overweight, in turn, is associated with three other risk factors: hypertension, cholesterol, and diabetes, therefore physical activity also reduces CVD risk indirectly by reducing overweight (Daubenmier, Ades et al., 2005; Daubenmier et al., 2007; Loomba & Arora, 2009).

Physical activity might directly impact CVD risk, as overweight women experience a decreased CVD risk after exercise, even if they do not lose weight (Weinstein, Sesso et al., 2008). There is also evidence that the more a woman engages in physical activity, the greater the reduction in her cardiovascular risk factors (Dalleck et al., 2009). There is a connection between experiencing stress and CVD, therefore physical activity might also impact CVD risk by releasing stress (Hamer, 2006). While research demonstrates that physical activity is an important

factor in reducing a woman's risk of developing CVD, the majority of women are not meeting the Surgeon General's guidelines and are less physically active than men. Many individuals advised to engage in physical activity after a CVD diagnosis fail to do so (Wofford et al., 2007; American Heart Association, 2009). Physical activity is more important than ever for girls and women now that hormone replacement therapy (HRT) is no longer the standard treatment for lowering women's risk for heart disease, given the evidence from large-scale clinical trials demonstrating that HRT might actually increase risk of coronary events (Barrett-Connor 2006; NHLBI, 2007). With HRT no longer considered the gold standard for treating post-menopausal women for CHD, it is now critical to focus on modifiable lifestyle factors such as physical activity.

- An estimated 12.2% of heart attacks across the globe would be prevented with proper levels of physical activity (American Heart Association, 2009).
- According to the Behavioral Risk Factor Surveillance System study of 120,035 women, 38% had two or more risk factors for CVD (Sundaram et al., 2005).
- Only 33.9% of women, compared with 28.9% of men, regularly engage in physical activity in their leisure time (American Heart Association, 2009).
- According to the 2007 Youth Risk Behavior Surveillance System study, 31.8% of females in grades 9–12, vs. 18% of males, reported they engaged in less than an hour of moderate-to-vigorous physical activity on any day in the previous week (Eaton et al., 2008).
- It is projected that more than 90% of initial heart attacks could be eliminated if the following nine risk factors were controlled through changes in lifestyle: cigarette smoking, abnormal cholesterol levels, hypertension, diabetes, overweight and obesity, sedentary behavior, low fruit and vegetable consumption, excessive alcohol consumption, and psychosocial stressors (Yusuf, Hawken et al., 2004). Physical activity can lower cholesterol, reduce hypertension, and control or eliminate diabetes, as well as reduce stress.
- After considering other CVD risk factors such as smoking, diabetes, hypertension, obesity, cholesterol, alcohol consumption, and psychosocial factors, physical inactivity accounts for approximately 12% of the global burden of myocardial infarctions (Yusuf et al., 2004).
- A review study found that just one hour of walking per week reduces a woman's overall risk of CHD, stroke, and CVD (Oguma & Shinoda-Tagawa, 2004).
- Walking more than one hour per day is associated with greater reductions in body fat and obesity (Hornbuckle et al., 2005).
- The Women's Health Study, a prospective cohort study of 38,987 women who were free of CHD at baseline found that by 10.9 years, women who reported engaging in at least five days of vigorous physical activity for 30 minutes or more per week were at a 31% risk reduction for CHD compared to those who were sedentary. This study also showed that overweight and obese women who exercised reduced their risk of cardiovascular disease compared with women of comparable weight. However, their risk was still higher than women of normal weight who participated in similar amounts of physical exercise (Weinstein et al., 2008).
- Cholesterol is a major risk factor for CHD. In a study of CHD patients enrolled in a lifestyle intervention program, women who increased their exercise levels (engaging in aerobic activity a minimum of twice a week for at least three months) reduced their total cholesterol levels (Weidner, 2007).
- In a large prospective study of women living in Japan, those who reported walking more than one hour a day, or doing sports more than five hours a day, had a 20%–60% risk of mortality from CVD compared with those who only walked one-third of

an hour a day or engaged in sports between one and two hours a week (Noda et al., 2009).

- African-American women have the highest blood pressure rates, the highest levels of obesity, and the lowest levels of physical activity (Sundaram et al., 2005).

- In a study of post-menopausal women (45–75 years old), subjects were assigned moderate intensity exercise five times a week for 12 weeks. One group exercised for 45 minutes and another for 30 minutes. The remaining subjects were assigned to a non-exercise control group. Women in both exercise groups showed improved fitness, weight loss and lower cholesterol levels. However, women who received 45 minutes of exercise showed greater improvements in these areas (Dalleck et al., 2009).

## Cancer

### Background

Cancer (the spread and growth of abnormal cells) is a leading cause of death among women in the United States. Women in Western countries are diagnosed with breast cancer more often than any other female cancer. It is the second-leading cause of cancer-related deaths for women after lung cancer, and is followed by colorectal cancers (American Cancer Society, 2009). There is evidence that women with breast cancer are more likely to develop colorectal cancer (Ochsenkuhn et al., 2005). In 2009, estimates predict there will be approximately 713,220 new cases of female cancer with approximately 269,800 cancer-related deaths among women (American Cancer Society, 2009). While the word "cancer" is terrifying, cancer is the second-most preventable disease next to heart disease (Demark-Wahnefried et al., 2008). Ample evidence suggests that one-third of all cancers are related to preventable lifestyle factors such as overweight and obesity, physical inactivity, and unhealthy eating habits (American Cancer Society, 2009).

Early detection is another factor considered to reduce cancer-related deaths. There is some evidence that men may be screened for colorectal cancer more often than women (Woods et al., 2005). The risk of cancer diagnosis increases with age, so more individuals are at risk for developing cancer as the American population ages. In addition to increasing health care costs, the indirect effects of cancer-related morbidity and mortality are crippling. Therefore, modifying lifestyle factors like physical activity and overweight/obesity, which place women at risk for cancer, are important initiatives for the future.

- Estimates predict that in 2009 there will be 192,370 new cases of breast cancer; 54,090 of colon cancer, and 103,350 of lung cancer (American Cancer Society 2009).

- In 2008, the overall costs of cancer, including health care costs and costs associated with morbidity and mortality, were about $228.1 billion (American Cancer Society, 2009).

- In a study comparing women with breast cancer to those without, women over the age of 65 with breast cancer were more likely to test positive for colorectal adenomas, precursors to colon cancer, than women over the age of 65 without breast cancer (Ochsenkuhn et al., 2005).

- Men are more likely than women to have their colon cancer diagnosed at an earlier stage. In a study of 2,891 colon cancer patients, women were significantly more likely to be diagnosed with Stage II colon cancer while men were more likely to be diagnosed colon cancer at Stage I (Woods et al., 2005).

- Maintaining a healthy weight, increasing physical activity, and consuming smaller portions and more plant foods are recommended for reducing cancer risk (Demark-Wahnefried, Rock et al., 2008).

- There are more than 500,000 cancer deaths in the U.S. annually with one-third attributable to poor diet, overweight and obesity, and a lack of physical activity (Demark-Wahnefried et al., 2008).

## Facts and Research Findings

Physically active women are less likely to develop cancer. Mounting evidence exists that physical activity is associated with a number of cancers common among women (McTiernan, 2008). There is very strong evidence demonstrating that physical activity reduces risk for breast and colon cancer (Harriss et al., 2007; Coyle, 2008; Irwin et al., 2008; Irwin, 2009) as well as re-occurrence and death after a diagnosis (Friedenreich & Cust, 2008; Friedenreich et al., 2008; Holick, 2008; Irwin, 2009). This evidence is stronger for post-menopausal women than pre-menopausal (Monninkhof et al., 2007; Schmidt et al., 2008; Neilson et al., 2009; Shin et al., 2009). However, there is also evidence that physical activity throughout the lifespan, beginning in childhood, is important in lowering cancer risk (Friedenreich, 2004). There is also support, although less consistent, that physical activity can decrease cancers impacting the female reproductive system, such as ovarian and endometrial cancers (Brown et al., 2007; Olsen et al., 2007; Voskuil et al., 2007) and that physical activity is associated with lower lung cancer rates.

- A review of 31 studies found a 12% increase in risk of post-menopausal breast cancer for every 5Kg increase in BMI (Renehan, Tyson et al., 2008).
- A review of 23 studies examining the effect of moderate and vigorous physical activity during adolescence on cancer risk found those who had the highest levels of physical activity during adolescence and young adulthood were 20% less likely to get breast cancer later in life (Lagerros et al., 2004).
- A review of 62 breast cancer studies identified a 25–30% reduction in breast cancer risk for women who were physically active (Friedenreich & Cust 2008; Friedenreich et al., 2008).
- A review of studies examining the relationship between physical activity and lung cancer finds that a reduced risk of cancer is strongly associated with more vigorous levels of physical exercise, particularly for women (Tardon et al., 2005).
- A review of 48 studies of pre- and post-menopausal breast cancer risk found risk reductions of 15–20% for pre-menopausal and 20-80% for post-menopausal women who were physically active. There was also a 6% risk reduction for each additional hour of physical activity per week (Monninkhof et al., 2007).
- The pooled results of 12 studies of the relationship between ovarian cancer and physical activity find a modest inverse relationship between level of physical activity and risk for ovarian cancer (Olsen et al., 2007).
- The Japan Collaborative Cohort Study, which included 30,157 women, ages 40–69, found that the most physically active group (those walking more than an hour per day and exercising more than one hour per week) were less likely to get breast cancer than those who were the least active. These results were found regardless of menopausal status and body mass index (Suzuki et al., 2008).
- In the NIH-AARP Diet and Health Study, 488,720 participants (ages 50–71) were followed for almost 10 years. Women who engaged in exercise and/or sport five or more times per week had a reduced risk of colon cancer compared with those who were sedentary (Howard et al., 2008).
- In the same NIH-AARP Diet and Health study, the most active women (engaged in at least 20 minutes of moderate-intensity exercise per week) had a 13% lower breast cancer risk than the most inactive (Peters et al., 2009).
- In the Breast Cancer Detection Demonstration Project Follow-up Study, 32,269 women were followed for over 10 years. During this time, those post-menopausal women least likely to develop increased cancer risk were those engaged in vigorous activity (Leitzmann et al., 2008).

The mechanism through which physical activity positively impacts breast, colon, lung, endometrial, and ovarian cancers is complex and varies by specific cancer form. Because so many factors are involved, it is difficult to unravel the interconnections between physical activity, hormones, obesity, and nutrition as they affect cancer risk. However, it is clear that hormonal factors play a big role (Coyle, 2008). Increased estrogen levels are associated with greater incidents of breast and endometrial cancers (McTiernan, 2008). Women who experience menarche at an earlier age, first child birth at a later age, and late age of menopause are at higher risk for breast cancer, in part because of increased estrogen exposure (Peters, McTiernan 2008; Neilson et al., 2009; Peters et al., 2009). Individuals who are overweight and obese have higher circulating estrogen. Physical activity is thought to reduce estrogen directly or indirectly by reducing obesity (Harriss et al., 2007; McTiernan, 2008). There is some support for the direct effect of physical activity on breast cancer risk reduction as studies have reported that physical activity reduces breast cancer risk, independent of weight (Schmidt et al., 2008; Shin et al., 2009). However, there is also some evidence that physical activity does not help reduce cancer risk in overweight women (Leitzmann et al., 2008).

In addition to hormonal and weight control factors, physical activity is also thought to reduce colon cancer rates by reducing gastrointestinal transit time (Slattery, 2004; Harriss et al., 2007). While it still stands to reason that sports and exercise are indirectly related to lung cancer through reduction in smoking behavior since sports and fitness practices encourage girls not to start smoking, or among seasoned smokers help them quit (American Cancer Society, 2009), there is evidence that exercise itself might actually contribute directly to the relationship (Tardon et al., 2005).

As the number of women who survive cancer grows, there is an increased focus in the research community on life after cancer. Numerous studies examine the relationship between physical exercise, cancer re-occurrence and long-term survival (Hammer, 2009). These studies find that women who engage in exercise are less likely to have cancer re-occurrence, as well as having higher survival rates than those who do not (Holmes et al., 2005; Lynch et al., 2007; Holick et al., 2008; Schmidt et al., 2008; Hamer et al., 2009; Shin et al., 2009). Physical activity at a moderate intensity shows the most consistent promise of reducing cancer risk. Although women should exercise more after a cancer diagnosis, unfortunately there is evidence that they actually engage in less exercise post-cancer diagnosis. This relationship is particularly strong for women who complain more about fatigue (Biceogo et al., 2008).

- In the Shanghai Breast Cancer Study, 3,458 women with breast cancer were compared with 3,474 matched controls without breast cancer. Physically active women, both post- and pre-menopausal, were at a lower risk for developing breast cancer. This relationship was stronger for post-menopausal than pre-menopausal women (Shin et al., 2009).

- In the MARIE study, a population-based case control study of 3,414 pre- and post-menopausal women (ages 30–49 and 50-plus) with breast cancer, levels of physical activity were compared with 6,4569 controls. Results showed a stronger protective effect of physical activity for post-menopausal women. These effects were independent of body mass index (Schmidt et al., 2008).

- In a prospective cohort study, 1,231 women, ages 20–79 and diagnosed with breast cancer, were followed. Those who engaged in greater levels of physical activity had a significantly lower risk of dying from breast cancer, regardless of their age, stage of disease, and body mass (Holick et al., 2008).

- In a study with 1,996 colorectal cancer survivors, pre- and post-diagnosis physical activity levels were measured. After their diagnosis, 21% fewer cancer patients met recommended physical activity

guidelines than pre-diagnosis. Compared to men, women were less likely to follow the physical activity guidelines (Lynch et al., 2007).

- The Scottish Health Survey studied the impact on mortality of physical activity after a cancer diagnosis. They found that participation in three vigorous sessions of exercise per week, for at least 20 minutes, was associated with lower risk for mortality (Hamer et al., 2009).

- In the Nurses' Health study, a prospective study based on 2,987 female registered nurses, women who walked between three and five hours per week, at a moderate pace, had a reduced risk of breast cancer recurrence (Holmes et al., 2005).

Researchers have examined how exercise helps cancer patients and survivors deal with negative repercussions of the disease by improving aspects of the person's quality of life (McNeely et al., 2006; Bicego et al., 2008). There is some evidence that female cancer survivors fare worse than males on quality-of-life measures and physical functioning (Phipps et al., 2006; Finnegan et al., 2007; Lynch et al., 2008; Giesinger et al., 2009). Cancer can create physical and psychological problems that continue for years after diagnosis and treatment (Giesinger et al., 2009), some of which, like obesity, are thought to contribute to disease re-occurrence (Kim et al., 2009). Many survivors have lowered physical functioning, increased muscle weakness and atrophy, pain, difficulty sleeping, and increased weight gain, conditions often associated with some of the cancer treatments. However cancer fatigue (a sense of persistent tiredness that interferes with usual functioning), the most common symptom, experienced by 70–100% of all cancer patients, can be ameliorated through exercise (Courneya et al., 2005; Kirshbaum 2006; Luctkar-Flude et al., 2007).

Physical exercise can preserve treatment-related losses in cardiopulmonary function (fitness), increase muscle and bone strength, reduce weight gain, and help to combat fatigue (Pinto et al., 2008; Winter-Stone et al., 2008; Kim et al., 2009). Cancer patients also experience a number of psychological and social stressors associated with fear of disease re-occurrence and death (Basen-Engquist et al., 2008; Everdingen et al., 2008), increased depression, and decreased social and interpersonal functioning (Kirshbaum, 2006; Luctkar-Flude et al., 2007). In general, there is strong evidence demonstrating that exercise has a positive impact on physical and psycho-social functioning in cancer patients and survivors, regardless of age (Luctkar-Flude et al., 2007; Bicego et al., 2008). Although there is strong evidence that demonstrates the importance of exercise in improving physical and psycho-social functioning, there is also evidence that the majority of cancer survivors are not meeting recommended guidelines for physical activity (Lynch et al., 2007; Basen-Engquist et al., 2008; Coups et al., 2009).

- In a study comparing colorectal cancer survivors with the general population, colorectal cancer survivors reported lower physical, social role, and emotional functioning, as well as higher levels of fatigue and pain. In a comparison of men and women with colorectal cancer, the majority of men reported a better quality of life, including better emotional and cognitive functioning with less financial impact (Giesingerr et al., 2009).

- For a study of long-term colon cancer survivors, research subjects evaluated their health, functional status, and quality of life. The majority reported lack of energy, pain, and emotional problems associated with colon cancer. Distress about future diagnostic tests and the spread of cancer was highly ranked (Phipps et al., 2006).

- In a prospective study of 136 breast cancer survivors, more than one-half of the sample experienced moderate-to-high levels of disease-recurrence fear and increased anxiety levels (Everdingen et al., 2008).

- In review of previous studies that examined the impact of exercise on the quality of life in older

cancer patients (age 65 and older) during and after treatment, aerobic exercises such as moderate walking and strength training were associated with a reduction in fatigue, improved sleep, improved physical functioning, and greater sense of well-being (Luctkar-Flude et al., 2007).

In a study following the progress of 374 breast cancer survivors, diagnosed at age 40 or younger, for approximately 10 years post-diagnosis, those who exercised more after diagnosis scored higher in physical-health functioning and general health, and reported experiencing less bodily pain (Kendall et al., 2005).

In a study examining physical activity in a sample of breast cancer survivors, those who expended more energy at higher intensities (without excessive strain) demonstrated improved physical functioning, better general health, and lower levels of pain and depression (Basen-Engquist et al., 2008). A review of 33 experimental studies of the impact of exercise programs on participants diagnosed with cancer demonstrated strong evidence that physical function improves with exercise (Stevinson et al., 2004).

In a review of 29 studies examining the relationship between physical activity and indicators of quality of life it wasfound that breast cancer patients engaging in aerobic exercises, such as walking at moderate intensities, reported improvements in their quality of life, their sleep and their feelings of self-esteem, as well as reporting less weight gain (Kirshbaum 2006).

In a review study of the effectiveness of 10 aerobic exercise interventions for women receiving cancer therapy, weekly exercise sessions of 2–5 and 30–40 minutes over 6–26 weeks were shown to have a moderate-to-large effect on fitness and lean body mass (Kim et al., 2009). A study examining the relationship between physical activity and quality of life for people with colorectal cancer 6, 12, and 24 months after diagnosis found that participants who achieved at least 150 minutes of physical activity per week had 18% higher quality-of-life scores (comprised of measures of physical, social and emotional well-being) than those who reported engaging in no physical activity (Lynch et al., 2008).

- In a study of 47 breast cancer survivors, higher fatigue was associated with lower physical activity, increased body fat, and poorer lower-extremity strength (Winters-Stone et al.,2008).

## Obesity and Overweight

### Background

Obesity and overweight (weight ranges associated with increased heath problems) are leading preventable causes of mortality and morbidity among women (Centers for Disease Control and Prevention, 2009); NaPier et al. 2005; Redinger, 2008). Overweight leads to metabolic syndrome, a group of conditions known to increase risk of cardiovascular disease (CVD), high blood pressure, Type II diabetes, and/or cholesterol problems (Gaal et al. 2006; Gill & Malkova, 2006; Dugan, 2008). In addition, overweight leads to a number of other serious conditions including a number of cancers and an overall poorer quality of life with markedly lower levels of physical functioning (Swallen et al. 2005; Leon-Munoz et al. 2005; Lee et al. 2006; Heim et al. 2008; Shiri et al. 2008).

Over the past 30 years, obesity and overweight has reached epidemic proportions worldwide, contributing to an estimated 300,000–400,000 premature deaths in the U.S. annually and creating tremendous medical and health-care costs (Wyatt et al. 2006; Li et al. 2009). In general, women of all ages, around the world, are more likely to be overweight than men (Haslam et al. 2005). Although a global problem, the highest levels of obesity and overweight are identified in the Western developed nations which are characterized by more sedentary lifestyles (Redinger, 2008). The United States has higher numbers of overweight and obese children, adolescents, and adults than most of the world, who, as a result of overweight also suffer from co-morbidities (Janssen et al. 2005). Since the late 70s, the average weight of the U.S. population has

increased so that all people, including children, are now heavier than their counterparts were in prior decades and the heaviest have become even heavier (Ogden et al., 2006; Ogden et al., 2007). While overweight and obesity have increased among all sectors of the U.S. population, lower socioeconomic groups (Liy et al., 2009; Scharoun-Lee et al., 2009), and African-American and Mexican American girls and women are at increased risk in comparison to white females (Ogden et al., 2007; Franzini et al., 2009; Robinson et al., 2009; Sinha & King 2009). Particularly disturbing is that the rise in overweight and obesity among young children and adolescents is paralleled by extremely large, unprecedented increases in Type II diabetes among these groups (Moore et al., 2008). Because the length of time an individual is overweight or obese increases that person's mortality risk, researchers project that the youth today will face shorter life spans than their parents if steps are not taken to reverse this growing problem (Haslam et al., 2005; NaPier et al., 2005; Atlantis et al., 2006; Hills et al., 2007).

- One-third of adults in the United States, more than 72 million people, were considered obese in 2009 (Centers for Disease Control and Prevention, 2009). This includes 35.3% of all women and 33.3% of all men (Ogden et al., 2007).
- In the United States, 66% of adults are overweight or obese (Ogden et al., 2007).
- Living in the United States longer than 10 years is associated with a higher chance of being overweight and obese (Goel et al., 2004).
- Overweight and obesity rates tend to be higher in rural areas than urban areas of the United States. (Joens-Matre et al., 2008).
- Obesity is responsible for more than $90 billion in annual medical costs (Li et al., 2009).
- A comparison of teen girls found that 27.7% of black girls and 14.5% of white girls were obese (Ogden, 2009).
- Waist circumference is strongly related to heart attack risk. The risk of heart attack increases with increasing waist-to-hip ratio values. In a study with 27,000 participants in 52 countries, individuals with the highest waist-to-hip ratios had a 24.3% risk of having a heart attack while individuals with the lowest waist-to-hip ratios only had a 7.7% risk of having a heart attack (Yusuf et al., 2004).
- Data from the Nurses Health Study found that women and men identified as obese were 20 times more likely to develop diabetes, 2 times as likely to develop heart disease or stroke, 2.5 times more likely to develop hypertension, and 1.5 times more likely to develop colon cancer (Field et al., 2001).
- The prevalence of diabetes, across all age groups around the world, is expected to rise to 366 million cases in 2030 if levels of obesity remain constant (Wild et al., 2004).
- Of women age 40–59 years, 53% of African-American, 51% of Hispanic and 39% of white women are obese (Ogden et al., 2007).
- In the late '80s, 7.2% of 2- to 5-year-olds, 11% of 6- to 11-year-olds, and 17% of 12- to 19-year-olds were overweight or obese compared with 13.9%, 19%, and 17% respectively in 2004 (Centers for Disease Control and Prevention, 2009).
- The prevalence of overweight among girls ages 12 to 19 has gone from 13.8% in 1999 to 16.0% in 2004 (Ogden et al., 2006).
- Overweight or obese individuals are more likely to suffer from osteoarthritis, lower back pain, sleep apnea, asthma, polycystic ovary disease, eclampsia pregnancy, nonalcoholic fatty liver disease, and certain cancers (Redinger, 2008).

## Facts and Research Findings

Physical activity and dietary factors can cure most overweight and obesity, leading to improved health for girls and women (Hills et al., 2007). Overweight

and obesity are caused by an imbalance between the food an individual consumes and the energy they expend in physical activity. While the causes of obesity can involve complex biological and social factors, the widespread increase in the number of overweight and obese individuals is due primarily to environmental and lifestyle changes (increased access to technology, computers, machinery and labor-saving devices) leading to more sedentary behaviors (lower occupational activity levels and less activity during leisure time) that researchers refer to as "obesogenic lifestyles" (Janiszewsk & Ross, 2007; Wareham, 2007; Joens-Matre et al., 2008; Brock et al., 2009).

There is evidence certain environmental factors that lead to more sedentary behaviors are associated with increased obesity. Obesity is linked to living in pedestrian-unfriendly neighborhoods, watching TV, playing video games, using the computer, and perceiving one's neighborhood as unsafe (Velde et al., 2007; Wareham, 2007; Grafova, 2008; Franzinit et al., 2009). Studies show that the more physically active an individual, the less likely it is she will become overweight and that physical activity is crucial in preventing weight gain throughout the lifespan (Bensimhon et al., 2006; Janiszewsk & Ross, 2007). Those who are more sedentary tend to be more overweight, less physically active, and less fit (Ball (Marshall et al., 2004; Stettler et al., 2004; Ball et al., 2005; Stovitz et al., 2008). There is evidence that girls who are more sedentary are more likely to be overweight than boys who are sedentary (Velde et al., 2007).

In general, women and girls are less physically active than men and boys (Nader et al., 2008; Stovitz et al., 2008) and researchers see both a reduction in physical activity and an increase in overweight and obesity around the time of puberty (Ness et al., 2007). There is a growing interest among obesity researchers in physical activity patterns developed during the preschool years. The prevalence of obesity has tripled for preschool children over the past thirty years and it is clear that even preschool children are not immune from an "obesogenic lifestyle" (Floriani & Kennedy, 2007). There is evidence that later obesity is associated with increases in weight between the ages of three and six. Researchers believe that the timing of weight gain in preschool children could program the body towards later obesity therefore increasing physical activity levels among preschoolers is of particular concern (Hills, et al., 2007).

There is overwhelming evidence that physical activity reduces overweight and obesity and therefore the risk for diseases associated with overweight and obesity (Lambers et al., 2008; Fletcher et al., 2009; Lee et al., 2009). Even if overweight and obese individuals do not lose weight, moderate-to-high levels of fitness significantly reduce CVD and cancer risks in these individuals, but do not completely eliminate them (Gill & Malkova, 2006; Lee et al., 2009). Therefore, researchers argue that, although weight loss and exercise combined are the best tools for combating mortality and morbidity associated with overweight and obesity, exercise—independent of weight loss—is still important (Janiszewsk & Ross, 2007). In addition to improving cardiovascular risk factors and other risk factors for chronic disease, physical activity among overweight or obese individuals has been shown to enhance quality of life by improving physical functioning, general health, and vitality (Lee et al., 2006).

While the Surgeon General recommends that children and adolescents get 60 minutes of vigorous physical exercise per day, most do not. In fact, adolescent girls fail to meet these guidelines earlier in the lifespan than adolescent boys becoming sedentary at earlier ages (Nader et al., 2008). While physical activity is extremely beneficial in weight reduction and the prevention of weight gain, studies show "diet plus exercise" is best for maintaining weight loss and for preventing long-term overweight and obesity (Bensimhon et al. 2006; Brown & Summerbell, 2008; Dugan, 2008). While physical activity throughout the lifespan, starting as early as the preschool years, is important in preventing later obesity, today fewer

schools offer physical education programs (Brown & Summerbell, 2008).

- In a study of students in the grades 6, 8 and 11, those with low levels of physical activity were three times more likely to be positive for metabolic syndrome than those students who were more likely to be physically active. Students who were the least physically active were 2.4 times more likely to be overweight than those who reported greater levels of physical activity (Moore et al., 2008).
- The greater the level of physical activity among high school girls, the greater the impact on healthy body mass indices. Of high school girls who played on three or more athletic teams, 80% had a healthy BMI compared to 75% of moderately involved athletes and 60% of non-athletes (Sabo & Velez, 2008).
- States with the highest levels of inactivity are also those with the highest levels of obesity (Brock et al., 2009).
- According to Sabo and Velez (2008), fewer female athletes in grades three to eight watched 21 or more hours of TV during the week than did non-athletes.
- Hispanic girls at risk for being overweight reported significantly fewer sessions of moderate physical activity, less involvement with team sports, and more time spent watching TV (Stovitz et al., 2008).
- In a longitudinal study of physical activity among low-income youth ages 9–12, girls engaged in less moderate-to-vigorous physical activity than boys. By age 13 girls failed to meet the recommended 60 minutes of moderate-to-vigorous physical activity per day (Nader et al., 2008).
- In a study of girls, ages 6 to 10, those who were more physically active were less likely to be overweight and more likely to be fit (Ball et al., 2005).
- In a study of 650 fifth-grade children and their primary caregivers, those youth who were overweight or obese reported living in less safe neighborhoods and were less likely to be physically active (Franzini et al., 2009).
- A 10-month nutrition and physical-activity intervention with obese African-American children ages 2–19, consisting of 60 minutes of cardiovascular activities and 30 minutes of toning exercises twice a week, was successful in decreasing overweight among these youth (Fletcher et al., 2009).
- In a study of 11-year-olds from nine European countries, girls who were sedentary (spent more time watching TV and using the computer) were more likely to be overweight (Velde et al., 2007).
- In a longitudinal study of 12-year-old children, girls were found to be less physically active than boys. Going through puberty was associated with increases in obesity among girls. Those children who were engaged in more moderate-to-vigorous physical activity were less likely to be obese (Ness et al., 2007).
- Based upon the pooled results of 14 studies examining the effects of exercise on treating overweight children and adolescents, 155–180 minutes of aerobic exercise per week, at moderate-to-high intensities, effectively reduces body fat in overweight or obese children and adolescents (Atlantis et al., 2006).

- A study of 619 Asian-American and 1,385 Hispanic adolescents in Southern California examined the association between acculturation and certain obesity-related behaviors (i.e., physical activity levels and fast-food consumption). Respondents completed surveys in both the 6th and the 7th grade, revealing that in 6th grade, acculturation impacted physical activity participation while in 7th grade, there was a higher frequency of fast-food consumption. The findings suggest that health promotion programs are needed to encourage physical activity and healthy diets among students whose families are going through the acculturation process (Unger et al., 2004).

## Osteoporosis

### Background

Osteoporosis (the excessive loss and deterioration of bone mass) and osteopenia (low bone mass predicting osteoporosis in the next 10 years) are serious public health concerns, particularly for women (Eng et al., 2008) (Beaudoin & Blum, 2005; Rittweger, 2006). Osteoporosis is chronic degenerative disease shaped by physical activity and nutrition habits during childhood and adolescents. It begins in young adulthood and accelerates after menopause and typically develops fully in older age (Kanis et al., 2008). Osteoporosis and low bone mass affect more than 44 million Americans (National Osteoporosis Foundation, 2009) and 80% of those individuals are women (Beaudoin & Blum, 2005). Excessive bone loss among those affected results in increased fractures, which in turn have a severe impact on quality of life (Gunendi et al., 2008). Fractures often lead to institutionalization as well as increasing morbidity and mortality (Zigmond et al., 2004; Lim et al., 2004).

The majority of women currently affected are white. However cases among Hispanic women are increasing compared with past decades. While fewer African-American women have osteoporosis, when they do have it, they are the least likely of these three groups to obtain adequate treatment (Pothiwala et al., 2006). As the population in the United States grows to 80 million by 2050 and continues to age, and children and adolescents become more and more sedentary, cases of osteoporosis will continue to increase, creating an even greater economic burden than we bear now.

- More than 10 million people have osteoporosis and another 34 million suffer from low bone mass (National Osteoporosis Foundation, 2009).
- Worldwide, 200 million people are estimated to have osteoporosis and the majority are women (National Osteoporosis Foundation, 2009).
- A study of prevalence of osteoporosis and osteopenia in suburban U.S. areas found that 25% of the female sample had low bone mass (Gueldner et al., 2008).
- Women over 50 years old are three times more likely to have osteoporosis than men (Kanis et al., 2008).
- Estimates are that 6% of men and 21% of women age 50–84 have osteoporosis (Kanis et al., 2008).
- Since the 1980s, the number of Hispanic women diagnosed with hip fractures has almost doubled in California, the state with the highest number of Hispanic residents (Zingmond et al., 2004).
- The mortality rates for women over 50 years old with osteoporotic fractures is about 50% greater than for women without those fractures (Hasserius et al., 2005).
- Approximately 20% of hip-fracture patients older than 50 die within one year of their fracture (National Institutes of Health Consensus Development Panel, 2001).
- In the U.S. and Europe, approximately 30% of post-menopausal women have osteoporosis. Over 40% of these women will have at least one fracture over their lifetime (Gunendi, et al., 2008).

- One-half of all women and one-third of all of men will experience a fracture in their lifetime (Karlsson et al., 2008).

- Half-a-million hospital admissions are related to osteoporosis. The direct care of fractures is estimated to cost $18 billion annually (Tosteson & Hammond, 2002).

## Facts and Research Findings

The importance of lifestyle factors in preventing osteoporosis cannot be underestimated. Osteoporosis is caused by inadequate accumulation of bone mass before skeletal maturity or the excessive loss of bone during aging (Borer, 2005). Physical activity and healthy nutrition improve bone mass throughout the lifecycle. They prevent osteoporosis by stimulating bone formation, strengthening muscles, and improving balance, all factors associated with reduced fracture rates (Borer 2005; Gunendi et al., 2008). The most critical time for developing bone mass occurs during growth when hormone levels allow for the accrual of peak bone mass (maximum skeletal strength) (Karlsson et al., 2008). Children and adolescents who are physically active and nutritionally healthy demonstrate higher levels of peak bone mass and a lower risk for developing osteoporosis later in life.

When women reach their 30s, slow declining hormones mirror slower declining bone mass. Once women reach menopause, which is characterized by a rapid decline in hormone levels, bone mass begins to decline sharply (Benton & White, 2006). Physical activity and proper nutrition has been shown to decelerate bone loss during these times (Bellew & Gehrig, 2006; Kemmler et al., 2007).

Physical activity is more important than ever as hormone replacement therapy, once considered the optimum treatment for hormone loss, is now deemed more risky than beneficial (Azoulay, 2004; Benton & White 2006). However researchers also caution that excessive exercise or athletic training can induce amenorrhea (the loss of menstrual periods or having fewer than two over the course of 12-months) (Borer, 2005). Amenorrhea is of major concern because the reduction in hormones leads to bone loss similar to that found in post-menopausal women. The Female Athlete Triad is a syndrome that includes three interrelated health conditions that female athletes may experience: energy deficit and eating disorders; menstrual disturbances and amenorrhea; and bone loss and osteoporosis. (More information on the important connections between Osteoporosis and The Female Athlete Triad can be found in the report section entitled “The Female Athlete,” which starts on page 66 in the Emerging Research section.)

- Girls have about 83% of their bone mass by the age of 12 (Borer, 2005).

- By age 20, the average women has attained 98% of her skeletal mass (Beaudoin & Blum, 2005). This can be accelerated with physical activity during childhood and adolescence (Bellew & Gehrig, 2006).

- Increases in fall and fracture rates among post-menopausal women are thought to be due to impaired balance associated with estrogen withdrawal and the speed at which the brain processes information (Gueldner et al., 2008). Physical activity increasing balance and strength will therefore decrease risk for falls.

- Less-physically-active patients with osteoporosis, who have poor balance, are also more likely to have a fracture (Lee et al., 2002).

- A study of 25,000 women, ages 50–80, found a significant increased risk for breast cancer and myocardial infarction for women taking hormone replacement therapy (Kuller, 2003). Given that hormone replacement therapy has greater risks than previously realized, physical activity is more important than ever as a way to improve bone health.

- A study comparing post-menopausal women enrolled in a multipurpose exercise training program

(endurance, strength training, and jumping) with others not enrolled in the program, found that the bone density of those enrolled in the program stabilized while those in the non-exercise group lost bone mass (Kemmler et al., 2004a; Kemmler et al., 2004b; Kemmler et al., 2007).

- Post-menopausal women with osteopenia and osteoporosis who walked at their target heart rate for one hour a day for at least four days a week, over a 12-month period, sustained bone mass while study participants assigned to a non-walking group lost bone mass (Yamazki et al., 2004).

- A study found that post-menopausal women who walked at least four hours per week had a 41% lower risk of hip fracture when compared to those walking less than one hour per week (Feskanich et al., 2002).

- In a study following pre-pubertal 10-year-old girls for 20 months, it was found that an exercise program lasting for 12 minutes, three times per week, led to an increase in bone mass. This was not found in girls who did not participate in the exercise program (MacKelvie et al., 2001; MacKelvi et al., 2002; MacKelvie et al., 2003; MacKelvie et al., 2004).

- A study that compared the bone density of elite, college-aged gymnasts, who had practiced since youth, with the bone density of young women who just engaged in leisure activities, confirmed that the bone density of the gymnasts was significantly higher (Bareither et al., 2008).

- When the bone mass of female gymnasts was compared to that of children in the regular student population, it was found that the female gymnasts had 21% higher bone mass than the non-gymnasts (Ward et al., 2005).

- A study comparing female former gymnasts with non-gymnasts found that the former gymnasts had higher bone density than the non-gymnasts. This demonstrates that bone mass acquired earlier in life is sustained later in life (Kudlac et al., 2004).

The kind of exercise that one engages in makes a difference. Aerobic activity, because of its intensity, and weight-bearing activities that load multiple sites of the body, are ideal for preventing osteoporosis. Sports that involve high ground reaction force (GRF) such as gymnastics, tennis, squash, and running are shown to create higher bone density than sports that do not present unusual loading patterns like swimming and cycling (Hind, 2007). It is important to load a variety of bones when engaging in physical activity. Studies indicate that the areas of the bone that are directly loaded show the greatest increases in bone mass (Karlsson et al., 2008). Whole body vibration, which involves standing on a platform that vibrates, has recently been shown to be effective in loading muscles and increasing bone density (Cardinale & Wakeling, 2005). In addition to loading patterns, exercise intensity is important for bone mass. Exercises with higher intensities tended to produce better bone mass results (Kemmler et al., 2007).

- In a study of female athletes ages 10–17, elite swimmers had significantly lower bone density than those who played soccer (Bellew & Gehrig, 2006).

- In a study comparing bone accrual in girls who were gymnasts with those who were not, differences in bone density between the two groups were found only in those bones directly loaded during gymnastic activity (Gero et al., 2005).

- In comparing the dominant and non-dominant arms of girls who play tennis, higher bone density was found in the dominant arm (Bass et al., 2002).

- Improvements in the bone mass of post-menopausal women were found after six months of whole body vibration, experienced over three, 30-minute sessions per week (Verschueren et al., 2004).

- When scientists had two groups of post-menopausal women perform the same resistive exercises at different intensity levels, it was found that those who performed those exercises at the higher intensities maintained their bone mass, while women in the other group lost bone mass (Stemgel et al., 2005).

Since osteoporosis is preventable, osteoporosis education should begin during childhood and continue through the lifecycle. Studies show that while many girls and women have some idea what osteoporosis is, many do not know how to prevent it (Anferson et al., 2005) (Reventlow, 2007). Ironically, many women with osteoporosis are afraid of physical activity for fear of suffering a fracture. (Mayoux-Benhamou et al., 2005). Therefore, osteoporosis education is as critical as osteoporosis screening.

- When post-menopausal women with low bone mass attended a one-day education session about the importance of exercise in preventing further bone loss, they were more likely to exercise as they were followed over an 18-month study (Mayoux-Benhamou et al., 2005).

- In a study interviewing women in their 60s, those who had bone scans indicating a higher risk for osteoporosis were more likely to decrease physical activity out of fear of falling (Reventlow, 2007). This illustrates why women need to learn that exercise actually improves balance and decreases their risk of falling.

- In a study of adolescent females 12–16 years old, girls knew that physical activity could strengthen bones however they were unable to correctly identify what kind of physical activities were beneficial. Also, a large number did not know that severe dieting, excessive exercise, and irregular menstrual cycles harmed bones (Anferson et al., 2005).

## Alzheimer's Disease and Related Dementias

### Background

Dementia and other forms of cognitive decline associated with aging are increasing problems for women. Because statistically women outlive men, they are twice as likely to develop dementia (Lindsay et al., 2004). Women are also more likely than men to be caregivers to those suffering cognitive decline (Yee & Schulz 2000). As such, more women than men experience stress and other adverse effects associated with the burden of caring for elders with dementia(Lindsay et al.,2004; Steinberg et al.,2008).

Dementia is characterized by a decline in memory and cognitive function severe enough to interfere with activities of daily living (Podewils et al., 2005; Woodhead et al., 2005; Barnes et al., 2007). Alzheimer's disease (AD) is the most common form, accounting for 30–70% of all dementia (Regan et al., 2005). AD is a chronic disease characterized by progressive cognitive and physical decline, functional impairment and neuropsychiatric symptoms (Rolland et al., 2007; Steinberg et al., 2008). It is the leading cause of death among the elderly (Perez & Carral, 2008). Older populations may also suffer from other forms of dementia or a condition known as " Cognitive Impairment Not Dementia" which affects about 16.8% of those age 65 years or older (Lindsay et al., 2004).

The prevalence of dementia rises dramatically with age, with nearly 35% of those age 85 years or older being diagnosed with some form of dementia (Lindsay et al., 2004). Currently the cost of caring for people with dementia is estimated at $100 billion in the United States alone (Boustani et al., 2003). These numbers are only expected to increase as the baby boom generation ages and their life expectancy increases (Lindsay et al., 2002; Regan et al., 2005).

Finding non-invasive and inexpensive ways to ameliorate or prevent dementia and other forms of cognitive decline is an important public health priority (Podewils, et al., 2005). Physical activity is one promising approach for ameliorating the negative

effects of dementia. Interestingly, many risk factors associated with inactivity have also been identified as risk factors for dementia later in life. These include cardiovascular disease (CVD), diabetes (Peila et al., 2002), hypertension, and obesity (Barnes, et al., 2007; Szekely, et al., 2007).

Physical activity lowers CVD risk and obesity and also increases "good" cholesterol and glucose tolerance, all of which are related to cognitive function. Studies show that countries with higher fat consumption levels have higher rates of dementia (Heyn et al., 2004).

A study of Kaiser members who were obese or overweight at 40–45 years old showed that they were more likely to develop dementia later in life compared with those who were normal weight. In fact, the risk for dementia increased 60–70% among men who weighed the most (Whitmer et al., 2005a; Whitmer et al., 2005b).

Adults who had better subjective and objective measures of cardiovascular fitness at age 55 years or older experienced less cognitive decline on tests of attention and executive function (Barnes et al., 2003).

## Facts and Research Findings

Simply being physically active earlier in life has been associated with reduced risk for developing dementia (Peila et al., 2002). Studies show that people who maintain good overall physical health have less cognitive decline relative to their age (Kramer & Willis, 2003; Kramer & Erickson, 2007). Being physical active is associated with reduced risk for dementia, AD, and cognitive decline later in life. While the physical activity measures varied across studies, it was found that, in general, the more physically active, the more likely a person would not experience cognitive decline later on in their life.

- The Canadian Study of Health and Aging found that individuals 65 or older were less likely to have AD five years later if they engaged in regular physical activity. Their risk of developing AD was reduced by 31% (Lindsay et al., 2002; Lindsay et al., 2004).
- When Swedish twin pairs, 65 years or older and discordant for dementia, participated in a population study, researchers found that those who engaged in light and regular exercise at midlife had a reduced risk for AD 31 years later when compared with those who did not exercise (Andel et al., 2008).
- A prospective longitudinal study found that if people 65 years or older engaged in physical activity three or more times per week, they were less likely to develop dementia six years later. This translated into a 32% risk reduction in dementia (Larson, 2006).
- Individuals 65 years or older who had the most physically active lifestyles also had the lowest risk of developing dementia, AD, and vascular dementia according to a prospective longitudinal study (Podewils et al., 2005).
- Another prospective longitudinal study found physical activity was associated with a 62% reduction in risk for AD later in life (Rovio et al., 2005).
- Older women who reported getting more exercise in terms of number of blocks walked, sports, and calories exerted in routine activities at baseline were less likely to experience cognitive decline six–eight years later, according to a prospective longitudinal study (Yaffee et al., 2001).
- A prospective longitudinal study of older Japanese men who walked over two miles a day at baseline were less likely to develop dementia than those who walked only a quarter of a mile. (Abbott et al., 2004).
- Walking distance and speed were associated with a reduced risk for dementia 4.7 years after baseline among older individuals ages 71–93 years old (Abbott et al., 2004).

- A longitudinal population study in Stockholm found that risk of developing dementia was lower in the physically active group when compared with a group that was not physically active (Karp et al., 2006).

- In the Canadian Study of Health and Aging, physical activity at baseline among elderly individuals without dementia was associated with a 42% reduction in the odds of cognitive impairment, a 50% reduction in AD, and a 37% reduction in dementia of any type (Laurin et al., 2001).

- A prospective longitudinal population based study found that people who were more physically active (walking, hiking, bicycling, swimming) at baseline had a reduced risk for developing AD when measured again 6.2 years later. More specifically, those who exercised more than three times per week were 34% less likely to be diagnosed with dementia than those who exercised less (Larson, 2006).

- Individuals age 55 years and older who provided objective and subjective or self-reported measures of cardiovascular fitness performed better on cognitive tests measuring executive control, attention, verbal memory, and fluency at six-year follow-up. This association was stronger for objective measures of fitness than the subjective ones (Barnes et al., 2003).

Physical activity can help combat physical disability associated with cognitive decline (Teri et al., 2008). People who suffer from AD tend to lose bodyweight and muscle mass due to metabolic changes occurring in the body, rendering them far less able to perform tasks related to daily living as well as less socially and mentally stimulated (Perez & Carral, 2008). Exercise benefits people with AD by building back strength which in turn increases their functional independence. Numerous studies demonstrate the feasibility of exercise programs for those with dementia.

- In a study of patients with AD, those who implemented a comprehensive, care-giver-delivered, home-based exercise program consisting of aerobic fitness, strength training, balance, and flexibility, demonstrated improved hand function and lower-extremity strength (Steinberg et al., 2008).

- In a study of nursing home patients with AD, those who engaged in physical exercise demonstrated less functional decline ((Rolland et al., 2007).

- In a randomized trial using home-living AD patients, those who received an exercise program showed improved physical function (Teri et al., 2003).

Physical activity has also been shown to improve the mental functioning of people diagnosed with dementia. Diseases like dementia often initially present as subtle cognitive impairment, most commonly memory problems. As neuro-degeneration takes place, reserve capacities in the brain are taken over and there is marked loss of functioning in numerous domains (Szekely et al., 2007). In addition to psychological and cognitive dysfunctions, numerous behavioral problems occur which present as problems with "activities of daily living" such as feeding, dressing, toileting, walking, problems with telephone use, meal preparation, money management, medication management, housekeeping, and shopping (Boyle et al., 2007). There are numerous studies showing that physical activity can delay the decline of cognitive functioning that impairs the ability to perform these activities related to daily life.

- In a longitudinal study of people in their 80s who were dementia free at baseline, the risk of developing disabilities in instrumental activities of daily living decreased 7% for each additional hour of physical activity (Boyle et al., 2007).

- In a 12-week randomized control study of elderly residents in care facilities, clients received one of the following programs: no intervention (control), social intervention consisting of a 30 minute visit with no exercise program, or finally an aerobic

exercise program (including joint and muscle movement) for 30 minutes, three times per week. At the end of the 12 weeks, those residents in the exercise program showed more improvement in self-help skills while the other groups showed a decline in self-help skills (Stevens & Killeen, 2006).

- A six-month, randomized control study of sedentary and active people, 65 years or older, examined the differences in decline in activities of daily living. Individuals categorized as sedentary participated in no physical activity program while individuals categorized as active participated in a comprehensive program consisting of respiratory, balance, and fine motor coordination exercises. At the end of the six-month intervention, these active individuals scored higher on activities of daily living and cognitive functioning tests that those in the sedentary group (Arcoverde et al., 2008).

- Nursing home residents with AD received either routine medical care as subjects in a randomized control study or participated in a comprehensive physical activity program for one hour, twice a week. The program was designed to increase balance, flexibility, strength, and aerobic fitness. Those participating in the exercise program demonstrated a slower decline in activities of daily living over a 12-month period than those in the group receiving routine medical care (Rolland et al., 2007).

- A meta-analysis reviewing experimentally-designed studies comparing the effects of a physical activity program to a non-physical activity control demonstrated that those in the physical activity group were more likely to improve in cognitive function (Heyn et al., 2004).

Physical activity has also been shown to ameliorate a number of mood-related problems associated with dementia. These include depression, mood, anxiety level, sleep problems, and agitation. AD and depression often coexist. Between 5 and 23% of people with AD are thought to have major depression. Dysthymia is believed to occur in between 8 and 34% of people with AD. Depression and dementia may be linked through an underlying neurobiological mechanism. The same vascular problems leading to dementia might also be shared by depression (Brayne et al., 2005). Depression in AD is associated with greater impairment in activities of daily living and is associated with earlier institutionalization (Regan et al., 2005), both of which can lead to lower mental stimulation, compounding problems associated with the greater cognitive decline of AD. Depressed nursing home residents tend to be more isolated and have greater morbidity, physical pain, and behavioral problems. As a result, depressed nursing home residents are more expensive to serve (Williams & Tappen, 2008).

- Walking has been shown to decrease depression in community-dwelling older adults with significant levels of depression (Teri et al., 1997).

- In a randomized trial of 153 patients with AD living at home, those who received a combination of exercise and caregiver education showed improved physical function and less depression (Teri et al., 2003).

- Those with dementia who engaged in comprehensive exercise program over 12 weeks were less depressed than those who received routine medical care (Teri et al., 2003).

- Comprehensive exercise programs consisting of 20-30 minutes of balance, flexibility, aerobics, and strength training conducted over 16 weeks were associated with higher positive mood and affect in residents of nursing homeswith AD (Williams & Tappen, 2007; Williams & Tappen, 2008).

- Engaging in muscular strength training twice a week is associated with an improved mood in early-to-moderate AD patients (Arkin, 2003).

- A study of depression in nursing home residents with AD compared depression levels after enrolling

residents for 16 weeks in one of three programs: comprehensive exercise, supervised walking, or social conversation. Depression was lowered in all three groups but more so in the exercise groups (Williams & Tappen, 2008).

- A pilot study of 14 elderly volunteers (4 male, 12 female) found that 30-minute, chair-based sessions of stretch and resistance training, three times per week, were associated with lower anxiety ratings immediately after exercise. Researchers still found lower anxiety ratings 12 weeks after initiation of the exercise program, as well as lower levels of depression (Stanziano et al., 2009).

- Of people with AD living in the community, those who exercised were less likely to be depressed than those who had hobbies (Regan et al., 2005).

- One study found that being mobile, stretching, and exercising lightly (seven times per week for at least 20 minutes) reduced agitated behaviors among patients suffering from dementia (Namazi et al., 1994).

- When the relationship between exercise and sleep disturbance was studied among those with dementia, patients who participated in a walking program had better sleep in terms of time and quality than those who were in the control group (Teri et al., 2008).

Physical activity is also believed to improve cognitive function through a number of social mechanisms. Engaging in physical activity is thought to provide a richer social environment (Podewils et al., 2005) and a more engaging social environment (Woodhead et al., 2005; Boyle et al., 2007), both of which could decrease dementia risk. Studies also show support for a number of biological mechanisms related to the association between physical activity and improved cognitive function. Numerous metabolic and neuropathological changes occur with AD, such as increased cerebral blood flow and other biological processes in the brain. These are thought to be modified by exercise (Barnes et al., 2007; Kramer et al., 2004; Boyle et al., 2007; Pereira, 2007; Rogers, 1990).

# II. Substance Use

Substance abuse is a continuing problem of staggering proportions in the United States, taking a toll on families, workplaces, and communities. While the economic costs, including those related to health care, crime, and lost productivity, are estimated at more than half a trillion dollars annually (NIDA, 2008); the human costs in misery and lost potential are immeasurable. The good news is that overall adolescent substance use has declined somewhat in recent decades. Nevertheless, teens who do use tobacco, alcohol, and other drugs face a dizzying constellation of negative consequences, damaging to their immediate and long-term health, safety, and well-being. Conventional wisdom suggests that the athletic experience may confer some protection against these dangers, but empirical research shows that the relationship between sports participation and substance use is complex. The playing field may help to buffer against some kinds of substance use, such as tobacco or illicit "hard" drugs, while exacerbating the risk of others such as smokeless tobacco, alcohol, and anabolic-androgenic steroids. Gender further complicates the equation. Traditionally girls have tended to have lower rates of substance use than boys, but the long-standing gender gap is narrowing—especially for these substances) that have most typically been closely linked to sports.

## Smoking

### Background

Smoking is the leading cause of preventable death in the United States, killing approximately 443,000 Americans a year and costing some $193 billion annually in health care costs and productivity losses (Centers for Disease Control, 2008). In the past 30 years, four million women have died prematurely due to lung cancer, cardiovascular disease, and other smoking-related diseases. Tobacco use has also been linked to other negative health outcomes of special concern to women, such as decreased bone density, impaired menstrual function, early menopause, infertility, pregnancy complications, and increased neonatal risk (USDHHS, 2001). Despite these health risks, adolescent smoking increased dramatically during the 1990s; although it has since leveled off and begun to decline. Unfortunately teens and young adults continue to have higher-than-average rates of tobacco use (Nelson et al., 2008). Every day, more than 3,600 American adolescents start smoking and 1,000 become regular smokers. About 60% of all new smokers are under age 18 (Substance Abuse & Mental Health Services Administration, 2008).

- It is estimated that 18.7% of high school girls are current smokers. White girls report the highest rates (22.5%) and African-American girls the lowest (8.4%), with Hispanic girls reporting intermediate rates (14.6%). Tobacco use increases over the high school years, from one in seven freshmen to one in four seniors (CDC, 2008).

According to the 2006 National Youth Tobacco Survey, 6.4% of middle school girls smoke cigarettes. When other forms of tobacco use (cigars, smokeless tobacco, pipes, bidis, and kreteks) are included, prevalence rises to 8.2% (CDC, 2006).

- Teenage girls are more likely to smoke if they have friends or family members who smoke (Faucher, 2003; Mercken et al., 2007), perceive smoking as a weight control strategy (Maldonado-Molina et al., 2007) suffer from low self-esteem (Abernathy et al., 1995; Kaufman & Augustson, 2008), or depression (Berg et al., 2009; Fergusson et al., 2003).

- Pro-tobacco advertising that emphasizes weight control, relaxation, and social acceptance can have a powerful impact on the decision of girls to smoke (Duke et al., 2009; French & Perry, 1996; Seo et al., 2009). Since the 1960s, tobacco companies have aggressively targeted women consumers with messages that smoking is feminine and fashionable. Today, Virginia Superslims Ultra Lights are sold in a sleek mauve or teal "purse pack" resembling a cosmetics case and the woman-friendly slogan for Camel No. 9 cigarettes is "light and luscious" (Campaign for Tobacco-Free Kids et al., 2009).

- Although it is still unclear whether tobacco is a "gateway" drug leading to other forms of substance use, adolescent cigarette smoking is a strong predictor of alcohol as well as marijuana, and other illicit drug use (Biederman et al., 2005; Chen et al., 2002; Vaughn et al., 2009).

### Facts and Research Findings

Athletic participation may help to protect girls against smoking. Both sports involvement and general physical activity are associated with lower rates of cigarette use, particularly for girls (Kaczynski et al., 2008a, 2008b). Possible reasons for this link include enhanced self-esteem (Nelson & Gordon-Larsen, 2008) and physical self-concept (Rodriguez & Audrain-McGovern, 2005); reluctance to compromise athletic performance through smoking-related reductions in lung function (Wichstrom & Wichstrom, 2009; Yusko et al., 2008); and greater awareness of the health consequences of smoking (Melnick et al., 2001). It is also possible that sports participation reduces the need for smoking as a source of stress reduction, mood elevation, self-esteem, or enhanced social status (Melnick et al., 2001). In addition, high school athletes may be unwilling to risk suspension or removal from the team if they are caught smoking (Rodriguez & Audrain-McGovern, 2004).

- A nationally representative study of U.S. public high school students found that organized sports participants were 22% less likely to be current cigarette smokers, regardless of gender (Castrucci et al., 2004).

- Physical activity is also associated with delayed onset of smoking or reduced odds that an individual will smoke at all. Highly active girls are less than half as likely as their less-active peers to start smoking cigarettes (Aaron et al., 1995; Verkooijen et al., 2008). Physical activity contributes to a physically active self-concept, which in turn reduces the odds of tobacco use (Rodriguez & Audrain-McGovern, 2005; Verkooijen et al., 2008).

- The more a girl is involved in sports, the less likely she is to smoke. Compared to nonathletes, female athletes are less likely to report current or lifetime cigarette use, and girls who participate on three or more teams in a given year are least likely of all to report cigarette use (Melnick et al., 2001; Page et al., 1998).

- A shift away from sports participation can signal increased risk for smoking. One study of Virginia high school students found that those whose participation level decreased over a two-year period were nearly twice as likely to smoke as those with low participation overall and three times as likely to smoke as those with high participation overall (Rodriguez & Audrain-McGovern, 2004).

- Type of sport may make a difference in the impact of athletic participation on smoking risk over time. A study of Norwegian high school students found that participation in team sports and endurance sports reduced later tobacco use, whereas participation in power sports did not (Wichstrom & Wichstrom, 2009).

- The protective effect of sports participation applies to young adults as well as adolescents. Female college athletes were two–three times less likely than nonathletes to engage in smoking, either in season or in the off-season for their sport (Yusko et al., 2008).

## Smokeless Tobacco

### Background

Smokeless tobacco (snuff, chew, dip, snus, or "spit" tobacco) is chewed, placed between the cheek and gums, inhaled, or snorted through the nose rather than smoked. Although sometimes promoted as a less-harmful alternative to cigarette smoking (Arabi, 2007), use of smokeless tobacco significantly increases a range of health risks including nicotine addiction, oral cancer, gum disease, cardiovascular disease, and pregnancy complications (International Agency for Research on Cancer, 2007; Tomar, 2007).

One-third of U.S. smokeless tobacco users are under 21 years old and more than one-half started before the age of 13 (Nemours Foundation, 2008).

- Smokeless tobacco has a significant following among U.S. youth; 13.4% of high school boys and 2.3% of high school girls are current users (CDC, 2008).
- Smokeless tobacco has been marketed to children by introducing them to less potent, starter versions of popular brands (e.g., Skoal Bandit) with candy or fruit flavorings (e.g., cherry, vanilla, or citrus blend) or promoting easily concealed spitless products (e.g., Camel Snus) (Campaign for Tobacco-Free Kids, 2008), and advertising a range of smokeless tobacco products in youth-oriented venues and magazines (Morrison et al., 2008).
- Three-quarters of 12th-grade girls perceive regular cigarette smoking as very risky although fewer than half perceive regular use of smokeless tobacco this way (Tomar & Hatsukami, 2007).
- High school students who use smokeless tobacco are twice as likely to have unprotected sex, two–three times more likely to start smoking (Severson et al., 2007; Tomar, 2003), and three times more likely to use marijuana (Everett et al., 2000).

### Facts and Research Findings

Smokeless tobacco is one of the few forms of substance use conventionally associated with athletic participation, partly as a result of corporate sponsorship of sporting events such as auto racing and major league baseball. Girls and women who play sports generally report lower rates than their male peers, but female athletes in certain sports may have an elevated risk.

- One national study found that high school girls who played on a school or community sports team were 83% more likely to use chewing or dipping tobacco; girls who played on three or more teams were more than three times as likely to use those products (Melnick et al., 2001).
- A second national study found that participants in organized high school sports were 32% more likely to report having used smokeless tobacco in the past and 89% more likely to report current use than those not on a sports team? (Castrucci et al., 2004).
- One in eight NCAA athletes has used smokeless tobacco in the past month. Female ice hockey players report unusually high rates (i.e., 19%) compared to girls in most other sports (e.g., 5% in lacrosse, 2% in basketball, or 1% in track/field). However, male athletes report considerably higher rates in nearly every sport (e.g., 37% in ice hockey, 27% in lacrosse, 10% in basketball, and 12% in track/field) (NCAA, 2006).
- Imitation may be one factor in young athletes' use of smokeless tobacco given that more than one-third of professional baseball players engage in this behavior (Severson et al., 2005).

## Alcohol Use

### Background

Although women generally drink less than men, they tend to suffer more severe consequences when they do drink heavily (Nolen-Hoeksema, 2004), and in fact the gender gap may be closing (Keyes et al., 2008). Problem drinking is associated with a constellation of negative health consequences, including liver disease, heart disease, brain damage, breast cancer, and fetal alcohol syndrome (NIAAA, 2003). Excessive drinking undermines academic performance and worker productivity and plays a significant role in sexual risk-taking, intimate violence, motor vehicle accidents, and suicide (United States Department of Health and Human Services, 2007). Underage drinking is also a key predicator of future alcohol dependence, illicit drug use, employment problems, and criminality (Ellickson et al., 2003; USDHHS, 2007). The National Academy of Sciences estimates that underage-alcohol use alone costs the nation $53 billion annually, including the costs of traffic accidents, violent crime, and treatment (NAS, 2004); a second analysis that included medical expenses, work loss, and lost quality of life put the direct and indirect costs at $62 billion each year (Miller et al., 2006).

- Alcohol continues to be the drug of choice among teenage girls. Of high school girls, 76% have tried alcohol in their lifetime and 45% report drinking in the past month (Centers for Disease Control, 2008, Table 36). Rates of binge drinking increase with age, ranging from 10% of 8th-grade girls (Johnston et at., 2008) to 33% of senior girls (CDC, 2008, Table 37).

- Girls have traditionally reported significantly lower drinking rates than their male counterparts, but the gender gap is narrowing (SAMHSA, 2008). In 2008, 14.7% of males and 15.05% of females aged 12 to 17 were classified as current drinkers. At the same time, however, senior boys are about 40% more likely to report binge drinking; in 1975, they were nearly 90% more likely to do so (Johnston et al., 2008).

- In studies on the prevalence of drinking and driving, 8% of high school girls reported driving after drinking and 29% reported riding in a vehicle with a driver who had been drinking (CDC, 2008, Table 5).

- There is a strong link between alcohol and suicide. Adolescent girls who drink frequently are almost six times more likely to attempt suicide (Jersild, 2002).

- Drinking puts girls and women at increased risk for dating violence, unsafe sex, unplanned pregnancy, and sexually transmitted diseases, including HIV (CASA, 2003; Davis et al., 2007).

- Alcohol has been identified as a possible "gateway drug" that precedes use of other illicit drugs in a developmental progression (Kandel, 2002; Willner, 2001).

- Adolescent girls are more likely than boys to drink as a way to cope with problems, boost confidence, or relieve stress. Low self-esteem, depression, disordered eating patterns, and anxiety over weight are all red flags for problem drinking in girls and women (CASA, 2003; O'Brien et al., 2008).

- One-third of adolescent girls have tried alcopops. These fruit-flavored alcoholic beverages are aggressively marketed to girls 12–21 years old who see 95% more magazine ads for alcopops than women who are more than 21 years old (American Medical Association, 2004; Center on Alcohol Marketing and Youth, 2002).

## Facts and Research Findings

Research on the relationship between female athletic participation and alcohol consumption is inconsistent. Most studies find that female athletes in high school or college are more likely than nonathletes to engage in problem drinking, including binge drinking alcohol consumption (Hildebrand et al., 2001; Hoffman, 2006; Nelson & Wechsler, 2001; Wichstrom & Wichstrom, 2009; Wilson et al., 2004), but some have found the opposite effect, or none at all (Fredricks & Eccles, 2006; Mays & Thompson, 2009; Storch et al., 2005; Yusko et al., 2008). The impact of athletic participation on drinking behavior is complicated by mediating factors such as peer influences, sport-related identities, and sport subcultures (Martens et al., 2006; Miller et al., 2003; Peck et al., 2008; Wichstrom & Wichstrom, 2009).

- Teen participants in organized sports report more alcohol use in later adolescence or young adulthood than nonparticipants (Hoffman, 2006; Wichstrom & Wichstrom, 2009).

- Because excessive alcohol use undermines muscle development and recovery, information processing and retention, and proper absorption and metabolism of nutrients, it hampers athletic performance (American College of Sports Medicine, 2000; Shirreffs & Maughan, 2006).

- Excessive drinking by athletes may result from self-medication to reduce the anxiety and stress of competition and injuries (Miller et al., 2002), cultural traditions of sport-related "celebratory drinking" (Neal et al., 2005), drinking-tolerant subcultures, or exaggerated perceptions of peer alcohol use (Dams-O'Connor et al., 2007).

- Although still extremely common, drinking by college athletes has been declining. Research shows

that 75% of college athletes reported drinking in 2005, compared to 89% in 1989 (NCAA, 2006).

- Some girls and women's sports may be more conducive to drinking than others. Higher rates tend to be found in team sports like soccer (Ford, 2007), swimming/diving (Martens et al., 2006), and lacrosse (Brenner & Swanik, 2007).

- Sport spectatorship also increases the risk of problem drinking (Neal et al., 2005; Nelson & Wechsler, 2003), and with good reason. The alcohol industry spends more than half a billion dollars a year on advertising during televised-sports programs, which are viewed by more than 80% of girls and women at some point in their lives.. A small but growing proportion of that advertising is devoted to women's sports (Center on Alcohol Marketing and Youth, 2003).

## Illicit Drug Use

### Background

Reliable estimates of the societal costs of illicit drug use are scarce; the last comprehensive assessment, $181 billion, is a decade old (ONDCP, 2001). Such calculations are further complicated by the fact that illicit drugs vary in both popularity and the severity of their effects; for example, marijuana is far more widely used, but also far less damaging to the user's health, than methamphetamine. In general, however, illicit drug use contributes to escalating health care costs, loss of worker productivity, homelessness, school failure, vehicular accidents, crime, unwanted pregnancies, and domestic violence. After significant increases in the early 1990s, adolescent use of marijuana and other illicit drugs has declined over the past decade. However the recent emergence of new drugs on the teen social landscape, such as club drugs (e.g., ecstasy, ketamine, GHB, or Rohypnol), prescription narcotics such as OxyContin (the brand name trademarked by Purdue Pharma) and Vicodin (a trademark of Abbot Laboratories) or dextromethorphan (found in over-the-counter cough suppressants) is cause for continuing concern (CASA, 2005; Johnston et al., 2008; Rome, 2001; Substance Abuse and Mental Health Services Administration, 2008).

- Nearly one in five 8th-grade girls, one in three 10th-grade girls, and more than 4 in 10 12th-grade girls have used an illicit drug at least once in their lifetimes (Johnston et al., 2008).

- The most commonly used drugs among 8th-grade girls are inhalants, with 9% of girls reporting use in the past year (Johnston et al., 2008). "Huffing" (inhaling fumes from glue, paint, aerosols, and other widely available household or industrial chemicals) can damage the brain, heart, kidneys, lungs, and liver (Kurtzman et al., 2001).

- Among high school seniors, boys are more likely to use illicit drugs than girls. Perhaps because girls tend to mature earlier, the difference is less pronounced at younger ages; among 8th- and 10th-graders, girls and boys are equally likely to use club drugs, cocaine, or heroin, and in fact girls are more likely to use inhalants, amphetamines, Ritalin, methamphetamine, or tranquilizers (Johnston et al., 2008).

- Research suggests some gender differences in the risk and protective factors associated with illicit drug use; for example, girls are more susceptible than boys to social influences, including peer, partner, or parental drug use (Amaro et al., 2001).

- At both the high school and college levels, rates of drug use tend to be lowest among African-American and Asian-American students, higher among whites and Hispanic students, and highest among Native American students (McCabe et al., 2007; Wallace et al., 2003).

### Facts and Research Findings

Most studies show lower rates of drug use by female athletes compared to their nonathlete peers. For example, findings from studies done by Ewing (1998) and Page (1998) show that athletic participation may

help protect girls against illicit drug use. Explanations for this relationship vary. Drug abstinence may be a rational decision for girls who wish to maximize their athletic performance and avoid jeopardizing their eligibility to play.

Athletic participation may also enhance self-esteem and provide a framework for supervision of free time. Research shows that teen athletes are more likely to disapprove of peer substance use (SAMHSA, 2001). Sports may facilitate participation in a prosocial network of teammates, as well as coaches, and health professionals, among whom illicit drug use is not tolerated.

- Two recent nationwide studies found that female school or community athletes were significantly less likely to use marijuana, cocaine, or most other illicit drugs. The protective effect of sports was strongest for white girls (Miller et al., 2001; Pate et al., 2000).
- High school athletes of either gender are less likely to use cocaine or psychedelic drugs than nonathletes (Naylor et al., 2001).
- A recent study profiling a "druggie lifestyle" found that college students who participated on an intercollegiate sports team were only half as likely to use hard drugs such as cocaine, LSD, opiates, stimulants, or ecstasy (Mustaine & Tewksbury, 2004).
- One study of college student substance use found that female athletes were significantly less likely than nonathletes to have used marijuana in the previous year, prescription drugs in high school, or designer "club" drugs (e.g., ecstasy, ketamine, or GHB) in their lifetimes (Yusko et al., 2008).
- Another study of college student substance use found that female athletes were significantly less likely than nonathletes ever to have abused prescription drugs, tranquilizers, or opiates (Ford, 2008).
- College student-athletes are at less risk for illicit drug use than their nonathlete peers, but they are not immune. According to NCAA statistics collected in 2005, one in five college student-athletes had used marijuana in the past year, including 37% of female lacrosse players, 34% of female ice hockey players, and 24% of female lacrosse players (NCAA, 2006).
- Agencies such as the Office on National Drug Control Policy (ONDCP), the Drug Enforcement Administration, and the Office of Juvenile Justice and Delinquency Prevention (OJJDP) see organized youth sports as a potential component in drug prevention programs (ONDCP, 2003; USDOJ, 1992, n.d.).

## Anabolic-Androgenic Steroid Use

Although anabolic-androgenic steroid is most often associated with organized sports, research suggests that many girls and young women may be motivated to use steroids for other reasons—most importantly, in order to look fit and attractive. A physically active lifestyle, which accomplishes the same purpose, may actually serve as a protective mechanism against the use of steroids. In combination with accurate knowledge about the potential consequences of steroid use, sports and exercise programs may be a potential weapon in the public health arsenal.

### Background

Anabolic-androgenic steroid use as a means of enhancing physical appearance or athletic performance has been condemned by the Committeeon Sports Medicine and Fitness of the American Academy of Pediatrics (1997), the American College of Sports Medicine (1987), and the National Institute on Drug Abuse (2000). The public health implications of anabolic-androgenic steroid use are dismaying. Steroid users face a variety of health risks, including heart disease, liver damage, high blood pressure and cholesterol, acne, depression, mood swings, and increased aggression (USDOJ, 2004; Yesalis, 2000). There is also evidence to suggest that steroids may be addictive (Wood, 2006). Although

steroid abuse is mostly seen as a male problem, the fastest-growing user population is female; approximately 2.7% of high school girls in the United States admit to using steroids at least once in their lifetimes without a doctor's prescription (CDC, 2008).

- Women who use steroids are susceptible to a variety of masculinizing side effects, including hirsutism (growth of facial and body hair), deepened voice, male pattern baldness, clitoral enlargement, reproductive abnormalities, and changes in libido. Once they occur, these side effects are often irreversible (Gruber & Pope, 2000; Kutscher et al., 2002).

- The risk of steroid use is even greater for adolescent girls, who are vulnerable to premature skeletal maturation. Users risk permanently stunted growth (Committee on Sports Medicine and Fitness, 1997; National Institute on Drug Abuse, 2000).

As with other illicit drugs, girls' lifetime steroid use increased significantly during the 1990s (a four-fold increase, according to one estimate) but has decreased over the past decade. In 2003, 5.3% of high school girls (grades 9-12) had used steroids without a doctor's prescription at least once; by 2007, only 2.7% reported having done so (CDC, 2008; Committee on Oversight and Government Reform, 2005).

- In 2007, 0.4% of high school senior girls and 1.6% of senior boys reported having used steroids without a doctor's prescription in the past month (Johnston et al., 2008).

- Adolescent female steroid users are significantly more likely to engage in other health-risk behaviors as well, including substance use (tobacco, alcohol, or other illicit drugs), sexual risk-taking, and violence. They are also more likely to experience depression and/or be suicidal (Elliot et al., 2007; Hall et al., 2005; Miller et al., 2005).

## Facts and Research Findings

Steroid use serves the primary purpose of building muscle mass, which may make it a tempting prospect for those seeking to maximize performance in strength-oriented sports. While athletes constitute a significant at-risk population, adolescent steroid use is not restricted to sports enthusiasts. Many girls and young women are motivated to use steroids in order to conform to contemporary "hard body" standards of attractiveness that prize a lean, muscular physique (Bahrke et al, 2000). For some, steroid use may be part of a pattern of disordered eating, poor body image, and preoccupation with weight (Elliot & Goldberg, 2000; Gruber & Pope, 2000; Irving et al., 2002). For others, steroid use is a component of a broader problem behavior syndrome with health risks that include elevated risk for alcohol, tobacco, or illicit drug use, sexual risk-taking, violence, suicidality, pathogenic weight control, and other unhealthy behaviors (Elliot et al., 2007; Miller et al., 2002b, 2005; Wichstrom & Wichstrom, 2001).

- Many, but by no means all, female adolescent steroid users participate in organized sports or bodybuilding. Most studies find that steroid use is more common among athletes than nonathletes (Bahrke et al., 2000; USDOJ, 2004; Yusko et al., 2008) but a substantial number of steroid users report no athletic involvement (Bahrke et al., 2000).

- Some national studies find that female steroid users are either equally likely (Miller et al., 2005), or less likely (Elliot et al., 2007), than nonusers to participate in school-sponsored team sports.

- Athletic participation may actually help to protect steroid users against other problem behaviors. While users are at heightened risk for illicit drug use, sexual risk-taking, and suicidal behavior, the risks are lower for athlete steroid users than for nonathlete users (Miller et al., 2002a).

- Preoccupation with physique can be what links sports and steroid use (Elliot & Goldberg, 2000; Irving et al., 2001). Because of their physique-altering ("body-shaping") function, steroids may play a role in the Female Athlete Triad of disordered eating, amenorrhea, and osteoporosis (Denham et al., 2007; Otis et al., 1997).

- Balanced, accurate education programs can be effective tools in reducing steroid use. However, when programs deny potential benefits (such as muscle development and enhanced strength) they are not credible and can actually backfire, increasing the risk of steroid use (National Institute on Drug Abuse, 2000; Wright et al., 2001).

- The ATHENA (Athletes Targeting Healthy Exercise & Nutrition Alternatives) program for girls and the ATLAS (Adolescents Training and Learning to Avoid Steroids) program for boys are established programs emphasizing healthy nutrition and strength-training alternatives to substance use. These programs have been shown to reduce steroid use or intentions to use steroids in high school athletes of both genders (Elliott et al., 2006; Goldberg et al., 2000).

# III. Sexual and Reproductive Health

Good news: In recent years, high-risk sexual behavior (such as unprotected intercourse or sexual contact with casual or high-risk partners) has declined among young women in the United States. We also see corresponding decreases in common outcomes associated with sexual risk-taking, most notably unwanted adolescent pregnancies and sexually transmitted diseases. However, these public health problems remain considerably more common in the United States than in other industrialized nations, largely as a result of inconsistent or ineffective contraceptive and/or prophylactic use. Participation in sports may offer girls and young women both incentives and resources to make healthy and responsible sexual choices.

As the Athletes for Sexual Responsibility suggest, "Smart sex is like baseball: You have to cover all the bases to make it home safe. Use a condom." (University of Maine, 2009)

## Sexual Risk Prevention

### Background

Risky sexual behavior remains a significant danger to the health and safety of American girls and women. Sexual risk-taking may take several forms, including sexual precocity (early initiation of sexual intercourse); promiscuity (multiple partners, either sequentially or concurrently); casual sex or "hooking up" (with an unfamiliar or uncommitted partner); unprotected sex (not using contraceptives or prophylactics); having sex with high-risk partners; or sexual activity in conjunction with substance use. These behaviors are often associated with serious negative outcomes, ranging from social stigma to sexual victimization and assault, unintended or unwanted pregnancy, and infection with STDs. Women are at greater risk than men for all of these consequences—including STDs, to which they are more susceptible and from which they are more likely to experience permanent harm (Misra, 2001).

- Adolescent girls' sexual activity has declined since the early 1990s. In 1991, 51% of high school girls had ever had sexual intercourse; in 2007, 46% had done so. Declines are especially marked for younger girls; the proportion of 9th-grade girls who report ever having sex dropped from 39% in 1991 to 33% in 2007 (CDC, 2008a; Terry-Humen et al., 2006).

- Of sexually active high school girls, 12% have had sex with four or more partners; 17% used alcohol or drugs and 45% did not use a condom during their most recent sexual encounter (CDC, 2008b). Although only 4% of girls report having intercourse before the age of 13, about two-thirds of sexually experienced teens say they wish they had waited longer before having sex (Albert, 2007; CDC, 2008b).

- Substantial numbers of young adults ages 18–24 report that on at least one occasion, alcohol or drugs have influenced their decisions about sexual behavior (37%), led them to engage in more sexual activity than they had planned (30%), or led them to have unprotected sex (24%) (Hoff et al., 2003).

- More than half of all adolescent girls (54%) report that they have had oral sex. Although often perceived as more acceptable and less risky than vaginal sex, oral sex can also have negative physical (i.e., sexually transmitted diseases ) and emotional consequences; girls in particular are vulnerable to feeling bad about themselves or feeling used (Brady & Halpern-Felsher, 2007; Halpern-Felsher et al., 2005; Lindberg et al., 2008).

- Inconsistent use of prophylactics has resulted in higher rates of STDs among teens in the United States than in other industrialized countries (Panchaud et al., 2000). Nearly two-thirds of young people ages 15 to 24 report that they have had sex without a condom at least once (Hoff et al., 2003).

- About one in three sexually active adolescents and young adults is infected with an STD by age 24. Teens and young adults ages 15 to 24 comprise 25% of sexually active Americans but represent about half of all new STD cases, which cost society at least

$6.5 billion in 2000 alone. HIV and HPV (human papillomavirus) account for 90% of the total medical cost burden of STDs (Chesson et al., 2004; Kirby, 2007; Weinstock et al., 2004).

- Almost one in five (18%) young adult women has experienced forced sexual intercourse (Holcombe et al., 2008). One in 10 (11.3%) high school girls has been physically forced to have sexual intercourse when she did not want to (CDC, 2008b). Research shows that 9.6% of all women between the ages of 18 to 24 who had sex before the age of 20, report that their first intercourse was not voluntary (Abma et al., 2004).

## Facts and Research Findings

Recent research suggests that athletic participation may reduce risky sexual behaviors in girls and young women, such as early sexual initiation, multiple sex partners, unprotected sex, and sex under the influence of drugs or alcohol. One possible explanation is that female athletes are better equipped to tap resources needed (such as self-esteem, coping skills, a sense of self-empowerment and efficacy, and even physical strength) to resist pressure to take sexual risks (Lehman & Koerner, 2004; Miller et al., 2002). Another explanation may be that girls who participate in sports have more incentive to avoid risky behaviors, the consequences of which (such as pregnancy) could jeopardize their opportunity to play (Dodge & Jaccard, 2002). Yet a third possibility is that organized, supervised athletic participation narrows the after-school "window of greatest opportunity" for risky sexual experimentation.

- Girls who play sports are less sexually active than those who don't. Female athletes tend to delay the onset of sexual activity until later in adolescence; when they do become sexually active, they have intercourse less frequently (Dodge & Jaccard, 2002; Erkut & Tracy, 2000; Miller et al., 2002).

- Girls who play sports engage in less high-risk sexual behavior than those who don't. Female athletes are less likely to have unprotected sex (without birth control or barrier protection), sex with multiple partners, or sex under the influence of alcohol or drugs (Kokotailo et al., 1998; Lehman & Koerner, 2004; Miller et al., 2002).

- Physical activity is also associated with reduced likelihood of sexual risk-taking. Girls who exercise strenuously are more likely to practice safe sex; they are also less likely to have sex before age 15, with multiple partners, or after using drugs or alcohol (Miller et al., 2002).

- Among sexually active adolescent girls, those involved in organized team sports are more likely to seek out sexual health-related information or services; for example, they are more likely to discuss contraceptive use or sexual history with their sex partners (Lehman & Koerner, 2004).

- Adolescent sports participation may buffer against sexual risk-taking in young adulthood. In one study, former high school athletes reported fewer sex partners, although they were no more likely than nonathletes to use condoms consistently (Eitle & Eitle, 2002).

- Researchers used data from the National College Health Risk Behavior Survey, conducted in 1995 by the U.S. Centers for Disease Control and Prevention, to test the hypothesis that female and male athletes may be protected from sexual victimization by their sport involvement. Based on a descriptive analysis of data for 2,903 traditional undergraduate students between the ages of 18–24, there was limited support for the "sport protection hypothesis." Athletes were significantly less likely to report sexual victimization during their late high school and early college years when compared with their non-athlete peers. Female students did report more sexual victimization across all student age groups, however no significant gender gap was found among athletes (Fasting, Brackenridge, Miller, & Sabo, 2008).

## Teen Pregnancy Prevention

### Background

The United States has the highest teen pregnancy rate in the industrialized world—twice as high as that of Canada, four to five times higher than that of most European nations, and eight times as high as that of Japan (Abma et al., 2004; Singh & Darroch, 2000). Nearly one-third of women in the United States get pregnant at least once by age 20, and more than 80% of all teen pregnancies are unintended. Associated costs to taxpayers, including health care, child welfare, criminal justice, public assistance, and lost tax revenues, are conservatively estimated at over $9 billion annually, or more than $4,000 per underage mother each year (Hoffman, 2006).

However there are positive reports that adolescent pregnancy rates in the United States fell by nearly 50% between 1990 and 2004, to their lowest level in three decades. These steep declines applied across all major racial and ethnic groups and were more marked among younger than older teens (over age 18). Lower pregnancy rates resulted in correspondingly lower rates of both live births and abortions; between 1990 and 2004 teen birth rates dropped by about one-third and abortion rates by about one-half (Ventura et al., 2008).

- Teenage mothers are less likely to finish school or go to college and more likely to be poor. Their children are at increased risk for low birth weight, impaired cognitive development, abuse, neglect, poor school performance, behavior problems, incarceration, and adolescent childbearing (Kirby, 2007; Terry-Humen et al., 2005).

- Teens in the United States are about as likely to have sex as teens in other countries, but other countries have lower pregnancy rates. The primary difference is that American teens are less likely to use contraceptives, especially more effective hormonal methods such as the birth control pill (Darroch et al., 2001).

- Most (86%) of the reduction in teen pregnancy rates since the early 1990s is attributable to more consistent and effective contraceptive use. The remaining 14% results from reduced or delayed sexual activity (Santelli et al., 2007).

- More than four out of five sexually active girls used contraceptives during their most recent sexual intercourse; however, many do not use them consistently or effectively. One recent study found that only 70% of adolescent girls who rely on oral contraceptives take a pill every day; another found that only 28% of girls used a condom every time they had sex (Abma et al., 2004; Kirby, 2007; Suellentrop, 2006).

- After a 14-year decline, the birth rate for teens ages 15–19 (but not for younger teens) increased by 5% from 2005 to 2007. Contraceptive use and abortion rates have both decreased slightly. Possible explanations for these trends include growth in immigrant populations with high fertility rates, rising economic inequality, and a public-policy shift from comprehensive sexual education programs to less effective abstinence-only programs (Hamilton et al., 2009; Martin et al., 2009; Moore, 2008).

- Teens who are exposed to high levels of sexual content in television programming are twice as likely to get pregnant within three years (Chandra et al., 2008).

### Facts and Research Findings

Most studies find that athletic participation is associated with reduced odds of teen pregnancy. Because girls who participate in sports risk losing their place on the team, as well as any associated benefits (such as social status or scholarship opportunities), they have considerable incentive to avoid pregnancy. Sport may also act as a source of social capital, meaning that sport as a vehicle for greater connection between female athletes and their communities, which is protective against unplanned pregnancy (Crosby & Holtgrave, 2006). In addition, female athletes may be less committed to the traditional, passive image of

femininity and thus more inclined to see themselves in terms of their own accomplishments, rather than their appeal to boys (Miller et al., 2002; Shakib, 2003). These factors may help to explain why female athletes report less sexual activity overall, less high-risk sexual behavior in particular, and more frequent and consistent use of contraceptives.

- Female high school and college athletes are significantly less likely to get pregnant than their nonathlete peers (Dodge & Jaccard, 2002; Kokotailo et al., 1998; Miller et al., 1999; Page et al., 1998; Rome et al., 1998; Sabo et al., 1998).

- The link between sports participation and reduced pregnancy rates is found across racial and ethnic categories, including white, African-American, and Hispanic girls in one nationwide sample (Sabo et al., 1998).

- One reason for lower athlete pregnancy rates is that girls at highest risk for pregnancy are less likely to get involved (or stay involved) with sports. Athletes tend to be younger and better educated, and are more likely to be white, than their nonathlete peers–all factors that reduce pregnancy risk. Athletes also engage in less sexual-risk behavior, in part because they are more reluctant to risk pregnancy (Dodge & Jaccard, 2002).

According to one recent study, 10% of young adult women with a history of extensive sports involvement in high school has a child outside of marriage, while the number is 25% for those who had little or no involvement in high school sports (Eitle & Eitle, 2002).

# IV. Mental Health and Well-Being

Given the physical nature of athletic pursuits, we may at times be inclined overlook their impact on less-tangible mental health outcomes. Researchers do not yet have a good understanding of the interrelated effects of depression, low self-esteem, and distorted body image on health-compromising behaviors such as suicide attempts or pathogenic weight control. However, growing numbers of studies are exploring how sports participation may serve to protect girls and women against some of these health risks while considering how it can exacerbate others. All other things being equal, athletes tend to enjoy a greater sense of self-esteem and feel less depression than their sedentary peers. Logically one could deduce that their activities generate a higher level of physical fitness that allows them to feel greater satisfaction with their own bodies than nonathletes. Yet, perhaps because they hold themselves to a more demanding physical standard, athletes are also at greater risk for eating disorders. Moreover, frequent exercise or sports activity may in some cases be a red flag for depression, low self-esteem, poor body image, or even suicidality when over-exercise is used as a coping mechanism or a strategy for weight loss. In essence, sports participation in moderation enhances mental health; in excess, it may (literally) be overkill.

## Depression

### Background

Depression is a treatable illness; symptoms may include persistent feelings of sadness; hopelessness; and worthlessness; loss of ability to experience pleasure; loss of interest in activities one usually enjoys; difficulty concentrating; and changes in sleep, appetite, weight, and energy levels. Though often dismissed or trivialized as "the blues," the annual economic burden of depression in the United States exceeds $83 billion in medical treatment costs, lost productivity, and mortality (Greenberg et al., 2003). Women are twice as likely as men to suffer depression. Reproductive hormones may play a causal role, particularly after birth or during menopause. Women may also be more prone to depression than men due to differences in how they respond to stressful life situations, such as conflicting work and family responsibilities. Women are also more likely to experience poverty and sexual or physical abuse (NIMH, 2008).

- Each year, 12 million women in the United States experience clinical depression. Although most can be treated successfully with medication and/or psychotherapy, less than half of these depressed women ever seek treatment (Mental Health America, 2008).
- There are common misconceptions that depression is not an illness but a normal part of childbirth, menopause, and aging, and that strong people can "snap out of it." These misconceptions may discourage some women from seeking help (Mental Health America, 2008a, 2008b).
- Women's depression frequently co-exists with other serious illnesses, such as eating disorders or post-traumatic stress disorder (Devane et al., 2005; Kessler et al., 2003). Depression is also a complicating factor in chronic medical conditions such as diabetes, cancer, or heart disease (Cassano & Fava, 2002; Katon & Ciechanowski, 2002).
- The World Health Organization (2001) predicts that depression will be the most prevalent cause of disability among women worldwide by the year 2020.
- Though the rates of depression are comparable among boys and girls in early childhood, by middle adolescence girls are twice as likely as boys to have experienced major depression. This gender gap continues until menopause (Cyranowski et al., 2000; Hyde et al., 2008).
- In 2007, 12% of girls between the ages of 12 and 17 suffered a major depressive episode. Two-thirds of these girls (8%) suffered severe impairment. More than half received no treatment, counseling, or medication for depression (SAMHSA, 2008).

- Teenage girls are especially vulnerable to depression due to biological and hormonal changes at puberty. Other sources may include pressures associated with parental conflicts, unrealistic standards of beauty and femininity, and the new social expectations related to reaching adolescence (Mayo Clinic, 2008; NIMH, 2008).

### Facts and Research Findings

With a few exceptions (e.g., Johnson et al., 2008), most studies find that physical activity is an antidepressant (Sallis et al., 2000; Teychenne et al., 2008). For both biochemical and psychological reasons, exercise elevates mood and creates a sense of happiness and well-being (Craft, 2005; Cripps, 2008). Moreover, it appears that moderate levels of sports activity can significantly enhance social and psychological functioning in ways that buffer against depression. The evidence for exercise as a treatment for clinical depression remains promising although still inconclusive due to methodological flaws in much of the research to date (Cripps, 2008; Lawlor & Hopker, 2001; Mazure et al., 2002).

- Aerobic exercise, toning, and resistance training can each reduce depressive symptoms (Ahmadi et al., 2002; Dunn et al., 2005; Taliaferro et al., 2008).

- Positive effects of exercise on depression apply across the lifespan, helping children (Sallis et al., 2000), teens (Dishman et al., 2006), young adults (McKercher et al., 2009), the middle-aged (Brown et al., 2005), or the elderly (Strawbridge et al, 2002).

- Reasons for exercising matter. In a recent nationwide assessment of more than 40,000 students by the American College Health Association, college women who exercised were less likely to report feeling hopeless or depressed—except for those who exercised frequently to lose weight (Taliaferro et al., 2008).

- Adolescent and young adult women who participate in organized sports report lower levels of depression. Possible reasons include greater levels of parental and peer emotional support (Gore et al., 2001), as well as greater social acceptance (Boone & Leadbeater, 2006), social connectedness and self-esteem (Armstrong & Oomen-Early, 2009), and improved physical self-concept and body satisfaction (Dishman et al., 2006).

- Moderate levels of sports activity are the most beneficial. In one study, high school seniors who played sports 3–6 hours/week were less depressed than those who played less often. More frequent participation had no such protective effect, perhaps due to the detrimental effects of overtraining (Sanders et al., 2000).

- Moderate levels of exercise continue to be shown to be the most beneficial. In one study, young women who walked at least 7,500 steps a day were 50% less likely to be depressed than sedentary women. However, very high levels of physical activity were associated with greater risk of depression (McKercher et al., 2009).

- Sports involvement may have long-lasting effects on mental health. Female college athletes are only two-thirds as likely as their nonathlete peers to be clinically depressed 10 years later (Wyshak, 2001).

## Suicide

### Background

It is impossible to calculate the intangible cost of suicide, and suicide attempts, in terms of human sorrow; however, the economic costs to society (including medical costs, lost productivity, and lost wages) exceed $15.4 billion annually (Institute of Medicine, 2002). Each suicide leaves an average of six survivors, those family members and friends intimately affected by the death. Suicide is the third-leading cause of death among American teenagers and young adults ages 15–24, accounting for one of every eight deaths in this age group (American Association of Suicidology, 2006; CDC, 2008)

- Women are three times as likely to attempt suicide as men, but men are four times as likely to succeed (American Association of Suicidology, 2006). One reason for this difference is that men are more likely to use firearms, whereas women are more likely to use potentially reversible methods such as poisoning or suffocation (CDC, 2007; Institute of Medicine, 2002).

- According to the Centers for Disease Control and Prevention, 36% of high school girls reported strong and persistent feelings of sadness or hopelessness in the past year, 19% seriously considered suicide, 13% made a suicide plan, and 9% actually tried to kill themselves. One in 50 of those attempts resulted in an injury, poisoning, or overdose that had to be treated by a doctor or nurse (CDC, 2008).

- The Centers for Disease Control and Prevention identified Hispanic girls as being at especially high risk for suicidal ideation and behavior; 42% felt sad or hopeless, 21% considered suicide, 15% made a suicide plan, 14% attempted suicide; and 1 in 25 attempts required treatment by a health professional (CDC, 2008).

- After doubling between the 1950s and the late 1970s, female adolescent suicide rates have declined slightly since 1980 (American Association of Suicidology, 2008; National Adolescent Health Information Center, 2006).

- Suicide attempts are especially common among adolescents; for every completed youth suicide, there are an estimated 100–200 attempts. In a typical American high school classroom, it is likely that one girl and two boys have tried to kill themselves in the past year (American Association of Suicidology, 2006).

- Adolescent and young adult suicidal ideation and attempts are linked to other high-risk behaviors. These include substance use (tobacco, marijuana, cocaine, and other illegal drugs), sexual risk-taking, vehicular risk-taking, delinquency, and interpersonal violence (Bae et al., 2005; Barrios et al., 2000; Hallfors et al., 2004; Schilling et al., 2009; Thompson et al., 2006).

## Facts and Research Findings

Although the relationship between overall physical activity and female suicidality depends partly on the motive for exercise, multiple studies have confirmed that women who participate in sports are less likely to consider, plan, or attempt suicide (Brown & Blanton, 2002; Brown et al., 2007; Ferron et al., 1999; Harrison & Narayan, 2003; Oler et al., 1994; Page et al., 1998; Sabo et al., 2005; Taliaferro et al., 2008a; Tomori & Zalar, 2000; Unger, 1997). Unlike exercise alone, sports participation generally takes place within the context of a social network of coaches, teammates, parents, and others that fosters pro-social behavior and provides a therapeutic emotional support base.

- Physical activity can be protective against suicidality (Taliaferro et al., 2008b). In adolescents and young adults who made nearly lethal suicide attempts, one study found far lower levels of physical activity, even after controlling for explanatory factors such as depression and alcoholism (Simon et al., 2004).

- Exercise alone is not necessarily protective against suicidality for women; in fact, girls and women who engage in frequent exercise may have an elevated risk of suicidal behavior, possibly because seek to lose weight in order to compensate for poor body image, low self-esteem, and depression (Brown & Blanton, 2002; Taliaferro et al., 2008b; Thome & Espelage, 2004).

- Female college students who don't participate in organized sports are two-thirds more likely to report suicidal behavior (Brown & Blanton, 2002).

- Girls who consider sport an important part of a healthy life, and as a useful coping behavior during times of distress, are less likely to be suicidal (Tomori & Zalar, 2000).

- In one nationwide study, high school girls who participated in organized sports were significantly

less likely to report feeling hopeless or suicidal, or report planning a suicide or having made multiple suicide attempts (Taliaferro et al., 2008a).

- A second nationwide study found the protective effect of sports against suicidal thinking to be strongest for girls who participated on three or more teams (Sabo et al., 2005).

- Another nationwide study found that female high school athletes were less likely to attempt suicide even after controlling for physical activity levels (Brown et al., 2007).

- Having a sport-related identity influences the relationship between sports participation and suicidality. Compared to college students who do not see themselves in sport-related terms, self-identified athletes are half as likely to attempt suicide—whereas self-identified jocks are twice as likely to do so (Miller & Hoffman, 2009).

## Body Image

### Background

One of the most pervasive and unchallenged prejudices in U.S. culture is the prejudice against fat people. By the age of five, children have absorbed the cultural bias against overweight (Musher-Eizenman et al., 2003). Popular imagery in media, literature, and advertising emphasizes a vision of female physical perfection that is unrealistically thin (Kilbourne, 2004; Lamb & Brown, 2006; Wolf, 2002). To the extent that girls and young women internalize such consistent messages (some subtle, some quite blatant), they are apt to make unfavorable comparisons between this idealized, unrealistic form and their own bodies (Groesz et al., 2002; Yamamiya et al., 2005). Although boys also experience dissatisfaction with their bodies, more commonly revolving around being insufficiently muscular, girls are especially vulnerable to developing and investing in a negative body image (Cash & Pruzinsky, 2002). While the active male body has traditionally been judged on its ability to accomplish desired goals, the objectified female body has traditionally been judged on its sexual attractiveness to men (Smolak, 2004). Negative body image is often associated with disordered eating (Ackard et al., 2002; Ricciardelli & McCabe, 2001), depression (Bearman & Stice, 2008; Brausch & Gutierrez, 2009), poor self-esteem (Clay et al., 2005; Tiggemann, 2005), and even abuse of substances with appetite-suppressing qualities such as cocaine, amphetamines, and, especially, cigarettes (Clark et al., 2005; King et al., 2005; Parkes et al., 2008).

- The U.S. weight-loss industry has grown rapidly in recent years; it represented approximately $30 billion in 1992, $46 billion in 2004, and is forecasted to exceed $60 billion before the end of the current decade (Adams, 2005; U.S. Food and Drug Administration, 1992).

- In one experiment, girls ages 5 to 8 who played with a Barbie doll reported lower body-esteem and a greater desire to be thinner compared with girls who played with a doll that had more realistic body proportions. According to one estimate, only .001% of women match Barbie's large-breasted, narrow-hipped physical proportions.

- Well over 90% of American girls own at least one Barbie doll (Dittmar et al., 2006; Norton et al., 1996; Rogers, 1999).

- In one recent study, about half of girls 9–12 rated their own bodies as too heavy, although fewer than 15% were objectively overweight (Clark & Tiggemann, 2006).

- Body dissatisfaction in American girls emerges by the age of 6 and is well-established by the age of 9 (Davison et al., 2000; Lowes & Tiggemann, 2003; Sands & Wardle, 2003).

- Only 12% of women (but twice as many men) think they look good in a swimsuit; moreover 31% of women are so uncomfortable that they avoid wearing a swimsuit in public, while that is true for only half as many men (Frederick et al., 2006).

- Among both teen and preteen girls, weight concern is a powerful motivator for tobacco use. Girls who are dissatisfied with their bodies are more likely to smoke as a means of weight control (Austin & Gortmaker, 2001; Kendzor et al., 2007; Neumark-Sztainer & Hannon, 2000).

### Facts and Research Findings

Research on links between female body image and sports and exercise has been somewhat inconsistent. Physical activity can build feelings of competence and self-esteem; it also boosts metabolism, thus improving physical conditioning and therefore appearance (Hausenblas & Downs, 2001). However, several studies have found that female athletes and/or exercisers have poorer body images than their less active peers (Parsons & Betz, 2001; Prichard & Tiggemann, 2008). Social physique anxiety can lead girls and women to either become more active in order to improve their appearance or to avoid social situations where their bodies will be on display (Hausenblas et al., 2004; Niven et al., 2009). For example, discomfort with wearing a swimsuit may be a barrier to swimming (James, 2000). The relationship between athletic participation and body image also depends on the sport; conventionally "feminine" sports may reinforce girls' acceptance of conventional cultural standards of female beauty, whereas nontraditional sports may ease the pressure to conform to those older standards.

- Exercise tends to have a positive effect on body image over time. In one study, college women who participated in a 12-week program of either aerobic exercise or circuit strength training reported significant improvements in body image compared to a non-exercising control group (Henry et al., 2006).

- Intervention programs emphasizing physical activity can serve as effective tools for reducing body dissatisfaction and improving body-esteem (Ciccomascolo & Grossi, 2008; Huang et al., 2007).

- Sports participation tends to have a positive effect on body image over time. In one study, women who participated in organized sports prior to college reported having a significantly better sense of positive body image while in college (Richman & Shaffer, 2000).

- Girls who participate in sports or athletic activities traditionally considered "feminine" or aesthetic, such as cheerleading, dance, or gymnastics, are more likely to report being ashamed of their bodies, feeling overweight, and actively trying to lose weight than girls who don't participate in sports (Crissey & Honea, 2006; Parsons & Betz, 2001).

- On average, female athletes are more likely to have positive a body image, and less likely to consider themselves overweight, than female nonathletes (Hausenblas & Downs, 2001; Miller et al., 2001).

- According to Sabo and Velez (2008), girls participating in three or more sports per year are more likely to have high scores on body-esteem measurements at all grade levels.

## Self-Esteem

### Background

Self-esteem, a positive or negative evaluation of one's own worth, is a key indicator of psychological well-being (Rosenberg, 1989). Self-esteem is a product of two factors: a sense of competence or self-efficacy based on our performance or accomplishments and an awareness of how others perceive us (McGee & Williams, 2000).. Research on the health and behavioral consequences of self-esteem has been hampered by methodological weaknesses and should not be considered conclusive (McGee & Williams, 2000); some researchers argue that the relationships in question have been significantly exaggerated in popular perception (e.g., Goodson et al., 2006). However, some studies have found links between low self-esteem and substance use (Boden et al., 2008; Swaim & Wayman, 2004; Wild et al., 2004a); sexual risk-taking (Ethier et al., 2006; Spencer et al., 2002); depression and suicidality (Orth et al., 2008;

Wild et al., 2004b); and unhealthy eating behavior (Martyn-Nemeth et al., 2009). Women, especially in adolescence, consistently suffer from lower self-esteem than their male peers, particularly in specific areas relating to appearance and physical competence (Gentile et al., 2009, Quatman & Watson, 2001).

- In Western cultures, girls tend to experience a significant decline in self-esteem over the course of adolescence, with the most severe loss found in white girls (Baldwin & Hoffmann, 2002; Biro et al., 2006).
- One important reason for low female self-esteem is that advertising, media in general, and popular culture pervasively sexualize girls and young women (American Psychological Association, 2007).
- For many girls, low self-esteem is linked to negative perceptions of weight, body fat, and body mass (Dunton, Jamner & Cooper, 2003).
- The link between self-esteem and sexual behavior differs considerably by gender; one study found that boys were more than twice as likely to be sexually precocious if they had high self-esteem, while girls were three times as likely to be sexually precocious if they had low self-esteem (Spencer et al., 2002). )
- Links between low self-esteem and depression are particularly strong. Both can be buffered by social support and social connectedness (Orth et al., 2008; Williams & Galliher, 2006).

## Facts and Research Findings

Research is divided on whether exercise and physical activity have positive impacts on women's self-esteem (e.g., Fox 2000) or not (e.g., Tiggemann & Williamson, 2000). This is due, in part, to a shortage of randomized, carefully controlled research studies that successfully isolate the influence of exercise itself from other factors that influence self-esteem, such as family dysfunction and/or poverty. Studies of the influence of sports participation on overall self-esteem have also had mixed results. One key area in which women and men differ is in athletic or physical self-esteem, a difference that can be seen early in the lifespan. Among children who play sports, boys report higher athletic self-esteem and perceived athletic competence than girls, a gender gap that increases during adolescence (Jacobs et al., 2002; Klomsten et al., 2004). The strongest findings suggest that sport affects girls' global self-esteem in indirect ways: by influencing other psychosocial factors that in turn contribute to a sense of physical and overall self-worth. For example, the relationship between sports participation and global self-esteem may be mediated by peer acceptance (Daniels & Leaper, 2006), sport self-concept (Slutzky & Simpkins, 2009), social connectedness (Armstrong & Oomen-Early, 2009), attachment to school (Tracy & Erkut, 2002), enjoyment of sports (Shaffer & Wittes, 2006), physical competence (Bowker, 2006), positive body image, and gender-role flexibility (Richman & Shaffer, 2000).

- Research shows that sports participation is positively associated with self-esteem in elementary school girls (McHale et al., 2005), 12th grade girls (Dishman et al., 2006), and college women (Armstrong & Oomen-Early, 2009).
- Tensions over gender-appropriate behavior can complicate the link between sports participation and self-esteem because female athletes risk being perceived as masculine by their peers (Daniels & Leaper, 2006; Richman & Shaffer, 2000). In one study, 11th-grade girls who endorsed a strongly feminine gender role orientation had lower self-esteem if they played competitive sports but higher self-esteem if they played recreational sports that were more socially-oriented and less competitive (Bowker et al., 003).
- The more time girls spend participating in team sports, the better they feel about their athletic abilities and the higher their level of self-esteem. The same link has not been found for individual sports (Pedersen & Seidman, 2004; Slutzky & Simpkins, 2009).

- Positive links between sports participation and girls' self-esteem have been found for white, African-American, and Hispanic girls (Erkut & Tracy, 2002; Schmalz et al., 2007; Tracy & Erkut, 2002).

- The indirect impact of sports participation on self-esteem has a shelf life of at least several years. In one study, preadolescent girls (ages 9–11) reported higher self-esteem two years later (Schmalz et al., 2007); in another study, women's pre-college sports participation predicted their self-esteem during the college years (Shaffer & Wittes, 2006).

## Pathogenic Weight Loss Behavior

### Background

Eating disorders are on the rise in the United States, affecting as many as 10-million Americans (National Eating Disorders Association, 2009) and over 90% of victims are female (Hoek & van Hoeken, 2003; Mitchell & Bulik, 2006). About 1% of women meet the diagnostic criteria for anorexia nervosa, a condition in which distorted body image and intense fear of gaining weight lead to voluntary starvation. Bulimia nervosa, a cyclical pattern of binge eating and purging, affects 1–2% of women. More than 3% of women suffer from a recently recognized third condition, binge eating disorder (Hudson et al., 2007). Far more common is a subclinical but maladaptive pattern of disordered eating that includes the use of dangerous weight control techniques such as self-induced vomiting; fasting; use of laxatives, diuretics, or diet pills; and excessive exercise (CDC, 2008; Neumark-Sztainer, 2005). Pathogenic weight control is associated with nutritional deficiencies, chronic fatigue, decreased bone density, erosion of tooth enamel, menstrual and reproductive abnormalities, lowered self-esteem, anxiety, and depression (Academy for Eating Disorders, 2009; Courtney et al., 2008; Fairburn & Harrison, 2003).

- Eating disorders are most common among adolescent and young adult women; 86% of cases report onset by age 20, and some girls have been diagnosed as young as age 7 (National Association of Anorexia Nervosa and Associated Disorders, 2004; Ricciardelli & McCabe, 2001).

- Anorexia nervosa has the highest mortality rate of any mental illness: as many as 20% of cases end in death according to some estimates (Eating Disorders Coalition, 2009).

- Unhealthy weight control behaviors are common among young women who are not eating-disordered. Nearly half of the college women in a recent study, reported attempting to compensate for the effects of eating by fasting (11.3%), exercising vigorously (16.3%), or both (15.4%) in the past month (LePage et al., 2008).

- More than half of adolescent girls use health-compromising weight control techniques such as skipping meals, fasting, smoking cigarettes, vomiting, and taking laxatives (Neumark-Sztainer, 2005). Overweight girls are especially prone to use these strategies (Neumark-Sztainer et al., 2007).

- High school girls are more likely than boys to report that in the past month they have fasted for 24 hours or longer (16.3% vs. 7.3%); used diet pills, powders, or liquids without a doctor's advice (7.5% vs. 4.2%); or vomited or taken laxatives (6.4% vs. 2.2%) to lose or avoid gaining weight (CDC, 2008).

- African-American women are at lower risk for anorexia and bulimia than white women, in part because they are less likely to adopt excessively thin beauty ideals (Perez & Joiner, 2003; Striegel-Moore et al., 2003). However, women of color are at no less risk for binge eating disorder and some pathogenic weight control techniques (Crago & Shisslak, 2003; Taylor et al., 2007).

### Facts and Research Findings

Female athletes are at elevated risk for pathogenic weight control behavior. In conjunction with amenorrhea and osteoporosis, eating disorders are part of a "Female Athlete Triad" that undermines health and (ironically) athletic performance (American

College of Sports Medicine, 2007; Manore et al., 2007). Sports participation may be a risk factor for eating disorders because of unique pressures to maintain a specific body weight and shape; personality traits commonly found in athletes, such as perfectionism, competitiveness, and compulsiveness, as well as competition-related anxiety may also play a role in disordered eating (de Bruin et al., 2009; Gulker et al., 2001; Holm-Denoma et al., 2009; Hopkinson & Lock, 2004). Pathogenic weight control techniques may even be perceived as "normal" within an athletic context, such as ballet dancers who routinely purge or gymnasts who stop menstruating due to self-imposed dietary restrictions.

- Eating disorders are most common in aesthetic sports that are scored on appearance or form (e.g., dancing, figure skating, or gymnastics); after puberty, the small-breasted, narrow-hipped ideal for these sports is difficult to attain without pathogenic weight control techniques (Bonci et al., 2008; Engel et al., 2003; Greydanus & Patel, 2004; Ryan, 1995; Sundgot-Borgen & Torstveit, 2004).

- Lean sports (e.g., running, swimming, or cycling) may also invite pathogenic weight-control behaviors. Adult women have about 25% body fat, elite female distance runners 12–16%, and elite female sprinters 8–10% (Greydanus & Patel, 2004). One recent study found 3% of non-lean-sport athletes at high risk for disordered eating but a much greater percentage (25%) of lean-sport athletes were at risk (Reinking & Alexander, 2005).

- Athletes often face significant social or financial pressure to regulate their body weight or shape. Failure may be noted, and sanctioned by, coaches, spectators, judges, and the athlete herself (Beals & Manore, 2002; Muscat & Long, 2008).

- Unsurprisingly, the most common weight-control behavior used by female college athletes is exercise. In one study, one-fourth of athletes exercised at least two hours a day for weight-related reasons—in *addition* to their sport training (Greenleaf et al., 2009).

- Elite athletes are at greater risk for pathogenic weight control behavior than those who compete at a lower level or participate in recreational sports only (Sundgot-Borgen & Torstveit, 2004; Smolak et al., 2000).

- A NCAA study found that 9% of female college athletes have clinically significant problems with bulimia and 3% have clinically significant problems with anorexia. Weekly binge eating is reported by 11% while 5.5% reported purging through self-induced vomiting, laxatives, or diuretics (Johnson et al., 1999).

- Pathogenic weight control also occurs in younger athletes. In one study, 19.6% of female high school athletes reported disordered eating in the past month (Pernick et al., 2006). A second study found middle and high school girls to be at least twice as likely to use vomiting, laxatives, or steroids if they participated in weight-sensitive sports (Vertalino et al., 2007).

A study using the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-IV) to define eating disorders found that such disorders were present in 31% of elite female athletes in "thin-build" sports (such as gymnastics and distance running), compared with 5.5% of nonathletes (Byrne & McClean, 2002).

# V. Educational and Social Dimensions

American girls faced gender bias in both education and athletics throughout most of the 20th century. Young girls were not pushed to pursue their own career goals and society expected women to depend on their husbands in order to survive. Similar to sports, certain academic subjects (e.g., science and mathematics) and careers (researchers and engineers) were labeled "masculine" by many educators and school advisors (Damarin, 2000). Recently however, girls have made progress overcoming societal stereotypes by excelling in academics. The pro-education orientation of young females is further demonstrated by the fact that 85% of girls graduate from high school, 27% earn a college degree, and 10% receive an advanced degree (U.S. Bureau of the Census, 2009). This represents an almost 30% increase in the number of girls earning high school and college diplomas since the 1970s (U.S. Census, 2006).

Several research studies highlight a positive connection between athletic participation and academic performance for both boys and girls. Interestingly, several researchers note that girls may reap more positive benefits from sport participation than boys. More specifically, sport participation has been shown to improve girls' performance in traditionally male-dominated subjects such as math and science.

## Sport and Academic Gains

### Background

Contrary to the "dumb jock" myth, research shows that participation in high school athletics can lead to improved academic performance. The positive academic outcomes derived from sport participation may include better grades, fewer disciplinary problems, increased attendance, and a greater desire to attend college. These positive outcomes are seen in both girls and boys and some have suggested that girls may experience greater benefits than boys (Broh, 2002). There are several mediating factors that influence the effect of sport participation on academics including socioeconomic status, the "jock stereotype," gender, race, and ethnicity. In fact, white girls appear to reap more positive benefits from sport performance than their African-American and Hispanic counterparts.

### Facts and Research Findings

- In a comprehensive review of the literature pertaining to high school sport participation and educational attainment, Hartmann (2008) concluded, "research has time and again demonstrated a strong and positive correlation between high school sports participation and academic achievement" (p. 3).

- With regards to educational success, interscholastic athletics have a similar positive effect to endeavors such as band, debate, music, and art that are commonly considered more "intellectual" (Barber, Eccles, & Stone, 2001; Darling et al., 2005; Eccles & Barber, 1999; Eccles et al., 2003; Marsh, 1992).

- Economists have found a positive association between sports participation and future wages and earnings (Barron, Ewing, & Waddell, 2000; Curtis, McTeen, & White, 2003; Ewing, 1995, 2007; Howell, Miracle, & Rees, 1984).

- Lipscomb (2006) found that high school athletes were 5% more likely have college aspirations than their peers who did not participate in sports. Kaylor and Flores (2007) suggested that female athletes from Culturally and Linguistically Diverse (CLD) backgrounds benefit from having an advisor or mentor who can help them formulate academic goals to positively affect their motivation as students.

- The positive effect of sports on academics appears to be similar, if not stronger, in girls than boys (Crosnoe, 2001, 2002; Hanson & Krauss, 1998; Sabo, Melnick, & Vanfossen, 1993). Positive effects may vary, however, depending on sport, and may be mediated out by racial and ethnic group (Eitle & Eitle, 2002; Hartmann, 2008).

- According to Troutman and Dufur (2007) females who participate in high school sports are more likely to complete college than those who do not participate in sports.
- Girls who participate in sports are more likely to experience academic success and graduate from high school than those who do not play sports (Sabo, Melnick, & Vanfossen, 1989a).
- Athletes in high school tend to do better academically over time (Crosnoe, 2002; Danish, 2002; Eccles & Barber, 1999; Marsh & Kleitman, 2003; Videon, 2002).
- Using a longitudinal sample of nearly 600 western New York adolescents, Miller et al. (2005) found that female and African-American adolescents who identified themselves as jocks reported lower grades than those who did not identify with the term "jock." Female athletes in the study also reported higher grades than female nonathletes.
- High school female athletes expressed a greater interest in graduating from college (Melnick, Vanfossen, & Sabo, 1988).
- A longitudinal study of 22,696 high school students in 1,052 schools found that both female and male athletes had higher grades, higher educational aspirations, and fewer school-related discipline problems than nonathletes (Fejgin, 1994).
- A nationwide study followed a sample of high school students between their sophomore and senior years. The positive educational impact of school sports was just as strong for girls as for boys and included improved self-concept and higher educational aspirations in the senior year, as well as greater school attendance; math, science and honors course enrollment; and time spent on homework (Marsh, 1993).
- High school athletic participation significantly lowered dropout rates for white females in suburban and rural schools (Sabo, Melnick & Vanfossen, 1989b).
- After finding that high school sports participation positively influenced 14 out of 22 senior and postsecondary educational outcomes (and showed no negative impact on the remaining eight outcomes), Marsh (1993) concluded, "participation in sport apparently adds to—not detracts from—time, energy, and commitment to academic pursuits" (p. 35).
- Researchers chose a nationwide sample of young people who were studied between their sophomore and senior years in high school and for four years after high school (1988–1994). Students involved with school sports had higher grades, more Carnegie units, and higher educational aspirations. Athletes spent more time on homework and applied to more colleges and universities. Two years after high school, former athletes were more likely to be enrolled in university and to have higher educational aspirations (Marsh & Kleitman, 2003).

African-American and Hispanic/Latino female athletes reported better grades in high school and greater involvement with extracurricular activities than female nonathletes. However these effects were more short-lived than for whites, for whom high school sports participation was associated with higher rates of college attendance and completion (Sabo, Melnick, & Vanfossen, 1989).

- In rural schools, Hispanic female athletes were three times less likely to drop out of school than nonathletes (Sabo, Melnick, & Vanfossen, 1989).
- Hispanic female athletes (especially from rural schools) were more likely than nonathletes to improve their academic standing while in high school, reach graduation and then attend college. (Sabo, Melnick, & Vanfossen, 1989).
- According to the NCAA, female athletes are more likely to graduate from Division I colleges and

universities compared to their male counterparts or the overall student population. (Christianson, 2008; NCAA Federal Graduation Rates Report, 2008). While the 2001–2002 graduation rate for all students was 62%, the graduation rate for female athletes was 72%.

- Although female college athletes in NCAA Division I schools generally graduate at higher rates than other students and male athletes, graduation rates for non-white female athletes lag behind those of white female athletes by as much as nine points. Graduation rates for female athletes by race and ethnicity for 2001–2002 were as follows: white female athletes, 74%; Asian/Pacific Islander, 72%; Hispanic, 69%; African-American,; and Native American female athletes, 65% (NCAA Federal Graduation Rates, 2008).

- In a study of the graduation success of 16 teams that advanced in the 2009 NCAA Men's and Women's Basketball Tournaments, female basketball players had greater academic success than male basketball players. Further, for both men's and women's teams, white athletes had higher graduation rates than African-American athletes (Lapchick et al., 2009).

- Anecdotal stories frequently appear in mass media suggesting college athletes get preferential treatment by faculty. In a 2007 study of 538 athletes (314 males and 224 females), results suggest that athletes may encounter negative prejudices from some faculty members at times while also benefiting from special treatment from others. Higher percentages of male athletes expressed a view that some faculty harbor negative perceptions of athletes compared to female athletes (39.6% to 23.7% respectively) and a higher percentage of male athletes reported receiving lower grades than they deserved than female athletes (30 .4% compared to 22.3%). At the same time, almost twice as many male athletes reported receiving higher grades than they deserved compared to their female athlete counterparts (13.8% compared to 7.6%) (Simon et al., 2007).

## Mathematics and Science Achievement

### Background

For many years girls were pushed away from traditionally "masculine" disciplines such as math and science (Sax et al., 2009). due to a belief that boys had an "innate ability" for math and science while girls possessed a "natural dislike" for these subjects (Halpern et al., 2007; Hyde & Mertz, 2009; Kiefer & Sekaquaptewa, 2006, 2007). For many girls, this meant that the educational doors leading to technical and scientific careers were closed in their faces.

- 7% of teenage girls reported an intention to work in science, engineering, and technology compared with 17% of boys (Marlino, & Wilson, 2003).

- In 2000, 21% of the Ph.D.s in mathematical and computer sciences, and 15.7% of the Ph.D.s in engineering at American universities, were awarded to women (National Science Foundation/Division of Science Resources Statistics, 2000).

- 40% of girls and 31% of boys said that math was their least favorite subject (Girls Incorporated, 2004).

- 21% of girls and 17% of boys said that science was their least favorite subject (Girls Incorporated, 2004).

It is increasingly evident that the gender disparity in math performance between boys and girls is a reflection of cultural expectations rather than hard-wired differences between the sexes (Berger et al., 2007; Halpern et al., 2007; Hyde & Mertz, 2009). Despite what some have characterized as a general aversion to math and science, a significant number of young girls are beginning to enroll in honors courses and girls' performance on the math portion of the SAT has improved. Further, as Halpern et al. (2007) point out, the differences between women's and men's math- and science-related abilities and choices

are far more subtle and complex than the oft-stated, oversimplified, perception that men are better than women in math and science.

- The average math SAT score for women has increased by 19 points since 1993 (National Science Foundation, 2003).

- Over the past 20 years, scores on the ACT exam have increased for both boys and girls, with minimal differences by sex in composite scores (boys, 21; girls, 20.9). A small sex difference was reported in 2004 in mathematics scores, with boys reporting an average score 1.1 points higher than that those reported by girls girls (Lacampagne et al., 2007).

- According to The College Board (2003) a higher percentage of young women (55%) enrolled in honors math than young men (45%). Young women also enrolled in honors science courses at a higher percentage (57% vs. 43%).

- In 2005, girls had lower scores on the math section of the SAT compared to boys. Within the subgroup consisting of girls, there were differences in average performance by race and ethnicity. Asian-American girls averaged a score of 566 in math while African-American girls averaged a score of 424. With the exception of African-Americans, for whom the sex difference favoring boys was 18 points, across different racial and ethnic groups, the size of the sex difference is at least 29 points (College Board, 2005 as reported in Lacampagne et al., 2007).

- According to Lacampagne et al. (2007), the largest differences in mathematics achievement levels favoring boys are found in the small percentage of students at very advanced levels.

- Results from the 2005 National Assessment of Education Progress (NAEP) High School Transcript Study indicate that high school girls, on average, earn slightly more credits in mathematics and science (7.3) than boys (7.1). A greater percentage of girls completed biology, advanced placement biology, and chemistry (Shettle et al., 2007).

- Based on data from the U.S. Department of Education High School Transcript Study, girls, on average, had a higher combined high school grade point average in mathematics and science than did boys in every year between 1990 and 2005 (National Girls Collaborative Project, 2009).

- Using data from the National Assessment of Educational Progress (NAEP) findings indicate that mathematics scores for both African-American and white public school students in grades 4 and 8 nationwide were higher than those reported in any previous assessment, going back to 1990. However, on average, white students recorded scores that were 26 points higher than African-American students. In 2007, the average score gains for African-American females were greater than those of their white peers (Vanneman et al, 2009).

- Contrary to the perception that girls are not interested in math and science, women earned 78% of all bachelor's degrees, 78% in psychology, 62% in biological sciences, 51% in chemistry, 46% in mathematics, 25% in computer sciences, 22% in physics, and 21% in engineering in 2004 (National Science Foundation, 2006). Women earn fewer graduate degrees in math and science disciplines and do not pursue careers in math and science to the degree men do (Halpern et al., 2007).

## Facts and Research Findings

Since the passage of Title IX women have begun to break into the traditionally male-dominated world of sports. Coinciding with this increased sport participation (and possibly because of it) women have also begun to enter into the traditionally male areas of math and science. Research suggests that there may be a connection between sport participation and math and science performance. In fact, in some studies, female high school athletes performed better in math and science courses than their female, non-athletic counterparts.

- In a study designed to determine the independent contributions of physical activity (distinguished

from physical education) to academic achievement in children, Stevens et al. (2008) found that physical activity was significantly and positively related to both mathematics and reading achievement in boys and girls.

- In a study of 134 children in the third, fourth, and fifth grade, Eveland-Sayers et al. (2009) found that physical fitness and academic achievement were linked in elementary school children. The study further found that the link was stronger for girls than for boys.

- Using data gathered for the 3,990 elementary students (kindergarten through eighth grade) in the Cambridge Public School Department for the academic year 2004–2005, Chomitz et al. (2009) reported a statistically significant relationship between fitness and academic achievement in math.

- Using data from the Early Childhood Longitudinal Study, Kindergarten Class of 1998 to 1999, Carlson et al. (2008) reported a small but significant benefit for academic achievement in mathematics and reading for girls enrolled in longer periods of physical education (70-300 minutes). For boys, more physical education wasn't associated with academic achievement, either positively or negatively.

- Results from a study of 11,957 children across the United States indicate that students who participate in school activities such as physical education classes and team sports, or played sports with their parents, are 20% more likely than sedentary children to earn an "A" in math or English (Nelson & Gordon-Larson, 2006).

A study by Lipscomb (2006) found that students who participated in high school sports scored 2% higher in standardized math and science tests.

- A 2002 study by the California Department of Education (CDE) showed a positive correlation between academic achievement and fitness scores with a greater association in math than in reading.

- Math scores increased with physical activity in a study conducted by Dwyer, Coonan, Leitch, Hetzel, & Baghurst (1983).

- Students who participated in a program that required them to participate in five more hours of physical activity each week showed improvements in math and overall intelligence scores despite spending 13–14% less time in the classroom (Shephard, 1997; Shephard et al., 1984).

- Increased physical activity has been shown to improve math scores, even when it replaces classroom time (NASPE, 2006).

- Intense physical activity programs have a positive effect on performance in math, reading, and writing (Symons, Cinelli, James, & Groff, 1997).

- High school girls who play sports are more likely to do well in science (Hanson & Kraus, 1998, 1999). Research on the relationship of sport type to academic success in science suggests that females involved in sports that challenge gender stereotypes may manifest better academic success in science classes compared with girls who participate in more "feminine" sports (Crissey et al., 2005).

Using National Educational Longitudinal Survey data, Eitle (2005) found that for female students in grades 8 and 10, the academic achievement benefits in math, science, and history may be greater, and more consistent, for white girls who participate in team and individual sports—with the exception of softball or basketball—than for African-American athletes.

- One study followed a nationwide sample of 11,683 high school students between their sophomore (1980) and senior years (1982). Compared to female non-athletes, female athletes reported greater access to, and more positive attitudes

toward, science and math courses. These findings were especially marked among white females from higher socioeconomic backgrounds (Hanson & Kraus, 1998).

- A nationwide sample of 8,325 young women was studied between their eighth-grade year (in 1987-88), through their sophomore year and senior year, and finally two years after high school (1994). Sports participation had a positive effect on math and science access, attainment, and attitude with the strongest influence occurring in the sophomore year (Hanson & Kraus, 1999).

## Exercise and Learning

### Background

Recently many school systems have downsized or eliminated their physical education programs in a response to economic struggles and the belief that more classroom time will improve academic performance. Therefore, many children are not receiving the recommended amount of physical activity each week. Additionally, the decreased opportunity to participate in physical activity may be more pronounced for girls than boys.

- From 2005–2006 only 28% of high school girls met the current physical activity requirements. White (30%) and Hispanic girls (27%) were more likely to meet current standards for physical activity than African-American girls (21%) (National Center for Education Statistics, 2003).

- The percentage of students taking daily physical education classes dropped from 42% to 29% between 1991 and 1999 (Centers for Disease Control and Prevention, 2003).

- Only 48% of high school girls attended a physical education class at least once a week in 2005 or 2006 (National Center for Education Statistics, 2003).

- Despite recommendations that children should engage in 60 minutes of moderate activity on most days of the week, estimates are that only 3.8% of elementary schools provide daily physical education (Lee, Burgeson, Fulton, & Spain, 2007).

- While white girls tend to be more physically active than African-American girls (Aaron, Kriska, Dearwater, et al., 1993; Crespo, Ainsworth, Keteyian, Heath, & Smit, 1999; Crespo, Smit, Andersen, Carter-Pokras, & Ainsworth, 2000; Heath, Pratt, Warren, & Kann, 1994; Sallis, Zakarian, Hovell, & Hofstetter, 1996; Trost, Pate, Saunders, Ward, Dowda, & Felton, 1997; Washburn, Kline, Lackland, & Wheeler, 1992; Wolf, Gortmaker, Cheung, Gray, Herzog, & Colditz, 1993), starting as early as age 10 both white and African-American girls show a steady decrease in physical activity (Crespo, Ainsworth, Keteyian, Heath, & Smit, 1999; Crespo, Smit, Andersen, Carter-Pokras, & Ainsworth, 2000; Department of Health and Human Services, 1996; Sallis, Alcaraz, McKenzie, & Hovell, 1999; Washburn, Kline, Lackland, & Wheeler, 1992)

In a study by Sue et al. (2002) the activity levels of 1,213 African-American girls and 1,166 white girls decreased significantly between the ages of 9 and 18. White girls suffered a 64% decline, while African-American girls experienced a 100% decline in activity.

- Vigorous physical activity is more common among white female high school students than Hispanic and African-American females (Centers for Disease Control and Prevention, 2002).

- Overall, male students (87.7%) are significantly more likely to have exercised 20 or more minutes in their average physical education (PE) classes than female students (78.8%) in their PE classes (Centers for Disease Control and Prevention, 2002).

- Nationwide 51.7% of students were enrolled in PE class. Approximately one-third (32.2%) of students nationwide attend PE class daily. There were no significant sex differences in participation in ninth and 10th grade, but male students in grade 11 (30%) were significantly more likely than female students

(15.6%) to have attended PE classes daily. In grade 12, males (26.1%) were significantly more likely than female students (14.7%) to have attended daily PE classes (Centers for Disease Control and Prevention, 2002).

## Facts and Research Findings

Several studies have shown that physical activity does not need to be sacrificed to improve academic performance. In fact, in many cases participation in physical activity has been shown to improve academic performance.

- Exercise itself may be associated with increased cognitive energy and learning. At a time when physical education classes are being dropped from many school curriculums, evidence suggests that physical activity and learning go hand-in-hand (Action for Healthy Kids, 2003).

- Several researchers have suggested that there is a link between physical fitness and some physiological functions which may improve cognitive performance (Colcombe et al., 2003; Endres et al., 2003; Moss, Franks, Briggs, Kennedy, & Scholey, 2005; Perico et al., 2005; Sohn, Chung, & Jang, 2005; Swain et al., 2003; Zheng et al., 2005)

- Schools that offer intense physical activity programs for their students experience an increase in academic achievement, concentration, and a decrease in disruptive behavior (Kolbe, Green, Foreyt, et al., 1986; Symons, Cinelli, James, & Groff, 1997).

- In a sample of 200 overweight 7- to 11-year-old children, physical activity improved cognitive function and test scores (Davis, Tkacz, & Tomporowski, 2007; Hellmich, 2007).

- In a study by Collingwood, Sunderlin, and Reynolds (2000), grade point average and attendance improved when physical activity increased.

- In some studies physical activity increased self-reported GPA and self-esteem and administration-reported academic performance (Dwyer, Blizzard, & Dean, 1996; Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001; Field, Diego, & Sanders, 2001; Linder, 1999; Tremblay, Inman, & Willms, 2000).

- Shephard (1997) and Shephard, Volle, Lavallee, LaBarre, Jequier, and Rajic (1984) found that participating in physical activity each week improved arousal and attention levels in the classroom as well as academic performance for second- and sixth-graders.

- Studies show that when a significant amount of time is dedicated to physical activity during the school day, academic performance is equal to, if not greater than that of students who are sedentary (Linder, 2002; Shephard, 1997; Tremblay, Inman, & Willms, 2000).

- Children who participate in physical activity experience several benefits that may positively impact their academic performance including increased brain function, higher energy, increased concentration, and increased self-esteem (Cocke, 2002; Dwyer, Coonan, Leitch, Hetzel, & Baghurst, 1983; Shephard, 1997; Tremblay, Inman, & Willms, 2000).

- Research suggests that regular exercise can improve cognitive function and increase the brain's ability to maintain healthy neurons (Cocke, 2002). Additionally, physical activity may increase energy and decrease boredom by providing a break from regular classroom activity. This increased energy and time away from the classroom may result in higher attention levels during instruction (Linder, 1999).

- The California Department of Education (CDE) (2002) found a highly positive correlation between academic achievement and fitness scores. In addition, females showed higher academic achievement at higher fitness levels than males.

- Harvard professor John Ratey (2008) suggests that exercise can help people focus and may help new neurons grow.

- In a study of 259 third- and fifth-graders Hillman, Erickson, and Kramer (2008) found that BMI and aerobic capacity were significantly related to higher academic scores. In addition, they found that students who were more physically fit had more activity in the prefrontal cortex of their brain, which is known for its control over other brain processes.

- Studies show that daily physical education periods do not adversely affect academic performance; in fact, regular exercise may improve cognitive functioning and concentration in students (Pellegrini & Smith, 1998; Shephard, 1997; Sibley & Etnier, 2003; Tomporowski, 2003).

- Several studies in Australia, Korea, and the United States found a positive relationship between physical fitness scores and academic performance in elementary and high school students (Castelli, Hillman, Buck, & Erwin, 2007; Chomitz, et al., 2009; Dwyer, Sallis, Blizzard, Lazarus, & Dean, 2001; Eveland-Sayers, et al., 2009; Kim et al, 2003; Knight & Rizzuto, 1993).

- A study in North Carolina found that students who received daily 10-minute activity breaks had an 8% increase in on-task behavior (Mahar et al., 2006).

- Physical exercise may boost brain function, improve mood, and otherwise increase learning (King, 1999)

- A review of almost 200 studies on the links between exercise and cognitive functioning reported that physical activity enhances learning (Etnier et al, 1997).

- Several studies document links between physical activity programs and concentration, as well as favorable academic outcomes such as better test scores and enhanced performance in math and reading (Shephard et al, 1984; Shephard, 1997; Symons et al, 1997).

# VI. Athletic Interest and Participation

## Interest in Sports

### Background

Title IX opened the doors of athletic opportunity for girls in 1972; since that time female participate increasingly at all levels of American sports. While data exist on female participation rates in sport, little is known about what gets girls interested in sports and physical activity and maintains that interest over time.

### Facts and Research Findings

Why some young girls take an interest in physical activity and sports while others do not has attracted the attention of researchers. Girls get involved with sports for many reasons, including self-image, body-image, peer support, parental encouragement, presence of role models, cultural supports, and not encountering barriers to their participation. Girls and their families also need program resources, safe venues, and opportunities to participate in school and community sports programs.

- A study of 20 middle school girls explored their attitudes toward participating in physical education classes. Findings indicate that when girls of that age feel connected to encouraging teachers, those who emphasize participation and effort over skill per se and who create a safe environment for girls both emotionally and physically, the girls want to compete and stay involved in PE classes. (Constantinou et al., 2009).

- Girls who engage in more "masculine" childhood activities, such as dodge ball, basketball or football, were more likely to get involved with organized sports (Giuliano, Popp & Knight, 2000).

- Girls who played in mainly male or coed groups as children were more likely to participate in sports later in childhood (Women's Sports Foundation, 1988; Giuliano, Popp & Knight, 2000).

- Girls (and boys) in grades 4 to 6 are more likely to show interest in physical activity if their parents encourage them, enjoy physical activities themselves and model a physically active lifestyle (Green & Chalip, 1997; Brustad, 1996; Leff & Hoyle, 1995).

- For middle-school girls, perceptions of belonging (e.g., being part of a team, being with friends and acceptance by others) were very much related to their interest in, and enjoyment of, physical activity and sport (Allen, 2003; Prochaska, Rodgers & Sallis, 2002; Smith, 1999).

- One study of high school girls revealed the main reasons for quitting sports were injury (26%), time conflicts (18%), conflict with coaches (16%), and boredom (14%) (Stewart & Taylor, 2000).

- A study of teenagers in the 9th, 10th, and 12th grades found that, for both girls and boys, peer relationships played a key role in their continuing involvement in, and commitment to, their sport (Patrick et al, 1999).

- A survey of more than 500 college students found that the number-one reason female athletes persisted in their participation in a sport was "personal fulfillment" (62%). The most commonly cited reasons for leaving their sport were "other activities prevented participation" (51%) and "low perceived ability" (17%) (Martin, 1997). Excessive commitment to a special sport talent can lead to feelings of entrapment and "burnout" among some female athletes (Weiss & Weiss, 2003).

- Urban girls, especially girls of color, often face unique barriers to participation. Many have jobs to supplement family incomes, while others take care of siblings at home. In some ethnic groups, girls may lack parental support for athletic participation (Place, 2004).

- Through focus group interviews with Hispanic students ages 12–18, Carter-Pokras et al. (2006) found that the students and their parents were positive about physical activity and exercise

but believed there were too few programs in Montgomery County (MD). Additionally, other barriers to participation identified in the study included: programs were too costly, lack of transportation, parental English ability, program staff and neighborhood concerns, not having time, and home chores. Findings supported a recommendation to develop more programs for Hispanic adolescents.

New research is exploring in finer detail how gender, along with social class and race, affect opportunities for girls to participate in sport and physical education. In a nationwide study of girls and boys in grades 3 through 12, as well as their parents, a complex picture of gender differences in athletic opportunities and physical activity emerged (Sabo & Veliz, 2008). Selected findings from this study include:

Similar rates of sport participation exist for girls and boys in suburban communities. However, girls are less involved in sport than boys in urban and rural settings.

- In general, boys overestimate their interest in sport while girls underestimate their interest. Of the children in grades three through eight described as non-athletes, 42% of boys indicated that "sports are a big part of who they are" compared with 16% of girls.

- There is a marked gender gap in physical education (PE), with 84% of urban girls and 68% of rural girls reporting no PE classes in the 11th and 12th grades (Sabo & Veliz, 2008).

### Youth Sport and Physical Activity

In Sabo and Velez's study, *Go Out and Play* (2008), girls participated in a wider array of physical activities while boys' menu of activities generally focused on more traditional forms of sport and exercise (e.g., baseball, basketball, football). In their study factors that appear to influence young people's involvement in sport and exercise included:

- While dance appeals to girls of all ages, volleyball is especially popular among middle-school girls. Basketball engages boys across all grade levels and skateboarding is popular among 3rd- to 5th-graders.

- While basketball, swimming, and jogging/running/cross-country are popular with both girls and boys, dancing and football are gender-specific activities.

- Inline skating ranks 9th (33%) in popularity for girls, while skateboarding ranks 10th (29%) for boys.

- Overall, girls and boys explored similar numbers of physical activities across grade levels.

- Compared with girls, boys generally engage in a narrower array of exercise and sports activities, tending to focus more on traditional sports. Girls are more apt to explore newly emerging physical activities like volleyball, cheerleading, dance, Double Dutch, and gymnastics

- There is a gender gap in physical activity. About 4 in 10 boys (39%) exercised six to seven days per week compared with 26% of girls. Girls are also slightly more likely than boys to be physically in active, i.e., 27% of girls and 21% of boys exercised on two days or less per week.

- The gender gap in physical activity widens when activity levels are traced across grade levels. As girls get older they are less likely to engage in high rates of physical activity (five days or more a week), while more boys remain highly involved with physical activity from childhood through high school.

- The steepest decline in physical activity is seen among Asian girls as they move into their high school years.

### High School Sports and Physical Activity

#### Background

Over the course of the past three decades, critics have questioned whether too much emphasis is placed on the link between Title IX, increased opportunities for girls and women to participate in sport and physical

activity, and the resulting potential for improvements in their overall health. However, a study examined just that link by examining the health of high school girls during the decade of the 1970s (when Title IX was first implemented). Results show that an increase in activity levels had a beneficial effect on the health of adolescent girls. The 20-point increase in girls' participation in sport in the immediate aftermath of Title IX's passage yielded a 24% increase in physical activity levels (Kaestner & Xu, 2006; Lewis, 2007). It is through the lens of Title IX that current levels of female participation in sport and physical activity at the high school level should be weighed, as well the existing shortfalls evaluated.

## Facts and Research Findings

Using 1972 as a baseline, the increase in the number of girls who participate in high school sports is nothing short of spectacular.

- In the 1971–72 school year, 294,015 girls participated in varsity sports. In 2007–08, the number grew to 3,057,266, representing an increase of more than 1,000% from the baseline year (National Federation of State High School Associations, 2008).
- The five most popular sports for high school girls in the 2007–08 school year were basketball (449,450); outdoor track and field (447,520); volleyball (397,968); fast-pitch softball (357,293); and soccer (346,545) (National Federation of State High School Associations, 2008).
- The data for the school year 2007–08 show a female presence in such nontraditional and "masculine" sports as riflery (1,062); 11-player football (1,225); baseball (1,010); wrestling (5,527); weight lifting (7,630); ice hockey (8,621); and water polo (17,773) (National Federation of State High School Associations, 2008). It should be noted, however, that what researchers consider nontraditional and "masculine" sports may not be regarded that way by girls themselves.
- While the absolute increase since the early 1970s in the number of female high school athletes has been impressive, the percentage of females playing varsity sports has remained relatively flat over the past five years.
- Despite the fact that 50% of the high school population is female, female athletes had access to only 41.1% of athletic opportunities in 2007–08, a gap of nearly nine points. In contrast, male athletes had access to 58.8% of playing opportunities (National Federation of State High School Associations, 2008
- Between the academic years 2003–04 and 2007–08, the percentage of athletic opportunities for girls slowly declined. There were 41.5% female athletic opportunities available at the start of that five-year window, and they had declined to 41.1% by the end (National Federation of State High School Associations, 2008).
- In real numbers, female athletes in 2007–08 had access to 1.3 million fewer athletic opportunities compared to male athletes (National Federation of State High School Athletic Associations, 2008).
- Suggested reasons for this reverse in the number of athletic opportunities for high school girls include increasing enrollments—but dwindling resources—in schools, both of which mean that girls are finding it more difficult to gain membership on varsity teams (Brady & Sylwester, 2003).
- High school boys receive nearly 60% more chances to play varsity sports than girls (National Federation of State High School Associations, 2008).
- Boys experience a 10% decline in sports participation between middle school and high school, whereas girls experience a 23% decline in participation (U.S. Secretary of Health and Human Services and U.S. Secretary of Education, 2000).
- If a girl does not participate in sports by the time she is 10, there is only a 10% chance she will participate when she is 25 (Bunker, 1988).

There are also troubling indications that declining rates of participation in physical education and exercise also include younger children, especially in poorer communities and school districts.

- According to the 2008 Physical Activity Guidelines for all Americans, adolescent girls should be have at least 60 minutes or more of physical activity per day. Throughout the week, girls should be doing activities that yield aerobic benefits, strengthen bones, and strengthen muscle. (U.S. Department of Health and Human Services, 2008).

- Adolescent girls are significantly less likely than boys to report that they have sufficient levels of vigorous physical activity in their lives (Centers for Disease Control and Prevention, 2002; U.S. Secretary of Health and Human Services and U.S. Secretary of Education, 2000).

- In 2007, the percentage of male students participating in at least 60 minutes of physical activity per day was 43.7% compared to 25.6% of female students. Whereas 33.2% of male students attended PE classes daily, only 27.3% of female students did so (U.S. Department of Health and Human Services, 2008; CDC Youth Risk Surveillance, United States, 2007).

- In the Youth, Education, and Society Study, data were gathered regarding participation levels of students in sport and physical activity for the years 2003 through 2005. Although more than 91% of 8th-grade students took physical education classes, only slightly more than one-third of high school seniors did. Varsity sport participation remained consistent across grade levels, with boys participating at a higher rate than girls (37.4% to 33.7%) (Johnson et al., 2007).

- In the Youth, Education, and Society Study, student participation in intramural activity declined for both boys and girls between 8th and 12th grade; boys' participation decreasing from 24% to 16% and girls' participation decreasing from 21% to 13% (Johnson et al., 2007).

- Almost 50% fewer female students in grades 11 and 12 attended PE classes daily compared with male students (Centers for Disease Control and Prevention, 2002).

- In one softball league for girls in the largely Dominican Manhattan neighborhoods of Washington Heights and Inwood, child-care responsibilities were a significant issue in reduced athletic participation for girls, along with an increasing lack of parental support as girls grew older (Baker, Freedman & Furano, 1997).

- Overall, male students (87.7%) in physical education class are significantly more likely than female students (78.8%) to have exercised 20 or more minutes during an average PE class. (Centers for Disease Control and Prevention, 2002).

- Recess and physical education are disappearing from urban school schedules (Halpern, 2003).

- Boston boys participate in about 50% more sports and physical activity programs than do girls (Cradock et al, 2002).

- Just over one-fourth of New York City high school girls (26%) participated in high school sports in 1997 compared with 42% of girls nationwide (Centers for Disease Control and Prevention, 1999).

- Of the children who live less than a mile from their schools, fewer than one in five children walk to school on a regular basis (Centers for Disease Control and Prevention, 2002).

- In research compiled by the federal government, 14% of young people reported no recent physical activity. Inactivity was more common among females (14%) than males (7%) and among African-American females (21%) than white females (12%) (Surgeon General of the United States, 1996).

Many girls who want to become physically active face unique obstacles, particularly poor girls and girls of color.

- The majority of youth programs and drop-in centers for older children and adolescents have male-oriented, if not male-dominated, cultures. Although they are welcome and some sports activity is co-ed, girls sometimes feel marginalized (Halpern, 2003).

- Some gender-associated constraints to physical activity for girls include lack of role models, social pressures, body image issues and fewer sports choices. Girls also lack parental encouragement, a significant factor because reportedly they rely on such encouragement more than boys (Team up for Youth, 2002).

- Girls sometimes feel less safe in public recreation spaces and use those spaces more for social than for physical purposes, including watching boys play sports (Team up for Youth, 2002).

- Nationwide, 51.7% of students are enrolled in PE class. Approximately one-third (32.2%) of students nationwide attend a PE class daily. There are no significant sex differences in participation in 9$^{th}$ and 10$^{th}$ grade, but male students in grade 11 (30%) are significantly more likely than female students (15.6%) to have attended PE classes daily. In grade 12, males (26.1%) are significantly more likely than female students (14.7%) to have attended a daily PE class (Centers for Disease Control and Prevention, 2002).

- Substantial declines in physical activity occur during adolescence in girls and are greater in African-American girls than in white girls. One study of 1,213 African-American girls and 1,166 white girls conducted over 10 years from the time the girls were 9 or 10 to the ages of 18 or 19 years found a 100% decline for African-American girls and a 64% decline for white girls. By the age of 16 or 17 years, 56% of the African-American girls and 31% of the white girls reported no habitual leisure-time activity (Kimm et al, 2002).

The discrepancies in the number of females participating in sport and physical activity are often attributed to a lack of inherent interest in sports on the part of girls and women. Although the size of the growth in women's sport from 1972 to the present, in every sector of the sport enterprise around the world as well as in the United States, provides evidence that biological determinism doesn't account for girls' and women's participation shortfall. There are persistent stereotypes that subtly discourage girls from participating in sports and research illuminates factors that contribute to these stereotypes:

- Based on interviews with 44 basketball players (25 females, 19 males) from socioeconomically diverse high schools, Shakib (2004) suggested that communication within a family, particularly between parents and female athletes, can be modified in a way that encourages females to participate in sport. For example, the experience of mothers who had not participated in sport was interpreted by males to mean that their mothers were not interested in sport without consideration for the fact that their mothers may not have had opportunities available to their sons and daughters. Similarly, for girls whose mothers are known to have curtailed their athletic experience due to family and home obligations, there was a tendency for subjects to develop stereotypical expectations that females give up their athletic careers earlier than male athletes. With modest prompts (i.e., discussing female athlete role models in the home or female athletes who have children and careers), there is the potential for both female and male athletes to adjust their views about what female athletes can achieve.

- When male and female high school basketball players were asked to recall formal and informal sport experiences they had as children; results revealed that the females in this study had fewer opportunities to play single-sex sports and were more likely to "gender-cross," meaning that they had played on a mixed-gender team in order to play a sport they liked. They also reported that their high school popularity was contingent on emphasizing

traditional femininity and downplaying their athleticism (Shakib, 2003).

- In a study of 17 NCAA Division I female head coaches, parental influence was identified as key to them having had the opportunity to participate in sport that lead to their careers in athletics. Specifically, parents supported these future coaches by attending games and providing the logistical support necessary to allow their daughters to compete. Mothers in particular played a role in creating an atmosphere where sport participation seemed appropriate for girls, especially during adolescence. The female coaches in this study also credited their parents with offering them encouragement without pressure (Dixon, Warner, & Bruening, 2008).

## College Sports Participation

### Background

The window of time marked by the passage of Title IX has held compelling possibilities for women at the college level. A nearly 1,000% increase in participation from 1972 to the present offers some evidence of positive change. At the same time, some of the challenges to achieving equity within a sex-segregated environment remain up for debate and discussion. The patterns documented here reflect both the progress that has been made and the challenges that remain.

- Between 1971–72 and 2000–01, overall female participation in college athletics increased from 15% to 42%. The increase among women of color was 7% to 15% for that time period (Women's Sports Foundation, 2002).

- During the 10 years between the years 1995–2006 and 2004–05, the number of females participating in college athletics grew by 26,000. The rate of growth, however, slowed in the last four years of this time frame (Cheslock, 2007; 2008).

- Both men and women's participation levels have increased over the last 25 years (Cheslock, 2007, 2008).

- Early growth in women's college sports favored sports with the highest level of racial and ethnic diversity. In recent years, growth is seen in women's sports characterized by less diversity because NCAA schools already sponsor most of the sports with high representation among female athletes of color (Cheslock, 2008).

- During the 2007–08 academic year, according to the NCAA, approximately 412,768 athletes participated in the varsity sports for which the NCAA sponsors championships. Of that group, 57.4% were male. The average NCAA member institution provided 232 athletic opportunities to males compared to 168 athletic opportunities for females (DeHaas, 2009).

- In 1978, the average number of athletic teams that colleges and universities offered to female athletes was only slightly greater than 2.00 while the average number of athletic teams offered had grown to 8.65 by 2007 (Acosta & Carpenter, 2008).

### Facts and Research Findings

Despite these gains in participation, gender inequalities persist.

- Few intercollegiate institutions provide participation opportunities for female athletes in proportion to the number of women in the general student body. For 2005–06, females comprised approximately 55% of all students attending NCAA member institutions. Across all divisions, with the exception of Division I non-football, 41% to 45% of all athletes were women. For schools in the highest division without football teams, women comprised almost 50% of the athlete population (DeHaas, 2008).

- Within the average NCAA Division I athletic department in 2005–06, male athletes received 55% ($2,175,200) of the scholarship money available while women received 45% ($1,799,000) of those funds (DeHaas, 2008).

- During the 2005–06 academic year, NCAA Division I athletic departments devoted 68% ($247,300)

of available recruiting dollars to male athletes compared with the 32% ($115,900) allocated to recruit female athletes (DeHaas, 2008).

- In an analysis of Equity in Athletics Disclosure Act (EADA) data for 555 public two-year institutions, women made up 55% of the overall student population during the four-year time period between 2003–04 and 2006–07. However only 37% of athletic opportunities were available to women, resulting in an 18% gap in athletic equity. In real numbers, while female athletes had access to 25,576 playing opportunities in 2006–07, their male counterparts had access to 44,778 opportunities (Staurowsky, in press).

## Incentives for Future Careers in Sport

### Background

In the first two decades following the passage of Title IX, much of the research on women in the sport workplace dealt with issues pertaining to the representation of women in college coaching and administration. In recent years, a growing body of research has expanded that frame to include the career paths of women serving in a wide range of positions within the vast array of sport organizations. A consistent finding across the expanse of this research is that, despite more female athletes than ever before participating in the sport system, obstacles persist for women who wish to be leaders and decision-makers in the sport industry. The career aspirations of young women often collide with the gender barriers that exist in most male-dominated sport organizations.

### Facts and Research Findings: Women in College and High School Coaching and Administration

Very little research exists gauging the involvement of women in high school coaching and athletics administration. In one of the few studies focused on this area, only 10% of the 423 high school athletic directors surveyed were female. When the male and female directors were given opportunities to apply for promotions to the position of athletic director, the females were as successful as their male counterparts (Pedersen & Whisenant, 2005). However, the question of when those opportunities arise is important. In many instances, the position of athletic director was paired with the position of head football coach. In those circumstances, women were not likely apply. This is borne out in a study of 301 job advertisements. Of those positions advertised, 73% (220) required the applicant to coach a boys' sport, predominantly football (94%) (Miller, Whisenant, & Pedersen, 2007).

A 31-year national study of women in leadership positions in college and university athletic programs, conducted by researchers Vivian Acosta and Linda Carpenter (2008), substantiates that despite the gains in girls and women's participation since 1972, women lost considerable ground in the areas of program leadership and decision-making.

- In 1972, 90% of all the coaches of women's college and university athletic teams were women. By 2008 women represented 42.8% of head coaches of NCAA women's sports teams (Acosta & Carpenter, 2008). For 30 years, the percentage of women coaching men's intercollegiate teams remained under 2% (Acosta & Carpenter, 2004). Between 2004 and 2008, there was a slight up-tick with 2 to 3% of men's teams being coached by women (Acosta & Carpenter, 2008).

- Women administrators directed 90% of women's intercollegiate sports programs in 1972, compared with only 21.3% of such programs in 2007-2008 (Acosta & Carpenter, 2008)..

- In American college and university athletic departments, 11.3% of the head sports information directors were women as were 27.3% of the full-time athletic trainers.

Whereas the Acosta and Carpenter (2008) study provides baseline data to demonstrate this decline, several other studies in recent years have yielded findings that offer insight into the perceptions of female college athletes and the degree to which

they aspire to pursue careers in athletics. They also provide possible explanations for why there are so few women coaches and athletics administrators at the college level.

- A three-part study of NCAA member institutions in 2007-2008 examined the perceptions of female athletes, coaches, and athletics administrators about careers in athletics. Approximately 30% of 8,900 female athlete respondents indicated they would likely or very likely have a career in athletics or exercise science. Of that group, 16% indicated that their long-term career goal was to work in college athletics (Bracken, 2009).

- Of the nearly 70% of NCAA female athletes who indicated that they did not anticipate pursuing a career in college sport, 70% expressed a desire for a higher salary than they could expect to earn in college coaching while approximately 60% of respondents expressed concern about the time demands of the job. When asked to identify reasons they believe qualified women leave careers in intercollegiate athletics, NCAA female athletes identified time requirements (37%), salary (27%), and unfavorable gender discrimination (11%) as the top three (Bracken, 2009).

- The perception of female college athletes that coaches of women's teams are not compensated equitably is borne out in a study of head coach and assistant coach salaries for colleges and universities in the state of Ohio between 2002–03 and 2005–06. Using EADA data, the wage gap for coaches of women's teams increased during those four years from approximately $7,500 to $13,440. There was also a gap in assistant coach compensation favoring coaches of men's teams, with assistant coaches of women's teams earning on average $5,000 to $6,000 less than assistant coaches of men's teams were making (Staurowsky, Morris, Paule, & Reese, 2007).

- In the 2005-2006 NCAA Gender Equity Report (DeHaas, 2008), the average Division I athletic department spent $1,202,400 on salaries for male coaches and $659,000 on salaries for female coaches. Athletic departments, on average, spent $1,128,110 on salaries for male assistant coaches and $481,700 on salaries for female assistant coaches.

- In a study of 201 (100 males, 101 females) Division I athletes measuring intentions to coach and identifying perceived barriers to entering the coaching profession, women collegiate athletes expressed less interest in coaching at all but the youth/recreational level compared with their male counterparts. Results mirrored the absence of female coaches at each level, where women athletes were less inclined to consider coaching at Division I and professional sport, arenas where there are fewer female coaches (Kamphoff & Gill, 2008).

- In the Kamphoff and Gill (2008) study, female college athletes were more likely to agree that women coaches receive different treatment than men coaches, evidencing an awareness that discrimination does exist in the coaching ranks.

- Female athletes may, in fact, be basing their perceptions on their observations of the few female coaches with whom they interact. According to the 1,475 female coaches in another study, 32% believed that they did not have work-life balance in their careers. Work-life balance appears to be even more difficult to achieve for female athletics administrators. Of the 1,107 surveyed for this study, 40% indicated they did not have balance between their work and personal lives (Bracken, 2009).

- Using an online focus group interview format, 41 mothers who are Division I head coaches discussed issues related to conflicts between work and family. Results indicated that work-family conflict affects work outcomes, including staffing patterns, relationships with athletes, and team performance, as well as relationships at home where they feel diminished time for children, spouses or partners and other family members. Head coaches who were mothers also commented on the guilt and exhaustion they experience and their efforts to

maintain perspective and balance (Bruening & Dixon, 2007).

- Documenting the experiences of five college coaches, Cruz (2009) explored what she called the "microcompetitions" that are the hallmarks of a female coach's experience and very existence working in a male-dominated setting. She explored the dilemmas female coaches face on a daily basis as they attempt to maintain their equilibrium in a culture that is both hypercompetitive and masculine.

- Reporting on the culture of athletic departments and workplace expectations, Dixon and Bruening (2007) found that a large majority of women head coaches (38 out of 41) believed there was flexibility work situations that allowed for bringing children to the office, working at home when necessary, and otherwise adjusting to the demands of work and family. Three of the coaches reported a work environment that was very different, stressing that colleagues and administration were not as tolerant of women bringing children to work and noting that supervisors believed accommodations to family life disrupt time in the office.

- According to 70% of the female coach respondents and 95% of female athletics administrators studied, qualified women do not apply for open positions in coaching and athletics administration. Further, 40% of the female administrators and 60% of the female coaches believed that the most qualified applicants, regardless of gender, are being hired (Bracken, 2009).

- Regarding hiring of women in college sport, 83 to 84% of the female administrators in the 2007-2008 NCAA study agreed that there was gender discrimination in athletics administration specifically and in athletics in general (Bracken, 2009).

- According to the Coaching and Gender Equity (CAGE) Project (Drago et al., 2006), the imbalance in the lives of coaches and athletics administrators does seem to have a substantive foundation. Based on Census 2000 data, full-time male coaches reported working 2,600 hours per year, while full-time female coaches were putting in 2,400 hours per year, far above the averages for women and men in other occupations.

- Describing a *family-unfriendly* work culture, the CAGE report documented that men college coaches were just as likely to be married as other men while women coaches were far less likely than their female counterparts in other occupations to be married (29.8% compared to 55.3%) (Drago et al., 2006). Although there may be a myriad of reasons why female coaches may be less likely to be married compared to their male counterparts (sexual orientation being one, women in sport possibly being more independent), nevertheless there is considerable support not just in this study but in the larger discussion regarding work-family conflict to identify this as an issue for coaches and for young women aspiring to become coaches. To further compound this picture, lesbian coaches in same-sex relationships with children may potentially be in a less tolerant atmosphere in terms of family culture than their heterosexual counterparts, either female or male.

In a full examination of the hiring practices and patterns for the academic year 2006–07 within college sport organizations, including the NCAA headquarters, conference offices, and individual athletic departments, Lapchick, Little, Lerner, & Matthew (2009) uncovered the following facts:

- Nearly 90% of all coaches of women's team were white.

- At the NCAA itself, only four women held positions at the level of vice-president.

- Women did not lead a single one of the most powerful football conferences in the country.

- The 30 power Division I conferences were all led

by white male commissioners, except at historically African-American colleges.

- African-American women and men held a combined 13.6% of head coaching positions in Division I basketball (10.7% and 2.9% respectively). As Lapchick et al. point out, this figure contrasts sharply with the 47.4% of African-American women who played college basketball.

- Among all NCAA college and university athletics directors, 93% of were white and 17% were women (7.8% at the Division I level, 15.6% at the Division II level, and 27.1% at the Division III level).

## Facts and Research Findings: Women in Other Sectors of the Sport Workplace

- During the 2008–09 season, the National Basketball Association (NBA) had three female majority owners while women comprised 18% of team vice-presidents, 24% of senior-level administrators, and 40% of professional administration (e.g., managers, supervisors, or coordinators in areas such as marketing, promotions, and publications). Of those broadcasting NBA games on television and radio, 8% were women (Lapchick et al., 2009).

- Women remain under-represented in what some call the American pastime, otherwise known as the business of professional baseball. For the 2008 season, one woman held a position at the presidential level while 17% served as team vice-presidents and 17% as senior team administrators (e.g., senior advisors, assistant general managers, legal counsel). Women held 14% of the professional administration positions (see directly above for explanation) and 2% of radio and television baseball broadcasters were women (Lapchick, et al., 2009).

- Lapchick, Bowey, & Zahn (2008) report that nearly 40% of the Major League Soccer (MLS) Office professional staff is female In 2007, 20.4% of team senior administrators were women while women held 27.3% of team professional staff positions. Just under 4% of those broadcasting MLS games on radio and television were women.

- Relying on data from the 2007 season, Lapchick, Little & Lerner (2008) determined that 6% of National Football League (NFL) majority owners were women; 3% of those serving at the CEO/ President level were women; and 11% of vice-presidents in the NFL were women. Women comprised 18% and 34% of senior and professional team administrators while 1% of those announcing NFL games were women.

- In contrast to the men's professional leagues, the Women's National Basketball Association (WNBA) shows a markedly different gender profile among its management employees. As WNBA president, Donna Orender serves as the only female president of a professional sports league in the United States. The majority of employees in the league office are women (74%) while 43% of senior administrators in the WNBA were women in 2008 (Lapchick, Lerner, & Zahn, 2008).

# VII. Emerging Research

During the past three decades, as increasing numbers of girls and women became engaged in physical activity and sport programs, the research community continued to identify new issues as they have arisen. In the following section, three areas of emerging research are covered that compile studies done on the female athlete triad, summarize current knowledge about female athletes and injury, and introduce information regarding female athletes and energy drinks.

## The Female Athlete Triad

### Background

Despite the numerous important benefits that accrue to girls and women who participate in regular physical activity, a small percentage of females who exercise may fall victim to one or more serious medical conditions that are collectively known as the Female Athlete Triad  The female athlete triad consists of three interrelated conditions that, in their most severe form, include eating disorders, amenorrhea, and osteoporosis (Nattiv et al., 2007; International Olympic Committee, 2004 Although any one of these problems can occur in isolation, nutrition inadequate for a woman's level of physical activity often begins a cycle in which all three occur in sequence..." (IOC, 2004, p. 2).

The Triad is engaged when a female athlete, intentionally or unintentionally, creates an energy deficit situation, meaning the amount of energy available through the food she eats falls short of what she is expending on her sport and in maintaining normal bodily functions. Female athletes may exhibit various behaviors that fall within the spectrum of disordered eating. They can range from skipping meals occasionally to severely restricting calories and engaging in pathological weight control behaviors similar to those of individuals diagnosed with clinical eating disorders such as anorexia nervosa and bulimia nervosa (American Psychiatric Work Group on Eating Disorders, 2000).

Although female athletes make conscious decisions at times to cut back on eating and/or engage in excessive physical activity because of poor body image or a high drive for thinness (Sundgot-Borgen, 1994), female athletes may acquire eating disorders or manifest unhealthy eating behaviors inadvertently as a result of heavy training schedules, decreased hunger, poor knowledge of nutrition, or lack of food availability throughout the day. Regardless of the reason(s), when a female athlete is operating with an energy deficit, her body responds physiologically by trying to conserve energy. Mirroring patterns found in undernourished populations, exercising women with problems associated with the Triad have been found to exhibit lower resting metabolism, low body temperature, low body weight, and alterations in metabolic hormone profiles (De Souza & Williams, 2004).

When women who exercise do not consume enough calories to keep up with the physical demands placed on their bodies, they are likely to experience menstrual irregularities. The spectrum of menstrual disturbances observed in female athletes and exercising women can range from subtle changes in the menstrual cycle to the complete absence of menstruation known as amenorrhea (De Souza & Williams, 2004). Individuals who display severe menstrual disturbances for a prolonged time experience what is known as hypoestrogenemia or low estrogen levels. Bone loss can result when hypoestrogenemia is combined with chronic energy deficiency (Nattiv et al., 2007).

Similar to disordered eating and menstrual disturbances, there is a spectrum of severity for bone loss. Osteoporosis is the most severe form of bone loss afflicting amenorrheic athletes (see the earlier section on Chronic Diseases on page 20 for definitions and more information on osteoporosis). Current methods to assess bone are two-dimensional as in dual X-ray absorptiometry (DXA) and only determine bone mineral density (BMD) without measuring fully dimensional bone architecture or bone quality. Newer methods including peripheral quantitative computed tomography (pQCT) and axial quantitative computed tomography (QCT) and peripheral QCT

(pQCT) are now being used to determine the effects of exercise, energy deficiency, and hypoestrogenemia on bone quality. Both energy deficiency and menstrual irregularities have been linked to bone loss (De Souza et al., 2008), as the preservation of bone mass and increased bone mass during growth and development depend on adequate energy and nutrient intake (calcium and vitamin D) as well as adequate exposure to estrogen as occurs with normal menstrual cyclicity.

## Facts and Research Findings

The prevalence of eating disorders and bone loss has been discussed earlier in this report (see sections on osteoporosis, depression, and pathogenic weight loss behavior). This section will cover the third condition of the female athlete triad, athletic amenorrhea.

Athletic amenorrhea is defined as the interruption of the athlete's menstrual cycle in the absence of any other factors or medical conditions classically associated with amenorrhea such as pregnancy, prolactinoma, thyroid diseases, metabolic diseases, etc. (Golden, 2008). Among the most significant findings regarding this prong of the Female Athletic Triad are the following:

- Researchers report that 22% of gymnasts, divers, and cheerleaders experience delayed menarche, or primary amenorrhea, compared with less than 1 % of the general female population.

The prevalence of secondary amenorrhea (disordered menstruation post-menarche) varies widely depending on the sport, and is also affected by age and body weight. Approximately 25% of young adult athletes across multiple sports were found to have athletic amenorrhea (Beals, 2006).

- The prevalence of amenorrhea/oligomenorrhea was 23.5% in a cross-sectional study of 170 female athletes ages 13–18 from various sport disciplines (Nichols, 2006).

- Doctors report higher prevalence rates of amenorrhea/oligomenorrhea (irregular menses) in athletes in adolescents involved in sport disciplines emphasizing a lean physique such as ballet dancing and running (45–50%) Castelo-Branco et al., 2006).

- Subclinical (less pronounced) menstrual disturbances, such as anovulation and luteal phase defects, can occur even in women who have normal-length menstrual cycles and report their participation in athletics to be largely recreational as opposed to competitive (De Souza et al., 1998).

- In numerous studies, BMD has been lower in amenorrheic athletes than in eumenorrheic athletes, athletes with regular menstrual cycles. oligomenorrhea or amenorrhoea) has also been associated with a two to four times greater incidence of stress fractures (Bennell et al., 1999) and low bone mass, particularly at the spine (Keen & Drinkwater, 1997).

- While no research has yet determined the minimum number of normal menstrual cycles per year necessary to prevent bone loss, irregular cycle lengths—as well as a history of irregular cycle lengths—have been associated with reduced BMD (Drinkwater et al., 1990).

When researchers evaluate bone loss and low bone mass, they often the criteria established by the World Health Organization, which are based on comparing individuals' BMD with that of an average healthy 30-year-old of the same gender and ethnicity. Osteopenia (low bone mass, a common precursor to osteoporosis) is diagnosed if BMD falls between 1.0 and 2.5 standard deviations below the mean (T score: -1.0 to -2.5) (Nattiv et al., 2007). Osteoporosis is diagnosed if BMD falls 2.5 standard deviations below the mean or lower (T score: < -2.5).

Recent studies have found that between 22% and 50% of female athletes suffer from osteopenia (compared with 12 percent of the general population), and up to 13 percent of female athletes suffer from osteoporosis (compared with 2.3 percent of the population) (Khan et al., 2002). While these statistics are certainly

cause for concern, it's important to note that there are currently no epidemiological data directly linking fracture risk to low BMD in adolescents and pre-menopausal women. More research needs to be done to determine the risk of fracture in young athletes as it relates to BMD.

In terms of bone health assessment, the International Society of Clinical Densitometry (ISCD) recently redefined its osteoporosis criteria for pre-menopausal women. Now, osteoporosis can be diagnosed if an individual's BMD falls at least two standard deviations below average (Z score: < -2.0) and there is at least one secondary clinical risk factor, such as chronic malnutrition, an eating disorder, hypogonadism, glucocorticoid use, or previous fractures. This new standard is widely accepted in some medical fields, but it may not be a perfect fit for female athletes, whose average BMD should be greater than that of the general population. The American College of Sports Medicine recommends that athletes whose BMD falls one to two standard deviations below average (Z score: -1 to -2) should be diagnosed as having low bone mass. A BMD (DXA) test result in this range is serious enough to warrant a referral for treatment.

## The Female Athlete Triad: Diagnosis & Treatment

Many physicians are not familiar with the Triad and are dismissive of its signs and symptoms (though considerable progress has been made in this area). Amenorrheic athletes are still frequently prescribed hormonal contraceptives to prevent or slow bone loss, but this does not address the underlying problem—it only addresses the symptoms. Contraceptives may normalize menstrual periods and provide exogenous estrogen, but the literature is undecided as to whether benefits to BMD result (Liu & Lebrun, 2006). In fact, long-acting progesterone-only contraceptives like Depo-Provera have been shown to cause bone loss, and the packaging now includes a warning to this effect. Nevertheless, this particular drug remains popular among athletes who feel normal menstruation impairs their performance. Athletes on birth control pills often believe they have addressed their Triad-related problems, and thus are probably not being counseled to improve dietary habits. As a result, they may continue to fall further down the energy availability spectrum, which can negatively effect athletic performance, bone formation, and overall health.

Few studies have determined the prevalence of the "full" Triad, i.e., the occurrence of all three components at the same time in the same individual. Using the new ISCD criteria, one study found the prevalence of all three components in elite athletes from a wide variety of sports to be similar to the control group (4.3% vs. 3.4 %) (Torstveit & Sundgot-Borgen, 2005). But in that study the control subjects were not strictly "non-athletes"—they exercised an average of five hours per week. Additionally, every Triad-positive control group member was overweight and had a history of pathological weight loss behavior. Two other studies have found the existence of all three Triad components among 2.7 % of female college athletes and 1.2 % of high school athletes (Beals & Hill, 2006; Nichols et al., 2006). The major limitation of these studies that attempt to quantify prevalence of the "full" Triad is that none reported to date has menstrual status evaluated beyond reporting cycle length. Examining only menstrual cycle length will clearly minimize the presence of menstrual disturbances such as luteal phase defects and anovulation given that detailed hormonal evaluations are required to define these irregularities.

## Facts and Findings

Ongoing studies are attempting to determine just how many "extra" calories are needed for normal menses to resume but thus far it appears that even small increases in body weight, less than five pounds, can lead to subtle changes in metabolic hormones (reflecting modest positive changes in energy balance), may be all that's required to resume normal ovulation and menstrual cycles.

- Menstrual irregularities and low BMD increase stress fracture risk (Nattiv et al., 2007)
- Current thinking is that if an athlete has been amenorrheic for six months or more, has suffered fractures, or has current or previous irregular menstrual cycles (more than 36 days between periods), she should take a DXA test.
- If the DXA result is a Z score < -2, the athlete should be referred for evaluation by a physician experienced in Triad-related problems and should meet with a dietician or nutritionist.
- If the result is a Z score between -1 and -2, the athlete should be referred to a dietician or nutritionist; if menses does not resume, the athlete should repeat the DXA test in 12 months.
- Oral contraceptive pills should be considered in an athlete over age 16 with functional hypothalamic amenorrhea (FHA) if BMD is decreasing with nonpharmacological management, despite adequate nutrition and body weight (Nattiv et al., 2007).
- It's important to remember that not all Triad-related symptoms are caused by energy deficiency. Amenorrhea might also be due to an anatomic defect, premature ovarian failure, a prolactin-secreting tumor, polycystic ovarian syndrome (PCOS), or pregnancy. Likewise, low bone mass can have other causes. A physician's evaluation and testing can determine whether another health problem is present (Nattiv et. al., 2007)
- No pharmacological agent has been shown to adequately restore bone loss or correct metabolic abnormalities that impair health and performance in athletes with Triad-related amenorrhea (Nattiv et al., 2007).
- The criteria for initiating oral contraceptive or estrogen therapy, and the optimal dosing schedule have not been defined largely because the use of these therapies remains controversial (American Academy of Pediatrics, 2000).
- The use of estrogen or oral contraceptive therapy by clinicians treating athletic amenorrhea was shown to be very heterogeneous in a recent study: 21% of the 126 health professionals surveyed would never use it whereas 14% would use it in the majority of their patients. These observations are not surprising given that the literature reports contradictory findings on the efficacy of estrogen or oral contraceptive therapy to improve bone health in pre-menopausal women with amenorrhea (Liu & Lebrun, 2006).
- In functional hypothalamic amenorrhea, increases in BMD are more closely associated with increases in weight than with estrogen or oral contraceptive therapy administration (Nattiv et al., 2007).

## Prevention of the Female Athlete Triad

Prevention of the Triad must begin with education on the part of athletes, coaches, athletic trainers, physicians, and other members of the sports medicine team. It is important to realize that Triad problems can be prevented if adequate food energy is consumed and energy deficiency is avoided. Exercise per se does not cause the Triad. Most educational efforts aimed at preventing the Triad focus on disordered eating. A comprehensive approach should include not only clinically recognized eating disorders, such as anorexia nervosa and bulimia nervosa, but also subclinical disordered eating to include the many athletes who don't meet the criteria for an eating disorder but have a preoccupation with body weight and a poor body image, both of which can lead to pathological eating behaviors in athletes.

- Education about "food as fuel" and proper sports nutrition may be helpful especially to those athletes who inadvertently under-consume calories.
- Sports medicine professionals and athletes themselves should be aware that even subtle menstrual cycle changes, such as the development

of very light or spotting periods, or moderate caloric restriction (with or without weight loss), can be early signs in the progression to serious Triad complications. If an athlete exhibits one aspect of the Triad, the other two should be inquired about. This might mean, for instance, that a BMD test and nutrition counseling is warranted for an athlete who reports experiencing irregular menstruation.

- One of the best times to identify potential Triad-related problems is during pre-participation physicals and yearly check-ups. Female athletes should be asked about their eating habits and their menstrual regularity as part of basic screening, and people with a history of stress fractures may warrant special attention.

These recommendations extend to all female athletes—not just those in sports that emphasize leanness—and also to habitually physically active women.

## Female Athletes & Injury

Injuries are routine occurrences in sport. A growing literature in the social sciences draws attention to the prevalence of sports-related injuries and their costs. Costs include both the physical and emotional toll on athletes personally and the costs of medical treatment and rehabilitation (Young, 2004). A related body of research examines the normalization of injuries, a term applied to the routine acceptance of injuries in sport not only among athletes but among coaches and sport medicine personnel. Normalization of injuries occurs across the spectrum of competitive contexts, from youth sport to university competition and higher levels of amateur and professional sport, and it affects both women and men (Theberge, 2008.)

Until recently, analyses of the incidence and risk factors for sport-related injuries paid little attention to gender or to women's sport. With the dramatic rise in women's sport participation over the last decades has come a similar rise in the incidence of injuries among women athletes. This development has in turned prompted expanded research on injuries in women's sport. Much of the attention has been devoted to knee injuries, and specifically to tears of the Anterior Cruciate Ligament or ACL. This review will first consider the available information on injuries in women's sport generally and then discuss ACL injuries specifically. Following this, information is presented on concussions, which have enjoyed a new research focus.

## Background: Injuries in Women's Sport

Musculoskeletal medicine is one area in which an appreciation of the effects of sex and gender most influences treatment and outcomes. Sports injuries are one specific area of musculoskeletal health that shows the interplay of sex and gender (Tosi, 2000).

Research done on sports injuries indicates that injury patterns are generally sport-specific, not gender-specific (Tosi, 2000.) However, there are notable exceptions. Knee injuries and anterior cruciate ligament injuries, spondylolisthesis, stress fractures in the pelvis and hip, pelvic floor dysfunction, patello-femoral problems, and bunions affect women in greater proportion than men (Arendt, 1994).

Despite the widespread acceptance that injuries are common in sport, there is limited information on the extent and nature of sport-related injuries (Arendt, 2007). The major exception is the Injury Surveillance System maintained by the National Collegiate Athletic Association (NCAA), which tracks injury incidence for 15 women and men's sports across a sample of institutions. These data are particularly valuable because they allow comparisons over time, and for specific subsamples on the basis of sport or gender. Two measures of incidence are provided: percentage of all injuries and rates per athlete exposure (AE), where an exposure is defined as one player participating in a game or practice. Analyses from these data of trends for select injuries (ankle ligament sprains, ACL injuries, concussions) over a 16-year period indicate the following for women.

- While rates vary across sports, both as a percentage

of injuries and by AE, in both men and women's sports sprains are by far the most common injury. The relative ranking of concussions and ACL injuries by these two measures varied by sports (Hootman, Dick & Agel, 2007).

- Among all sports included in the ISS, football had by far the greatest number of injuries in all three categories (Hootman, Dick & Agel, 2007).

## Female Athletes and ACL Injuries

ACL injuries constitute the "largest single problem in orthopaedic sports medicine" (Renstrom et al., 2008). ACL ruptures can lead to both temporary and permanent disability; loss of time from work, school, or sports; as well as chronic knee problems including osteoarthritis. Rupture of the ACL is costly, with conservative estimates of surgery and rehabilitation at $17 000 to $25 000 per injury (Hewett, Myer & Ford, 2006). These factors are irrespective of gender.

A number of studies have documented the extent of ACL tears among female athletes. These patterns may be presented in a number of ways. The greatest attention has been directed to the disparity in rates for male and female athletes. According to reports, female athletes may be two to eight times more likely to experience an ACL injury (Arendt, 2007; Madden, 2007).

### Facts and Research Findings

The most extensive data on gender and ACL injuries are provided by the NCAA Injury Surveillance System. Analyses from these data indicate the following:

- The two sports that have received the greatest attention are basketball and soccer. Over a 13-year period, from 1990-2002, the ratio of female to male ACL injury rate in basketball was 3.58 and in soccer 2.78 (Agel, Arendt & Bershadsky, 2005).

- The rate of ACL injuries among women athletes has changed little over the 13-year period for which data are available (Arendt and Dick, 1995; Agel, Arendt & Bershadsky, 2005).

- Three of the four sports with the highest rates of ACL injuries were women's sports (gymnastics, basketball and soccer) and all had significantly higher ACL injury rates than any other sport (Hootman, Dick & Agel, 2007).

- Gender specific comparisons of athletes at the U.S. Military (Uhorchak et al., 2003; Mountcastle et al., 2007) and Naval Academies (Gwinn et al., 2000) have also found higher rates of ACL injuries among female than male athletes.

- Among high school athletes, complete ligament tears of the knee are higher among female than male athletes (Ingram et al.; Louw, Manilall & Grimmer, 2008; Renstrom et al.)

- The persistence of high rates among NCAA female basketball and soccer players, even as the experience of players has increased over time, suggest there is no direct correlation between level of experience and the rate of ACL tears (Giugliano & Solomon, 2007).

- In contrast to the extensive interest, both among researchers and the popular media, in women's ACL injuries, little attention has been paid to the fact that male athletes also sustain ACL injuries (Agel, Arendt & Bershadsky).

- The NCAA data show that over a 13-year period for the sample of schools included in the ISS, there were 908 ACL tears in basketball and soccer over 3,006,726 athlete exposures (Agel, Arendt & Bershadsky, 2005).

- A review of the NCAA data for a three-year period from 1999–20000 to 2001–02 indicates that 1 in every 40 female basketball players and 1 in every 48 female soccer players will injure their ACL, per season (Perrin & Shultz, 2005).

### Mechanisms of ACL Injuries

Research consistently demonstrates that the majority of ACL tears among women athletes are

non-contact, that is to say, the forces applied to the knee at the time of injury were a result of the athlete's movements, not contact with another athlete or object (Shultz, 2008; see also Arendt, 2007). Typically, these injuries occur during planting, cutting, and landing maneuvers (Giugliano & Solomon, 2007).

The occurrence of a high proportion of ACL injuries through non-contact mechanisms is significant, it points to features of the athlete's movement, and not the circumstances of the sport activity, as the precipitating event for the injury.

**Risk Factors for ACL Injuries**

The bulk of the research on risk factors has been directed to identifying factors related to non-contact ACL injuries. The research literature on ACL tears among women focuses on three types of risk factors: anatomical alignment, hormonal and neuromuscular. An important difference between these theories is that anatomical and hormonal factors are intrinsic and largely not modifiable whereas neuromuscular movement patterns are modifiable through training and conditioning programs (Ireland, 2002; McLean, 2008).

- Risk factors for ACL injuries include lower extremity anatomy, joint laxity, hormonal influences, muscular strength and imbalance, joint stiffness, and jumping and landing characteristics (Huston et al., 2000).
- The alignment of lower limbs differs in several respects between males and females. (Arendt, 2007). There is no evidence of a direct relationship between anatomic alignment and the risk of ACL injury (Arendt, 2007).
- There is some evidence of an association between risk of ACL injury and menstrual cycle phase (Renstrom et al., 2008).
- Research to date suggests there is no direct effect of hormones on knee function and strength (Arendt, 2007; Kelly, 2008).
- Hormones may also act as an indirect influence through their effect on neuromuscular mechanisms. An indirect link between hormones and neuromuscular activity has not been identified (Arendt, 2007).
- There is no basis for modification of participation during various phases of the menstrual cycle or manipulation of sex-specific hormones to prevent ACL injuries (Ireland & Ott, 2004).
- Video analysis of male and female athletes identifies differences in movement patterns that place athletes at risk for ACL tears. While these patterns are not excusive to women, research suggests that females perform riskier neuromuscular patterns more often than men when doing similar sporting moves (Arendt, 2007; McLean, 2008).
- Another category of risk factors is environmental and includes meteorological conditions, surfacing, footwear and bracing. Much less research attention has been devoted to this category of risk factors.
- Evidence regarding the influence of environmental factors on risk of ACL injuries is confusing and mixed. (Griffin et al., 2006; Renstrom, et al., 2008). Moreover, there is no solid indication of how these factors would pose specific risks for women.
- There is no agreement on the influence of specific causal factors on risk of injury (Huston et al., 2000).
- There is agreement that multiple factors are responsible for ACL tears (Ireland, 2002; Guigliano & Solomon, 2007; Arendt, 2007).
- There is growing consensus that research on ACL injuries should focus on integration across risk factors (Shultz, Schmitz & Nguyen, 2008).

**Prevention**

- Prevention programs have focused on altering neuromuscular risk factors. Most programs have reported a decrease in the rate of knee injuries in the intervention group. (Griffin et al., 2006; Hewett, Ford & Myer, 2006).

- The components of successful intervention programs include improving balance, agility and flexibility (Garrett, 2005; Griffin et al, 2006.).

- The multifactorial nature of risks for ACL injuries poses significant challenges in identifying precise means of reducing the incidence (McLean, 2008).

- Despite the development of successful neuromuscular training programs, ACL injury rates and sex differences in these rates persist. It appears that despite their success, these programs fail to counter key factors in the injury mechanism. (McLean, 2008).

- There is increasing consideration in the literature of the need for training and conditioning programs for male and female athletes in the same sport to be different (Ireland, 2002; McLean, 2008). Differences between the sexes in anatomy and joint mechanics suggest that "simply teaching women to 'move like men' may be largely ineffective." (McLean, 2008).

- Girls should be encouraged to participate in numerous sports and cross training activities while growing and developing in order to be exposed to various proprioceptive challenges (Madden, 2007; Sokolove, 2008).

- The severity and costs of ACL injuries, both to the athlete and the medical system, indicate an important need to address this issue by identifying successful prevention strategies.

**Future Research: What Is Not Known About ACL Injuries in Women's Sports?**

There is broad consensus in the research literature on the need for further research to determine the causes and prevention strategies for ACL injuries.

While much research is devoted to the comparative incidence of ACL injuries among males and females, there is a need to move beyond studies that document sex differences and to focus on the underlying causes of the injuries (Shultz, Schmitz & Nguyen, 2008).

Similarly, research should focus on an integrated assessment of anatomical and hormonal factors and resultant neuromuscular characteristics (McLean, 2008).

## Female Athletes & Concussions

The number of sports related concussions appears to be increasing and there is a growing interest in sport related concussions (McKeever & Schatz, 2003). Because of the possibility of neurological damage, traumatic brain injuries are particularly serious and warrant attention. While much of the research on concussions focuses on men's football and hockey, there is more analyses of concussions in women's sport appearing. Obtaining sound data on the incidence of concussions is complicated by variability in reporting and diagnosis.

**Facts and Research Findings**

- Among women's sports, the highest incidence of concussions occurs in soccer (Covassin et al., Gessel et al, 2007).

- In a ranking of high school and college sports on the basis of concussions as a percentage of all injuries, women's soccer and basketball ranked highest, followed by football and men's soccer (Gessel et al., 2007).

- In soccer and basketball, at both high school and collegiate levels females sustain higher rates of concussions than males (Hootman, Dick & Agel, 2007; Covassin et al., Gessel et al, 2007).

- Among collegiate ice hockey players, women sustain higher levels of concussions than men (Hootman, Dick & Agel, 2007).

- Younger athletes appear to be at increased risk for concussions. This may be the result of younger brains being more susceptible to traumatic brain injury but there is no conclusive evidence on the reasons for the increased susceptibility (Covassin et al, 2003; Gessel et al., 2007; McKeever & Schatz, 2003).

- Research on risk factors for concussions is at a preliminary stage. In attempting to explain the observed sex differences in concussion rates, attention is being directed to biomechanical, neuroanatomical and neuromuscular factors but little is known about this topic (Covassin et al. 2003; Gessel et al, 2007; McKeever & Schatz, 2003).

- There is need for a more widespread understanding of the potentially dangerous impart of concussions in sport (McKeever & Schatz, 2003)

## Energy Drinks

Since 1997, when Red Bull debuted in the U.S. market, energy drinks have emerged as one of the fastest growing segments of the packaged beverage industry (Chang, 2009). Sales are expected to surpass $9 billion by 2011 with a current estimated annual growth rate of 12% (Report Buyer, 2007). Energy drinks are described in the economic downturn as a relatively affordable luxury for younger consumers (Francella, 2008). With names like Adrenaline Rush, Full Throttle, Monster Energy, Rockstar, Red Bull, and Xyience, these drinks are marketed as products that will help consumers focus, enhance alertness, and increase energy. Containing caffeine, taurine, vitamins, and usually sugar, these drinks are "... not suitable sources of rehydration or restoration of electrolytes in association with physical activity" (Miller, 2008, p. 481).

Despite this limitation, producers of energy drinks forge strong links between physical activity and the consumption of their products, presenting male athletes in extreme sports such as snowboarding, rock climbing, parasailing, and BASE jumping as the quintessential consumers (Finnegan, 2003; Miller, 2008). As a case example, DNA Beverage Corporation, makers of DNA Energy Drink, used its title sponsorship of the DNA/Butler Brothers Racing Team, which competed in Supercross and Motocross, to reach millions of fans and viewers. Other action sports with which the company is associated include surfing, BMX, wakeboard, and skateboarding. Product endorsers are recognized stars in their respective sports (Reuters, 2009). .

The industry claims it does not market its products to children, but nevertheless there is an emerging body of evidence that children may be adversely affected by energy drink consumption. In the state of Florida, the Poison Control Center began to monitor cases of caffeine overexposure after 39 persons, ranging in age from 2 to 20 years, exhibited signs of anxiety attacks, dehydration, elevated heart rates, headaches and interrupted sleep patterns (Chang, 2009; Reissig et al., 2008; RedOrbit, 2008).

To compound this issue, there is confusion among some consumers between sport drinks, which are products, designed to rehydrate athletes during and after physical activity, and energy drinks, which have none of the restorative qualities found in sport drinks and are designed as energy boosters for both athlete and general populations (NSFHA, 2009).

Little research has been done to assess the potential health concerns associated with the use of energy drinks because it has been an emerging market. Still, existing research is helpful in highlighting areas of current concern and anticipating potential problems that might best be addressed proactively through regulation and public policy. As Reissig et al. (2009) report, "Although the full impact of the rise in the popularity of energy drinks has yet to be realized, the potential for adverse health consequences should be considered and may be cause for pre-emptive regulatory action" (p. 2).

The most recognizable active ingredient in energy drinks is caffeine. Whereas research has shown that modest levels of caffeine consumption generally pose little-to-no health risk to average consumers, the possibility of excessive caffeine consumption is higher in energy drink consumers because there is no regulation of caffeine content in these drinks as there is, for example, in soda. Within energy drinks, caffeine content varies but can be as high as 200 milligrams, a level twice as high as that found in coffee. While there is the real danger of caffeine overdose, especially in

younger consumers, there is little information on the possible short- and long-term effects of the other additives in these products in combination with excessive caffeine (Reissig et al., 2009).

- In 2008, approximately one-third of 12- to 24-year-olds regularly use energy drinks (Parker-Pope, 2008).
- In a study of 795 undergraduate students, self-reported measures of masculinity and risk-taking behaviors were positively associated with frequency of energy drink consumption (Miller, 2008).
- According to Malinauskas et al. (2007), 51% of college students consumed energy drinks.
- In a survey designed to examine the source of information and usage of nutritional supplements in 115 male and 88 female varsity athletes at a Division I institution, 73% of those survey reported using energy drinks (Froiland et al., 2004).
- In 2008, the National Federation of State High School Associations Sports Medicine Advisory Committee issued a position statement and recommendations on energy drinks (National Federatio of State High School Associations, 2008).
- The Arizona Interscholastic Association proactively seeks to educate parents and students about the potential dangers of energy drinks (Obert, 2009).
- According to Dr. Edward Laskowski (2009), "occasional energy drinks are fine for most people." For individuals with underlying heart problems, excessive amounts of energy drinks have been associated with a range of health problems, including manic episodes, seizures, chest pain, heart attacks, and sudden cardiac death.

Although little is known about the use of energy drinks by female athletes, there is at least one drink on the marketed targeted to female athletes, called "Go Girl Energy Drink" and CareerFair.com reports that one or two are now making claims that they are fortified with ingredients suited for the female body (How Women's Energy Drinks Work, n.d.).

## VIII. Giving Voice: The Last Word From Active Girls & Women

For all of the attention directed to improving the lives of girls and women through the promotion of sport and physical activity, there have been few concerted efforts over the years to create avenues for girls and women to voice their individual thoughts and feelings about what it means to be a varsity athlete or to be empowered through sport to lead a more fulfilled and fulfilling life. Some research is beginning to turn the controls over to girls and women for this very reason. To follow is a sampling of these studies

Krane, Ross et al (2009)—a study of female college athletes asking how they would want to represent themselves. Some want to be depicted in their team uniforms in action shots because they take pride in their identities as athletes. One young woman expressed a wish to be presented wearing an A-line skirt, pumps, and her letter jacket while carrying her books, because she wants to illustrate her belief that athletic participation is going to help her move forward into a career in business. Other female athletes wish to be depicted in action shots, showing their muscles and specific competence in their sport.

- Krane, Choi, Baird, Aimar & Kauer (2004)—this study allows female athletes to voice the challenges they face navigating the dual paths of being female and being an athlete. At the same time, these female athletes talk about the pride they have in being physically strong and powerful.

- Armstrong et al. (2008)—in this study of African-American female college athletes, voices of both triumph and frustration can be heard. These athletes talk poignantly about the educational opportunities afforded to them through athletics but also talk about how they are silenced

- Ross & Shinew (2008)—through interviews with 14 elite collegiate athletes (seven gymnasts and seven softball players), appreciation of their physical power was the primary theme when this group of female athletes talked about themselves. Although these women were aware of societal pressures to conform to standards of femininity, they appeared to have created strategies to deal with them while supporting one another as they individually and collectively develop the inspiring sense of an athletic ideal.

- Giovanni (2008)—This study explores the experiences of female athletes in contact sports

- Stoelting (2005)—Women who had retired from athletics, and had been out of college for at least two years, were interviewed about their experiences and what it was like to have been an athlete in school. They described the empowerment they felt at having had control over their own body and the ability to maintain control over other things in their life, expressing pride in having been able to handle the multiple demands of their academic and athletic lives.

- George (2005)—through participant-observation and interviews, George chronicled the complicated lives of members of a female collegiate soccer team. Through the female athletes in this study, we learn how women relate to their developing muscles. Although some players were ambivalent about recognizing signs that they were getting visibly stronger (e.g., developing biceps), others took great pride in how they were developing strength and power, both literally and figuratively.

- Madsen (2007)—this study engaged women college presidents to speak about their formative experiences. While these women describe themselves variously as being obedient, reflective, observant, smart, and self-directed as children, they also talk about having been competitive, having had moderate-to-high levels of confidence, and the ways in which sport experiences significant for some of them in their overall development.

## Conclusion

*Her Life Depends On It* II is the most comprehensive source of facts, research, and analysis on sports and physical activity in the lives of girls and women. The authors and the Women's Sports Foundation hope that our readers use the report to create and expand programs and participation opportunities. The bulk of research findings in this systematic review promise to inform current public health initiatives that aim to augment women's health and well-being. For access to additional data, research reports, and policy statements, visit www.WomensSportsFoundation.org

# References

## Executive Summary


Brown, D. R., & Blanton, C. J. (2002). Physical activity, sports participation, and suicidal behavior among college students. *Medicine & Science in Sports & Exercise 34* (7), 1087-1096.

Brown, D. R., Galuska, D. A., Zhang, J., Eaton, D. K., Fulton, J. E., Lowry, R., & Maynard, L. M. (2007). Physical activity, sport participation, and suicidal behavior: U.S. high school students. *Medicine & Science in Sports & Exercise 39*, 2248-2257.

Buchner, D. M., & Schmid, T. (2009, February). Active living research and public health: Natural partners in a new field. *American Journal of Preventive Medicine 36* (2) (supplement).

Cheslock, J. (2007). *Who's Playing College Sports? Trends in Participation*. East Meadow, NY: Women's Sports Foundation.

Cheslock, J. (2008). *Who's Playing College Sports? Money, Race and Gender.* East Meadow, NY: Women's Sports Foundation.

Cooky, C. (2009). "Girls just aren't interested": The social construction of interest in girls' sport. *Sociological Perspectives 52* (2), 259-284.

De Souza, M. J. & Williams, N. I. (2004). Physiological aspects and clinical sequelae of energy deficiency and hypoestrogenism in exercising women. *Human Reproduction Update 10*, 433-448.

Floriano, V., & Kennedy, C. (2007). Promotion of physical activity in primary care or obesity treatment/ prevention in children. *Current Opinion in Pediatrics 19*, 99-103.

Ford, J. A. (2008). Nonmedical prescription drug use among college students: A comparison between athletes and nonathletes. *Journal of American College Health 57* (2), 211-219.

Kirby, D. (2007). Emerging answers: Research findings on programs to reduce teen pregnancy. Washington, DC: National Campaign to Prevent Teen Pregnancy.

Lagerros, Y. T., Hsieh, S. F., et al. (2004). Physical activity in adolescence and young adulthood and breast cancer risk: a quantitative review. *European Journal of Cancer Prevention 13*, 5-12.

Lehman, S. J., & Koerner, S. S. (2004). Adolescent women's sports involvement and sexual behavior/ health: A process-level investigation. *Journal of Youth and Adolescence* 33 (5), 443-455.

MacKelvie, K., McKay, H., et al. (2001). A school-based exercise intervention augments bone mineral accrual in early pubertal girls. *Journal of Pediatrics 139*, 501-508.

MacKelvie, K., McKay, H., et al. (2002). Bone mineral response to a 7-month randomized controlled, school-based jumping intervention in 121 prepubertal boys: Association with ethnicity and body mass index. *Journal of Bone Mineral Research 17*, 834-844.

MacKelvie, K., Khan, K., et al. (2003). A school-based exercise intervention elicits substantial bone health benefits: A 2-year randomized controlled trial in girls. *Pediatrics 112* (6), 447.

MacKelvie, K., Petit, M., et al., (2004). Bone mass structure are enhanced following a 2-year randomized controlled trial of exercise in prepubertal boys. *Bone 34*, 75-76.

Melnick, M.J., Miller, K.E., Sabo, D., Farrell, M.P., and Barnes, G.M. (2001). "Tobacco use among high school athletes and nonathletes: Results of the 1997 Youth Risk Behavior Survey." *Adolescence*, *36*: 727-747.

McKercher, C. M., Schmidt, M. D., Sanderson, K. A., Patton, G. C., Dwyer, T., & Venn, A. J. (2009). Physical activity and depression in young adults. *American Journal of Preventive Medicine 36*, 161-164.

Miller, K.E., Sabo, D., Melnick, J.J., Farrell, M.P., and Barnes, G.M. (2000). *The Women's Sports Foundation Report: Health Risks and the Teen Athlete*. East Meadow, NY: Women's Sports Foundation.

Miller, K. E., Barnes, G. M., Melnick, M. J., Sabo, D., & Farrell, M. P. (2002). Gender and racial/ethnic differences in predicting adolescent sexual risk: Athletic participation vs. exercise. *Journal of Health & Social Behavior 43*, 436-450.

National Association of Anorexia Nervosa and Associated Disorders (2009). General information: Facts about eating disorders. Retrieved July 20, 2009, from http://www.anad.org.

National Association for Sport and Physical Education (NASPE) and American Heart Association (AHA) (2006). *Shape of the nation*. Washington, DC: American Heart Association.

National Federation of State High School Associations (2008). The 2007-2008 High School Athletics Participation Survey. Indianapolis, IN: National Federation of State High School Associations.

National Parent Teacher Association (PTA). (2006). Recess is at risk: New campaign comes to the rescue. Chicago, IL: Author.

National Physical Activity Plan Conference. (2009). Washington, DC, July 1-2, 2009.

Ogden, C. L. (2009). Disparities in obesity prevalence in the United States: Black women at risk. *American Journal of Clinical Nutrition 89*, 101-102.

Pate, R.R., Trost, S.G., Levin, S., and Dowda, M. (2000). Sports participation and health-related behaviors among U.S. youth. *Archives of Pediatric and Adolescent Medicine, 154*, 904- 04-911.

Sabo, D., Miller, K. E., Melnick, M. J., & Heywood, L. (2004). *Her Life Depends On It: Sport, Physical Activity, and the Health and Well-Being of American Girls*. East Meadow, NY: Women's Sports Foundation.

Sabo, D., Miller, K. E., Melnick, M. J., Farrell, M. P., & Barnes, G. M. (2005). High school athletic participation and adolescent suicide: A nationwide study. *International Review for the Sociology of Sport 40*, 5-23.

Sabo, D., & Veliz, P. (2008). *Go Out and Play: Youth Sports in America*. East Meadow, NY: Women's Sports Foundation.

Sanders, C. E., Field, T. M., Diego, M., & Kaplan, M. (2000). Moderate involvement in sports is related to lower depression levels in adolescents. *Adolescence 35* (140), 793-797.

Staurowsky, E. J., Morris, H., Paule, A., & Reese, J. (2007, October). Travelers on the Title IX compliance highway: How are Ohio's colleges and universities faring? *Women in Sport and Physical Activity Journal.*

Staurowsky, E. J. (in press). Gender equity in two-year athletic departments: Part I. In Hagedorn, L., & Horton, D. (Eds.). *New directions for community colleges*. New York, NY: Jossey Bass.

Taliaferro, L. A., Rienzo, B. A., Miller, M. D., Pigg, R. M., Jr., & Dodd, V. J. (2008a). High school youth and suicide risk: Exploring protection afforded through physical activity and sport participation. *Journal of School Health 78*, 545-553.

Theberge, N. (2008). 'Just a normal bad part of what I do': Elite athletes' accounts of the relationship between sport participation and health. *Sociology of Sport Journal, 25* (2), 206-222.

Troutman, K.P., & Dufur, M.J. (2007). From high school jocks to college grads: Assessing the long-term effects of high school sport participation on females' educational attainment. *Youth and Society, 38*(4), 443-462.

United States Department of Health and Human Services (USDHHS). (1996). *Physical activity and health: A report of the Surgeon General*. Atlanta, GA: CDC, 1996. Retrieved July 21, 2009, from http://cdc.gov/nccdphp/sgr/contents.htm

World Health Organization (2004). *Global strategy on diet, physical activity, and health*. Geneva, SW: Author.

Yusko, D. A., Buckman, J. F., White, H.R., & Pandina, R. J. (2008). Alcohol, tobacco, illicit drugs, and performance enhancers: A comparison of use by college student athletes and nonathletes. *Journal of American College Health 57* (3), 281-289.

## Introduction

Alzheimer's Association (2009). *2009 Alzheimer's disease facts and figures: Executive summary*. Retrieved August 28, 2009, from http://www.alz.org/national/documents/summary_alzfactsfigures2009.pdf

American Heart Association and American Stroke Association (2009). Heart disease and stroke statistics, 2009 update. Dallas, TX: American Heart Association and American Stroke Association.

American Cancer Society (2009). *Cancer facts and figures, 2009.* Retrieved August 28, 2009, from http://www.cancer.org/docroot/STT/content/STT_1x_Cancer_Facts__Figures_2009.asp?from=fast.

American Diabetes Association (2009). Direct and indirect costs of diabetes in the United States. Retrieved August 28, 2009, from http://www.diabetes.org/diabetes-statistics/cost-of-diabetes-in-us.jsp

Centers for Disease Control and Prevention. (2008). Youth risk behavior surveillance—United States, 2007. *Morbidity and Mortality Weekly Reports, 57* (SS-4), 1-131.

Centers for Disease Control and Prevention. (2008, November 18). Smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 2000-2004. *Morbidity and Mortality Weekly Reports, 57* (45), 1126-1128.

Harwood, H. (2000). Updating estimates of the economic costs of alcohol abuse in the United States: Estimates, update methods, and data. Report prepared by The Lewin Group for the National Institute on Alcohol Abuse and Alcoholism. Based on estimates, analyses, and data reported in Harwood, H., Fountain, D., and Livermore, G. (1998). The Economic Costs of Alcohol and Drug Abuse in the United States 1992. Report prepared for the National Institute on Drug Abuse and the National Institute on Alcohol Abuse and Alcoholism, National Institutes of Health, Department of Health and Human Services. NIH Publication No. 98-4327. Rockville, MD: National Institutes of Health.

Hoffman, S. (2006). *By the numbers: The public costs of teen childbearing*. Washington, DC: The National Campaign to Prevent Teen Pregnancy. Retrieved August 28, 2009, from http://www.thenationalcampaign.org/costs/pdf/report/BTN_National_Report.pdf

Li, W., Kelsey, J. L., Zhang, Z., Lemon, S. C., Mezgebu, S., Boddie-Willis, C., et al. (2009). Small-area estimation and prioritizing communities for obesity control in Massachusetts. *American Journal of Public Health, 99*(3), 511-519.

Miller, K. E., Sabo, D. F., Farrell, M. P., Barnes, G. M., & Melnick, M. J. (1998). Athletic participation and sexual behavior in adolescents: The different worlds of boys and girls. *Journal of Health and Social Behavior, 39,* 108-123.

Office of National Drug Policy (2004). T*he economic costs of drug abuse in the United States 1992-2002* Retrieved August 29, 2009, from http://www.ncjrs.gov/ondcppubs/publications/pdf/economic_costs.pdf

## I. Prevention of Chronic Diseases in Later Life

Pratt, M., Macera, C., and Wang, G. (2000). Higher direct medical costs associated with physical inactivity, *The Physician and Sports Medicine, 28*, 63-70.

## Heart Disease


Ades, P. A., Savage, P. D., Brochu, M., Tischler, M. D., Lee, N. M., & Poehlman, E. T. (2005). Resistance training increses total daily energy expenditure in disabled older women with coronary heart disease. *Journal of Applied Physiology, 98*, 1280-1285.

Albright, C., & Thompson, D. L. (2006). The effectiveness of walking in preventing cardiovascular disease in women: A review of the current literature. *Journal of Women Health, 15*, 271-279.

American Heart Association. (2009). *Heart Disease and Stroke Statistics–2009 Update*. Dallas: Texas.

Barrett-Connor, E. (2006). Hormones and heart disease in women: Where are we in 2005. Department of Family and Preventive Medicine, School of Medicine, University of California, San Diego, 85-87.

Bushnell, C., Hurn, P., & Colton, C. (2006). Advancing the study of stroke in women: summary and recommendations for future research from an NINDS-sponsored multidisciplinary working group. *Stroke*, *37,* 2387-2399.

Christian, A., Rosamond, W., & White, A. (2007). Nine year trends and racial and ethnic disparities in women's awareness of heart disease and stroke: an American Heart Association National Study. *Journal of Women's Health, 16*(1), 68-81.

Colhoun, H. (2006). Coronary Heart disease in women: Why the disproportionate risk. The Conway Institute, University College, Dublin, 22-28.

Crimmins, E. M., Hayward, M. D., Ueda, H., Saito, Y., & Kim, J. K. (2008). Life with and without heart disease among women and men over 50. *Journal of Women & Aging, 20*, 5-18.

Dalleck, L. C., Allen, B. A., Hanson, B. A., Borresen, E. C., Erickson, M. E., & Lap, S. L. D. (2009). Dose-response relationship between moderate-intensity exercise duration and coronary heart disease risk factors in postmenopausal women. *Journal of Women Health, 18*, 105-113.

Daubenmier, J. J., Weidner, G., Sumner, M. D., Mendell, N., Merritt-Worden, T., Sudley, J., et al. (2007). The contribution of changes in diet, exercise, and stress management to changes in coronary risk in women and men in the multisite cardiac lifestyle intervention program. *Ann Behav Med, 333*(1), 57-68.

Dracup, K. (2007). The Challenge of Women and Heart Disease. *Arch Intern Med, 167*, 681-683.

DuBard, C. A., Garrett, J., & Gizlice, Z. (2006). Effect of language on heart attack and stroke awareness among U.S. Hispanics. *American Journal of Preventive Medicine, 30*(3), 189-196.

Eaton, D., Kann, L., Kinchen, S., Shanklin, S., Ross, J., Hawkins, J., et al. (2008). Centers for Disease Control and Prevention (CDC) Youth Risk Behavior Su*rveillance: United States, 2007. MMWR Surveill Summ, 57*(1), 1-131.

Espnes, G. A., & Byrne, D. (2008). Gender differences in psychological risk factors for devlopment of heart disease. *Stress and Health, 24*, 188-195.

Ford, E. S., Mokdad, A. H., Li, C., McGuire, L. C., Strine, T. W., Okoro, C. A., et al. (2008). Gender differences in coronary heart disease and health-related quality of life: Findings from the 2004 Behavioral Risk Factor Surveillance System. *Journal of Women Health, 17,* 757-768.

Godfrey, J. R., & Manson, J. E. (2008). Toward Optimal Health: Strategies for Prevention of Heart Disease in Women. *Journal of Women Health, 17,* 1271-1276.

Hallman, T., Thomsson, H., GunillaBurell, Lisspers, J., & Setterlind, S. (2003). Stress,Burnout and Coping: Diferences between Women with Coronary Heart Disease and Healthy Matched Women. *Journal of Health Psychology, 8*, 433-445.

Hamer, M. (2006). Exercise and Psychobiological Processes. *Sports Medicine, 36*, 829-838.

Herrmann, C. (2008). Raising Awareness of Women and Heart Disease — Women's Hearts are Different. *Critical Care Nursing Clinics of North America, 20,* 251-263.

Hornbuckle, L., Bassett, D., & Thompson, D. (2005). Pedometer-determined walking and body composition varaibles in African American women. *Medicine & Science in Sports & Exercise, 37*, 1069.

Kokkinos, P., & Moutsatsos, G. (2004). Obesity and Cardiovascular Disease. *Journal of Cardiopulmonary Rehabilitation*, 24, 197-204.

Loomba, R. S., & Arora, R. (2009). Prevention of coronary heart disease in women. *Therapeutic Advances in Cardiovascular Disease, 2*(5), 321-327.

NHLBI. (2007). *THe Healthy Heart Handbook for Women.*

Noda, H., Iso, H., Toyoshima, H., Date, C., Yamamoto, A., Kikuchi, S., et al. (2009). Walking and sports participation andmMortality from coronary heart disease and stroke. *Journal of American Coll Cardiol, 46*, 1761-1767.

Norris, C., Ghali, W., Galbraith, P., Graham, M., Jensen, L., & Knudtson, M. (2004). Women with coronary artery disease report worse health-related quality of life outcomes compared to men. *Health Qual Life Outcomes, 2*, 21.

Oguma, Y., & Shinoda-Tagawa, T. (2004). Physical activity decreases cardiovascular disease risk in women: Review and meta-analysis. *American Journal of Preventive Medicine, 26*, 407.

Quinn, J., & King, K. (2005). Comparison of women and men experiencing acute myocardial infarction: are they really different? *Circulation, 111*(4), 31.

Quinn, J. R. (2008). Update on women and heart disease. *Nursing Management* (22-27).

Sarrafzadegan, N., Rabiei, K., Kabir, A., Sadeghi, M., Khosravi, A., Asgari, S., et al. (2008). Gender differences in risk factors and outcomes after cardiac rehabilitation. *Acta Cardiol, 63*, 763-770.

Stampfer, M., Hu, F., Manson, J., Rimm, E., & Willett, W. (2000). Primary prevention of coronary heart disease in women through diet and lifestyle. *New England Journal of Medicine, 343*, 16-22.

Sundaram, A. A., Ayala, C., Greenlund, K. J., & Keenan, N. L. (2005). Differences in the prevalence of self-reported risk factors for coronary heart disease among American women by race/ethnicity and age. *American Journal of Preventive Medicine, 29*, 25-30.

Torres, M., Calderon, S., Diaz, I., Chacon, A., Fernandez, F., & Martinez, I. (2004). Health related quality of life in coronary heart disease compared to norms in Spanish population. *Qual Life Res, 13*, 1401.

Travis, C. B. (2005). 2004 Carolyn Sherif award address: Heart disease and gender inequity. *Psychology of Women Quarterly, 29*, 15-23.

Weinstein, A. R., Sesso, H. D., Lee, I.-M., Rexrode, K. M., Cook, N. R., Manson, J. E., et al. (2008). The joint effects of physical activity and body mass index on coronary heart disease risk in women *Arch Intern Med, 168*, 884-890.

Wofford, T., Greenlund, K., Croft, J., & Labarthe, D. (2007). Diet and physical activity of U.S. adults with heart disease following preventive advice. *Preventive Medicine, 45*, 295-301.

Yusuf, S., Hawken, S., ounpuu, S., Dans, T., Avezum, A., Lanas, F., et al. (2004). Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case control. *Lancet, 364*, 937-952.

## Cancer


American Cancer Society. (2009). *Cancer facts & figures 2009*. Atlanta: American Cancer Society.

Basen-Engquist, K., Hughes, D., Perkins, H., Shinn, E., & Taylor, C. C. (2008). Dimensions of physical activity and their relationship to physical and emotional symptoms in breast cancer survivors. *Journal of Cancer Survivors, 2*, 253-261.

Bicego, D., Brown, K., Ruddick, m., Storey, D., Wong, C., & Harris, S. R. (2008). Effects of exercise on quality of life in women living with breast cancer: A systematic review. *The Breast Journal 15*(1), 45-51.

Brown, W. J., Burton, N. W., & Rowan, P. J. (2007). Updating the evidence on physical activity and health in women. *American Journal of Preventive Medicine, 33*(5), 404-411.

Coups, E. J., Park, B. J., Feinstein, M. B., Steingart, R. M., Egleston, B. L., & Wilson, D. J. (2009). Correlates of physical activity among lung cancer survivors. *Psycho-Oncology, 18*, 395-404.

Courneya, K. S., Friedenreich, C. M., Quinney, H. A., Fields, A. L. A., Jones, L. W., Vallance, J. K. H., et al. (2005). A longitudinal ltudy of exercise in colorectal cancerr survivors participating in a randomized controlled trial. *Annals of Behavioral Medicine, 29*(2), 147-153.

Coyle, Y. M. (2008). Physical activity as a negative modulator of estrogen-induced breast cancer. *Cancer Causes and Control, 19*, 1021-1028.

Demark-Wahnefried, W., Rock, C. L., Patrick, K., & Byers, T. (2008). Lifestyle interventios to reduce cancer risk and improve outcomes. *American Family Physician, 77*(11), 1573-1578.

Everdingen, M. H. J. v. d. B. v., Peters, M. L., Rijke, J. M. d., Schouten, H. C., Kleef, M. v., & Patijn, J. (2008). Concerns of former breast cancer patients about disease recurrence: a validation and prevalence study. *Psycho-Oncology, 17*, 1137-1145.

Finnegan, L., Wilkie, D. J., Wilbur, J., Campbell, R. T., Zong, S., & Katula, S. (2007). Correlates of physical activity in young adult survivors of childhood cancers. *Oncology Nursing Forum, 34*(5), 60-69.

Friedenreich, C. M. (2004). Physical activity and breast cancer risk: The effect of menopausal status. *Exercise and Sport Sciences Review, 32*(4), 180-184.

Friedenreich, C. M., & Cust, A. E. (2008). Physical activity and breast cancer risk: impact of timing, type and dose of activity and population subgroup effects. *British Journal of Sports Medicine, 42*, 636-647.

Friedenreich, C. M., Gregory, J., Kopciuk, K. A., Mackey, J. R., & Courneya, K. S. (2008). Prospective cohort study of lifetime physical activity and breast cancer survival. *International Journal of Cancer, 124*, 1954-1962.

Giesinger, J., Kemmler, G., Mueller, V., Zabernigg, A., Mayrbaeurl, B., Thaler, J., et al. (2009). Are gender-associated differences in quality of life in colorectal cancer patients disease specific? *Qual Life Res, 18*, 547-555.

Hamer, M., Stamatkis, E., & Saxton, J. M. (2009). The impact of physical activity on all -cause mortality in men and women after a cancer diagnosis. *Cancer Causes and Control, 20*, 225-231.

Harriss, D. J., Cable, N. T., George, K., Reilly, T., Renehan, A. G., & Haboubi, N. (2007). Physical activity before and after diagnosis of colorectal cancer: Disease risk, clinical outcomes, response pathways and biomarkers. *Sports Medicine, 37*(11), 947-960.

Holick, C. N., Newcomb, P. A., Trentham-Dietz, A., Titus-Ernstoff, L., Bersch, A. J., Stampfer, M. J., et al. (2008). Physical activity and survival after diagnosis of invasive breast cancer. *Cancer Epidemiol Biomarkers Prev, 17*(2), 379-386.

Holmes, M. D., Chen, W. Y., Feskanich, D., Kroenke, C. H., & Colditz, G. A. (2005). Physical activity and survival after breast cancer diagnosis. *American Medical Association, 293*(20), 2479-2486.

Howard, R. A., Freedman, D. M., Park, Y., Hollenbeck, A., Schatzkin, A., & Leitzmann, M. F. (2008). Physical activity, sedentary behavior, and the risk of colon and rectal cancer in the NIH-AARP Diet and Health Safety. *Cancer Causes Control, 19*, 939-953.

Irwin, M. L. (2009). Physical activity interventions for cancer survivors. *British journal of Sports and Medicine, 43,* 32-38.

Irwin, M. L., Varma, K., Alvarez-Reeves, M., Cadmus, L., Wiley, A., Chung, G. G., et al. (2008). Randomized controlled trial of aerobic exercise on insulin and insulin-like growth factors in breast cancer survivors: the yale exercise and surviorship study. *Cancer Epidemiol Biomarkers Prev, 18*(1), 306-313.

Kendall, A. R., Mahue-Giangreco, M., Carpenter, C. L., Ganz, P. A., & Bernstein, L. (2005). Influence of exercise activity on quality of life in long-term breast cancer survivors. *Qual Life Res, 14*, 361-371.

Kim, C.-J., Kang, D.-H., & Park, J.-W. (2009). A meta-analysis of aerobic exercise interventions for women with breast cancer. *Western Journal of Nursing Research*, 1-23.

Kirshbaum`, M. N. (2006). A review of the benefits of whole body exercise during and after treatment for breast cancer. *Journal of Clinical Nursing, 16*, 104-121.

Lagerros, Y. T., Hsieh, S.-F., & Hsieh, C.-C. (2004). Physical activity in adolescence and young adulthood and breast cancer risk: a quantitative review. *European Journal of Cancer Prevention, 13*, 5-12.

Leitzmann, M. F., Moore, s. C., Peters, T. M., Lacey, J. V., Schatzkin, A., Schairer, C., et al. (2008). Prospective study of physical activity and risk of postmenopausal breast cancer. *Breast Cancer Research, 10*(5).

Luctkar-Flude, M. F., Groll, D. E., Tranmer, J. E., & Woodend, K. (2007). Fatigue and physical activity in older adults with cancer: A systematic review of the literature. *Cancer Nursing, 30*(5), 35-45.

Lynch, B. M., Cerin, E., Newman, B., & Owen, N. (2007). Physical activity, activity change, and their correlates in a population-based sample of colorectal cancer survivors. *Annals of Behavioral Medicine, 34*(2), 135-143.

Lynch, B. M., Cerin, E., Owen, N., Hawkes, A. L., & Aitken, J. F. (2008). Prospective relationships of physical activity with quality of life among colorectal cancer survivors. *Journal of Clinical Oncology, 26*(27), 4480-4486.

McNeely, M. L., Campbell, K. L., Rowe, B. H., Klassen, T. P., Mackey, J. R., & Courneya, K. S. (2006). Effects of exercise on breast cancer patients and survivors: a systematic review and meta-analysis. *CMAJ, 175*(1), 34-41.

McTiernan, A. (2008). Mechanisms linking physical activity with cancer. *National Review of Cancer, 8* (3) 205-211.

Monninkhof, E. M., Elias, S. G., Vlems, F. A., Tweel, I. v. d., Schuit, A. J., Voskuil, D. W., et al. (2007). Physical activity and breast cancer: A systematic review. *Epidemiology, 18*, 137-157.

Neilson, H. K., Friedenreich, C. M., Brockton, N. T., & Millikan, R. C. (2009a). Physical activity and postmenopausal breast cancer: proposed biologic mechanisms and areas for future research. *Cancer Epidemiology Biomarkers Preview, 18*(1), 11-27.

Neilson, H. K., Friedenreich, C. M., Brockton, N. T., & Millikan, R. C. (2009b). Physical activity and postmenopausal breast cancer: Proposed biologic mechanisms and areas for future research. *Cancer Epidemiology Biomarkers Preview, 18*(1), 11-27.

Ochsenkuhn, T., Bayerdorffer, E., Meining, A., Spath, L., Mannes, G. A., Wiebecke, B., et al. (2005). Increased prevalence of colorectal adenomas in women with breast cancer. *Digestion, 72*, 150-155.

Olsen, C. M., Bain, C. J., Jordan, S. J., Nagle, C. M., Green, A. C., Whiteman, D. C., et al. (2007). Recreational physical activity and epithelial ovarian cancer: A case-control study, systematic review, and meta-analysis. *Cancer Epidemiology Biomarkers Preview, 16*(11), 2321-2330.

Peters, T. M., Schatzkin, A., Gierach, G. L., Moore, S. C., Jr., J. V. L., Wareham, N. J., et al. (2009). Physical activity and postmenopausal breast cancer risk in the NIH-AARP diet and health study. *Cancer Epidemiology Biomarkers Preview, 18*(1), 289-296.

Phipps, E., Braitman, L. E., Stites, S., & Leighton, J. C. (2006). Quality of life and symptom attribution in long-term colon cancer survivors. *Journal of Evaluation in Clinical Practice, 14*, 254-258.

Pinto, B. M., Rabin, C., Papandonatos, G. D., Frierson, G. M., Trunzo, J. J., & Marcus, B. H. (2008). Maintenance of effects of a home-based physical activity program among breast cancer survivors. *Support Care Cancer, 16*, 1279-1289.

Renehan, A. G., Tyson, M., Egger, M., Heller, R., & Zwahlen, M. (2008). Body-mass index and incidence of cancer: a systematic review and meta-analysis of prospective observational studies. *Lancet 371* (569-578).

Schmidt, M. E., Steindorf, K., Mutschelknauss, E., Slanger, T., Kropp, S., Obi, N., et al. (2008). Physical activity and postmenopousal breaat cancer: Effect modification by breast cancer subtypes and effective periods in life. *Cancer Epidemiology Biomarkers Preview, 17*(12), 3402-3410.

Shin, A., Matthews, C. E., Shu, X.-O., Gao, Y.-T., Lu, W., Gu, K., et al. (2009). Joint effect of body size, energy intake, and physical activity on breast cancer risk. *Breast Cancer Research and Treatment, 113*, 153-161.

Slattery, M. L. (2004). Physical activity and colorectal cancer. *Sports Medicine, 34*(4), 239-252.

Stevinson, C., Lawler, D. A., & Fox, K. R. (2004). Exercise interventions for cancer patients:

Systematic review of controlled trials. *Cancer Causes Control, 15,* 1035-1056.

Suzuki, S., Kojima, M., Tokudome, S., Mori, M., Sakauchi, F., Fujino, Y., et al. (2008). Effect of physical activity on breast cancer risk: Findings of the Japan Collaborative Cohort Study. *Cancer Epidemiology Biomarkers Preview, 17*(12), 3396-3401.

Tardon, A., Lee, W. J., Delgado-Rodriguez, M., Dosemeci, M., Albanes, d., Hoover, R., et al. (2005). Leisure-time physical activity and lung cancer: a meta-analysis. *Cancer Causes and Control, 16*, 389-397.

Voskuil, D. W., Monninkhof, E. M., Elias, S. G., Vlems, F. A., & Leeuwen, F. E. v. (2007). Physical activity and endometrial cancer risk, a systematic review of current evidence. *Cancer Epidemiology Biomarkers Preview, 16*(4), 639-648.

Winter-Stone, K. M., Bennett, J. A., Nail, L., & Schwartz, A. (2008). Strength, physical activity, and age predict fatigue in older breast cancer survivors. *Oncology Nursing Forum, 35.5*, 815-830.

Woods, S. E., Narayanan, K., & Engel, A. (2005). The influence of gender on colon cancer stage. *Journal of Women's Health, 14*(6), 502-506.

## Obesity and Overweight

Atlantis, E., Barnes, E., & Singh, F. (2006). Efficacy of exercise for treating overweight in children and adolescents: a systematic review. *International Journal of Obesity, 30*, 1027-1040.

Ball, G. D. C., Marshall, J. D., & McCargar, L. J. (2005). Physical activity, aerobic fitness, self-perception, and dietary intake. *Canadian Journal of Dietetic Practice and Research, 66*(3), 162-169.

Bensimhon, D. R., Kraus, W. E., & Donahue, M. P. (2006). Obesity and physical activity: A review. *American Heart Journal*, 598-603.

Brock, D. W., Thomas, O., Cowan, C. D., Allison, D. B., Gaesser, G. A., & Hunter, G. R. (2009). Association between insufficiently physicaly active and the prevalence of obesity in the United States. *Journal of Physical Activity and Health, 6*(1-5).

Brown, T., & Summerbell, C. (2008). Systematic review of school-based interventions that focus on changing dietary intake and physical activity levels to prevent childhood obesity: an update to the obesity guidance produced by the National Institute for Health and Clinical Excellence. *International Association for the Study of Obesity*, 110-141.

Centers for Disease Control and Prevention. Defining overweight and obesity. Retrieved September 16, 2009, from www.cdc.gov/obesity/defining.html

Centers for Disease Control and Prevention. Obesity still a major problem. Retrieved September 16, 2009, from www.cdc.gov/nchs/pressroom/06facts/obesity03_04.htm

Centers for Disease Control and Prevnetion. Prevalence of overweight among children and adolescents: United States, 2003-2004. 2009, from www.cdc.gov/nchs/products/pubs/pubd/hestats/overweight/overwght_child_03.htm

Dugan, S. A. (2008). Exercise for preventing childhood obesity. *Phys Med Rehabil Clin N Am, 19*, 205-216.

Field, A., Coakley, E., & Must, A. (2001). Impact of overweight on the risk of developing chronic diseases during a 10-year period. *Arch Intern Med, 161*, 1581-1586.

Fletcher, A., Cooper, J. R., Helms, P., Northington, L., & Winters, K. (2009). Stemming the tide of childhood obesity in an underserved urban African American population: A pilot study. *The ABNF Journal, Spring*, 44-48.

Floriani, V., & Kennedy, C. (2007). Promotion of physical acivity in primary care or obesity treatment/prevention in children. *Current Opinion in Pediatrics, 19*, 99-103.

Franzini, L., Elliott, M. N., Cuccaro, P., & Schuster, M. (2009). Influences of physical and social neighborhood environments on children's physical activity and obesity. *American Journal of Public Health, 99*(2), 271-279.

Gaal, L. F. V., Mertens, I. L., & Block, C. E. D. (2006). Mechanisms linking obesity with cardiovascular disease. *Nature Publishing Group, 444*, 876-880.

Gill, J. M. R., & Malkova, D. (2006). Physical activity, fitness and cardiovascular disease risk in adults: interactions with insulin resistance and obesity. *Clinical Science, 110*, 409-425.

Goel, M. S., McCarthy, E. P., Phillips, R. S., & Wee, C. C. (2004). Obesity among U.S. immigrant subgroups by duration of residence. *JAMA, 292*(23), 2860-2867.

Grafova, I. B. (2008). Overweight children : Assessing the contribution of the built environment. *Preventive Medicine, 47*, 304-308.

Haslam, D. W., Philip, W., & James, T. (2005). Obesity. *Lancet, 366*, 1197-2009.

Heim, N., Snijder, M. B., Deeg, D. J. H., Seidell, J. C., & Visser, M. (2008). Obesity in older adults is associated with an increased prevalence and incidence of pain *Obesity, 16*, 2510-2517.

Hills, A. P., King, N. A., & Armstrong, T. P. (2007). The contribution of physical activity and sedentary behaviors to the growth and development of chldren and adolescents. *Sports Medicine, 37*(6), 533-545.

Janiszewsk, P. M., & Ross, R. (2007). Physical activity in the treatment of obesity: beyond body weight reduction *Applied Physiology, Nutrition, Metabolism, 32*, 512-522.

Janssen, I., Katzmarzyk, P. T., Boyce, W. F., Vereecken, C., Mulvihill, C., Roberts, C., et al. (2005). Comparison of overweight and obesity prevalence in school-aged youth from 34 countries and thei relationships with physical activity and dietary patterns. *The International Association for the Study of Obesity* (123-132).

Joens-Matre, R. R., Welk, G. J., Calabro, M. A., Russel, D. W., Nicklay, E., & Hensley, L. D. (2008). Rural-urban differences in physical activity, physical fitness, and overweight prevalence of children. *National Rural Health Association*.

Lambers, S., Laethem, C. V., Acker, K. V., & Calders, P. (2008). Influence of combined exercise training on indices of obesity, diabetes and cardiovascular risk in type 2 diabetes patients. *Clinical Rehabilitation, 22*, 483-492.

Lee, D. C., Sui, X., & Blair, S. N. (2009). Does physical activity ameliorate the health hazards of obesity *British Journal of Sports Medicine, 43*, 49-51.

Lee, P.-H., Chang, W.-Y., Liou, T.-H., & Chang, P.-C. (2006). Stage of exercise and health-related quality of life among overweight and obese aduts. *Blackwell Publishing Ltd*, 295-303.

Leon-Munoz, L., Guallar-Casillon, P., Banegas, J., Gutierrez-Fisac, J., & Lopez-Garcia, E. (2005). Changes in body weight and health-related quality-of-life in the older adult population. *International Journal of Obesity, 29*, 138-1391.

Li, W., Kelsey, J. L., Zhang, Z., Lemon, S. C., Mezgebu, S., Boddie-Willis, C., et al. (2009). Small-area estimation and prioritizing communities for obesity control in Massachusetts. *American Journal of Public Health, 99*(3), 511-519.

Marshall, S., Biddle, S., Gorely, T., Cameron, N., & Murdey, I. (2004). Relationship between media use, body fatness and physical activity in children and youth: a meta-analysis. *International Journal of Obes Relat Metab Discord, 28*, 1238-1246.

Moore, J. B., Davis, C. L., Baxter, S. D., Lewis, R. D., & Yin, Z. (2008). Physical activity, metabolic syndrome, and overweight in rural youth. *The Journal of Rural Health, 24*(2), 136-142.

Nader, P. R., Bradley, R. H., & Houts, R. M. (2008). Moderate-to-Vvigorous physical activity from ages 9 to 15 years. *JAMA, 300*(3), 295-305.

NaPier, E. A., Meyer, M. H., & Himes, C. L. (2005). Old and overweight: Another kind of double jeopardy. *Ageism in the New Millennium*, 31-36.

Ness, A. R., Leary, S. D., Mattocks, C., Blair, S. N., Reilly, J. J., Wells, J., et al. (2007). Objectively measured physical activity and fat mass in a large cohort of children *PLoS Medicine, 4*(3), 0476-0484.

Ogden, C. L. (2009). Disparities in obesity prevalence in the United States: Black women at risk. *American Journal of Clinical Nutrition, 89*, 101-1002.

Ogden, C. L., Carrol, M. D., & Curtin, L. R. (2006). Prevalence of overweight and obesity in the United States, 1994-2004. *JAMA, 295*, 1549-1555.

Ogden, C. L., Carroll, M. D., McDowell, M. A., & Flegal, K. M. (2007). *Obesity among adults in the United States--no changes since 2003-2004*. Hyattsville, MD: National Center for Health Statistics.

Redinger, R. N. (2008). The prevalence and etiology of nongenetic obesity and associated disorders. *Southern Medical Journal, 101*(4), 395-399.

Robinson, W. R., Gordon-Larsen, P., Kaufman, J. S., Suchindran, C. M., & Stevens, J. (2009). The female-male disparity in obesity prevalence among black American young adults : contributions of sociodemegraphic characteristics of the childhood family. *American Journal of Clinical Nutrition, 89*, 1204-1212.

Sabo, D., & Velez, P. (2008). *Go Out and Play: Youth Sports in America.* Eisenhower Park, NY: Women's Sports Foundation.

Scharoun-Lee, M., Adair, L. S., Kaufman, J. S., & Gordon-Larsen, P. (2009). Obesity,race/ethnicity and the multiple dimensions of socioeconomic status during the transition to adulthood: A factor analysis approach. *Social Science & Medicine, 6*, 70-716.

Shiri, R., Solovieva, S., Husgafvel-Pursiainen, K., Taimela, S., Saarikoski, L., Huupponen, R., et al. (2008). The sssociation between obesity and the prevalence of low back pain in young adults

The Cardiovascular Risk in Young Finns Study. *American Journal of Epidemiology, 167*(9), 1110-1119.

Sinha, A., & King, S. (2009). A review of adolescent obesity: Prevalence, etiology, and treatment. *Obes Surg, 19*, 113-120.

Stettler, N., Singer, T., & Suter, P. (2004). Electronic games and environmental factors associated with childhood obesity in Switzerland. *Obesity Research, 12*, 896-903.

Stovitz, S. D., Steffen, L. M., & Boostrom, A. (2008). Participation in physical activity among normal -and overweight Hispanic and non-Hispanic White adolescents *Journal of School Health, 78*(1), 19-25.

Swallen, K. C., Reither, E. N., Haas, S. A., & Meier, A. M. (2005). Overweight, obesity, and health-related quality of life among adolescents: The National Longitudinal Study of Adolescent Health. *Pediatrics, 115*(2), 340-347.

Unger, J. B., Reynolds, K., Shakib, S., Spruijt-Metz, D., Sun, P., & Johnson, C. A. (2004, December). Acculturation, physical activity, and fast-food consumption among Asian-American and Hispanic adolescents. *Journal of Community Health 29* (6), 467-481.

Velde, S. J. t., Bourdeaudhuij, I. D., Thorsdottir, I., Rasmussen, M., Klepp, K.-I., & Brug, J. (2007). Patterns in sedentary and exercise behavior and associations with overweight in 9-14-old boys and girls — a cross-sectional study. *BMC Public Health 7*, 1-9.

Wareham, N. (2007). Physical activity and obesity prevention. *The International Association for the Study of Obesity*, 109-114.

Wild, S., Roglic, G., Green, A., Sigree, R., & King, H. (2004). Global prevalence of diabetes: estimates for year 2000 and projections for 2030. *Diabetes Care, 27*(5), 1047-1053.

Wyatt, S. B., Faan, Winters, K. P., & Dubbert, P. M. (2006). Overweight and obesity: Prevalence, consequences, and causes of a growing public health problem. *The American Journal of The Medical Sciences, 331*, 166-174.

Yusuf, S., Hawken, S., ounpuu, S., Dans, T., Avezum, A., Lanas, F., et al. (2004). Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (the INTERHEART study): case control. *Lancet, 364*, 937-952.

## Osteoporosis

Anferson, K. D., Chad, K. E., & Spink, K. S. (2005). Osteoporosis knowledge, beliefs, and practices among adolescent females. *Journal of Adolescent Health, 36*, 305-312.

Azoulay, C. (2004). Menopause in 2004: “Hormone replacement therapy” is not what it used to be anymore. *La Revue de Medecine Interne, 25*, 806-815.

Bareither, M. L., Grabiner, M. D., & Troy, K. L. (2008). Habitual site-specific upper extrimity loading is associated with increased bone mineral of the ultradistal radius in young women. *Journal of Women’s Health, 17*, 1577-1581.

Bass, S., Saxon, L., Daly, R., Turner, C., Robling, A., & Seeman, E. (2002). The effects of mechanical loading on the size and shape of bone in pre-, peri-, and postpubertal girls: a study in tennis players. *Journal of Bone Mineral Density, 17*, 2274-2280.

Beaudoin, C. M., & Blum, J. W. (2005). Calcium knowledge, dietary calcium intake, and bone mineral content and density in young women. *North American Journal of Psychology, 7*(2), 265-278.

Bellew, J. W., & Gehrig, L. (2006). A comparsion of bone mineral density in adolescent female swimmers, soccer players, and weight lifters. *Pediatric Physical Therapy*, 19-22.

Benton, M. J., & White, A. (2006). Osteoporosis: Recommendations for resistance exercise and supplementation with calcium and vitamin D to promote bone health. *Journal of Community Health and Nursing, 23*(4), 201-211.

Borer, K. T. (2005). Physical activity in the prevention and amelioration of osteoporosis in women: interactio of mechanical, hormonal and dietary factora. *sports and medicine, 35*(9), 779-830.

Cardinale, M., & Wakeling, J. (2005). Whole body vibration exercises: Are vibrations good for you? *British Journal of Sports Medicine, 39*, 585-589.

Eng, J. J., Pang, M. Y. C., & Ashe, M. C. (2008). Balance, falls, and bone health: Role of exercise in reducing fracture risk. *Journal of Rehabilitation Research and Development, 45*(2), 297-314.

Feskanich, D., Willett, W., & Colditz, G. (2002). Walking exercise and leisure-time activity risk of hip fracture in postmenopausal women. *JAMA, 288*, 2300-2306.

Foundation, N. O. (2005). Disease Statistics: Fast Facts.

Gero, N., Cole, J., Kanaley, J., & Meulen, M. v. d. (2005). Increased bone accrual in premenarchael gymnasts: A longitudinal study. *Pediatric Exercise Science, 17,* 149-160.

Gueldner, S. H., Britton, G. R., Madhavan, G., Pierce, C. S., Grabo, T. N., Penrod, J., et al. (2008). Ultrasonometric profiling of incidence and risk of osteorporosis in rural women. *Journal of Women & Aging, 20*, 21-30.

Gunendi, Z., Ozyemisci-Taskiran, O., & Demirsoy, N. (2008). The effect of 4-week aerobic exercise program on postural balance in postmenopausal women with osteoporosis. *Rheumatology Int., 28*, 1217-1222.

Hasserius, R., Karlson, M., Jonsson, B., Redlund-Johnell, I., & Johnell, O. (2005). Long-term morbidity and mortality after a clinically diagnosed vertebral fracture in the elderly—A 12- and 22-year follow-up of 257 patients. *Calcified Tissue International, 76*, 235-242.

Kanis, J. A., Burlet, N., Cooper, C., Delmas, P. D., Reginster, J.-Y., Borgstrom, F., et al. (2008). European guidance for the diagnosis and management of osteoporosis in postmenopausal women. *Osteoporosis Int., 19*, 399-428.

Karlsson, M. K., Nordqvist, A., & Karlsson, C. (2008). Physical activity increases bone mass during growth. *Food and Nutrition Research, 52,* 1664-1661.

Kemmler, W., Engelke, K., Stengel, S. V., Weineck, J., Lauber, D., & Kalender, W. (2007). Long-term four-year exercise has a positive effect on menopausal risk factors: the erlangen fitness osteoporosis prevention study. *Journal of Strength and Conditioning Research, 21*(1), 232-239.

Kemmler, W., Lauber, D., Weineck, J., Hensen, J., Kalender, W., & Engelke, K. (2004). Benefits of 2 years of intense exercise on bone density, physical fitness, and blood lipids in early postmenoposal osteopenic women: Results of the Erlangen Fitness Osteoporosis Prevention Study (EFOPS). *Arch Intern Med, 164*, 1084-1091.

Kemmler, W., Stengel, S. V., Weineck, J., Lauber, D., Kalender, W., & Engelke, K. (2004). Exercise effects on menopausal risk factors of early postmenopausal women: 3-yr erlangen fitness osteoprosis prevention study results. *Medicine & Science In Sports & Exercise*, 194-203.

Kudlac, J., Nicholas, D., Sanborn, C., & DiMarco, N. (2004). Impact of detraining on bone loss in former collegiate female gymnasts. *Calcified Tissue International, 74*, 482-487.

Kuller LH. (2003, January). Women's Health Initiative. Hormone replacement therapy and risk of cardiovascular disease: Implications of the results of the Women's Health Initiative. *Arteriosclerosis Thrombosis Vascular Biology*, *23,* 11-6.

Lee, S., Dargent-Molina, P., & Breart, G. (2002). Risk factors for fractures of the proximal humerus: results from the EPIDOS prospective study. *Journal of Bone Mineral Research, 17*, 817-825.

Lim, S., Joung, H., Shin, C. S., Lee, H. K., Kim, K. S., Shin, E. K., et al. (2004). Body composition changes with age hav gender-specific impacts on bone mineral density. *Bone 35*, 792-798.

MacKelvi, K., McKay, H., Petit, M., Moran, O., & Khan, K. (2002). Bone mineral response to a 7-month randomized controlled, school-based jumping intervention in 121 prepurbertal boys: association with ethnicity and body mass index. *Journal of Bone Mineral Research, 17*, 834-844.

MacKelvie, K., Khan, K., Petit, M., Janssen, P., & McKay, H. (2003). A school-based exercise internvetion elicits substantial bone health benefits: a 2-year randomized controlled trial in girls. *Pediatrics, 112*(6), 447.

MacKelvie, K., McKay, H., Khan, K., & Crocker, P. (2001). A school-based exercise intervention augments bone mineral accrual in early pubertal girls. *Journal of Pediatrics, 139*, 501-508.

MacKelvie, K., Petit, M., Khan, K., Beck, T., & McKay, H. (2004). Bone mass and structure are enhanced following a 2-year randomized controlled trial of exercise in prepubertal boys. *Bone, 34*, 75-764.

Mayoux-Benhamou, M. A., Roux, C., Perraud, A., Fermanian, J., Rahali-Kachlouf, H., & Revel, M. (2005). Predictors of compliance with a home-based exercise program added to usual medical care in preventing postmenopausal osteoporosis: an 18-month prospective study. *Osteoporos Int, 16*, 325-331.

National Institutes of Health (NIH) Consensus Development Panel on Osteoporosis Prevention, Diagnosis, and Therapy. *JAMA, 285,* 6, 785.795.

Pothiwala, P., Evans, E. M., & Chapman-Novakofski, K. M. (2006). Ethnic variation in risk for osteoporosis among women: A review of biological and behavioral factors. *Journal of Women's Health, 15*, 709-719.

Reventlow, S. D. (2007). Perceived risk of osteoporosis: restricted physical activities? Qualitative interview study with women in their sixties. *Scandinavian Journal of Primary Health Care, 25*, 160-165.

Rittweger, J. (2006). Can exercise prevent osteoporosis? *J. Musculoskelet Neuronal Interact, 6*(2), 162-166.

Silverman, N. E., Nicklas, B. J., & Ryan, A. S. (2009, April). Addition of aerobic exercise to a weight loss program increases BMD, with an associated reduction in inflammation in overweight postmenopausal women. *Calcified Tissue International, 84,* 4, 257-265.

Stemgel, S., Kemmler, W., Pintag, R., Beeskow, C., Weineck, J., Lauber, D., et al. (2005). Power training is more effective than strength training for maintaining bone mineral density in postmenopausal women. *Journal of Applied Physiology, 99*, 181-188.

Tosteson, A., & Hammond, C. (2002). Quality-of-life assessment in osteoporosis: Health status and preference-based measures. *Pharmacoeconimics, 20*(5), 289-303.

Verschueren, S., Roelants, M., & Delecluse, C. (2004). Effect of 6-month whole body vibration training on hip density, muscle strength, and postural control in postmenopausal women: a randomized controlled pilot study. *Journal of Bone Mineral Density, 19*, 352-359.

Ward, K., Roberts, S., Adams, M., & Mughal, M. (2005). Bone geometry and density in the skeleton of pre-pubertal gymnasts and school children. *Bone, 36*, 1012-1018.

Women's Health Initiative Study Group. Design of the Women's Health Inititiave clinical trial and observational study. *Control Clinical Trials, 19,* 61-109.

Yamazki, S., Ichimura, S., Iwamoto, J., Takeda, T., & Toyama, Y. (2004). Effect of walking exercise on bone metabloism in postmenopausal women with osteopenia/osteoporosis. *Journal of Bone ans Mineral Metabolism, 22*, 500-508.

Zigmond, D. S., Melton, L. J., & Silverman, S. L. (2004). Increasing hip fracture incidence in California Hispanics, 1983 to 2000. *Osteoporos, 15*, 603-610.

Zingmond, D. S., Melton, L. J., & Silverman, S. L. (2004). Increasing hip fracture incidence in California Hispanics, 1983 to 2000. *Osteoporos, 15*, 603-610.

## Alzheimer's Disease and Related Dementias

Abbott, R. D., White, L. R., Ross, G. W., Masaki, k. H., Curb, J. D., & Petrovitch, H. (2004). Walking and dementia in physically capable elderly men. *JAMA, 292*, 1447-1453.

Adlard, P., Perreau, V., & Pop, V. (2005). Voluntary exercise decreases amyloid load in a transgenic model of Alzheimer's disease. *Journal of Neuroscience*(25), 4217-4221.

Andel, R., Crowe, M., Pederson, N. L., Fratiglioni, L., Johansson, B., & Gatz, M. (2008). Physical exercises at midlife and risk of dementia three decades later: A Ppopulation-based study of Swedish twins. *The Journals of Gerontology, 63A*(1), 62-66.

Arcoverde, C., Deslandes, A., Rangel, A., Rangel, A., Pavao, R., Nigri, F., et al. (2008). Role of physical activity on the maintenence of cognition and activities of daily living in elderly with alzheimer's disease. *Arq neuropsiquitar, 66*(2-B), 323-327.

Arkin, S. M. (2003). Student-led exercise sessions yield significant fitness gains for Alzheimer Disease Other Demetia. *American Journal of Alzheimer's Disease and Other Dementias, 18*, 159-170.

Barnes, D. E., Whitmer, R. A., & Yaffe, K. (2007). Physical activity and dementia: The need for prevention trials. *Exercise and Sports Sciences Reviews, 35*(1), 24-29.

Barnes, D. E., Yaffee, K., Satariano, W. A., & Tager, I. B. (2003). A longitudinal study of cardiorespiratory fitness and cognitive function in healthy older adults. *Journal of the Ameircan Geriatric Society, 51*, 459-465.

Boustani, M., Peterson, B., & Hanson, L. (2003). Screening for dementia in primary care: A summary of the evidence for the U.S. Preventative Services Task Force. *Annals of Internal Medicine, 138*, 927-937.

Boyle, P., Buchman, A., Wilson, R. S., Bienias, J. L., & Bennett, D. A. (2007). Physical activity is associated with incident disability in community-based older persons. *JAGS, 55*, 195-201.

Brayne, C., Gao, L., & Matthews, F. (2005). Challenges in the epidemiological investigation of the relationships between physical activity, obesity, diabetes, dementia and depression. *Neurobiology of Aging, 26*, 6-10.

Briones, T. L. (2006). Environment, physical activity, and neurogenesis: Implications for prevention and treatment of Alzhemier's Disease. *Current Alzheimer's Research, 3*, 49-54.

Colcombe, S. J. (2004). Cardiovascular fitness, cortical plasticity and aging. *Proc Natl. Acad Sci U.S.A. , 101*, 3316-3321.

Colcombe, S. J., Erickson, K. I., & Raz, N. (2003). Aerobic fitness reduces brain tissue loss in aging humans. *J Gerontol A Biol Sci Med Sci, 58*, 176-180.

Ferri, C. P., Prince, M., Brayne, C., Brodaty, H., Fratiglioni, L., & Ganguli, M. (2005). Global prevalence of dementia: A Delphi consensus study. *Lancet, 366*, 2112-2117.

Heyn, P., Abreu, B. C., & Ottenbacher, K. J. (2004). The effects of exercise training on elderly persons with cognitive impairment and dementia: A mMeta-analysis. *Arch Phys Med Rehabil, 85*, 1694-1704.

Karp, A. S., Pillard-Borg, H. X., Wand, M., Silverstein, B., Windblad, B., & Fratiglioni, L. (2006). Mental, physical and social components in leisure activities equally contribute to decreased dementia risk. *Dement. Geriatr. Cogn. Disord, 21*, 65-73.

Kivipelto, M., Helkala, E.-L., Laakso, M. P., Hanninen, T., Hallikainen, M., Alhainen, K., et al. (2001). Midlife vascular risk factors and Alzheimer's disease in later life: longitudinal, population based study. *BMJ, 322*, 1447-1451.

Kramer, A., Bherer, L., & Colcombe, S. (2004). Environmental influences on cognitive and brain plasticity during aging. *Journalof Gerrontology A Biol Sci, 59*, M940-957.

Kramer, A. F., & Erickson, K. I. (2007). Capitalizing on cortical plasticity: influence of physical activity on cognition and brain function. *TRENDS in Cognitive Sciences, 11*(8), 342-348.

Kramer, A. F., & Willis, S. (2003). Cognitive plasticity and aging. In B. Ross (Ed.), *Psychology of Learning and Motivation* (Vol. 43). NY: Academic Press.

Larson, E. B. (2006). Exercise is associated with reduced risk for incident dementia among persons 65 years of age or older. *Annals of Internal Medicine, 144*, 73-81.

Launer, L. J., Ross, G. W., Petrovitch, H., Masaki, K., Foley, D., & White, L. R. (2000`). Midlife blood pressure and dementia: The Honolulu-Asia Aging Study. *Neurobiology of Aging, 21*, 49-55.

Laurin, D., Verreault, R., Lindsay, J., MacPherson, K., & Rockwood, K. (2001). Physical activity and risk of cognitive impairment and dementia in elderly persons. *Arch Neurol, 58*, 498-504.

Lindsay, J., Laurin, D., Verreault, R., Hebert, R., Helliwell, B., Hill, G. B., et al. (2002). Risk factors for Alzheimer's Disease: A prospective analysis from the Canadian Study of Health and Aging. *American Journal of Epidemiology, 156*(5), 445-453.

Lindsay, J., Sykes, E., McDowell, I., Verreault, R., & Laurin, D. (2004). More than the epidemiology of Alzheimer's disease: Contributions of the Canadian Study of Health and Aging. *Can J Psychiatry, 49*(2), 83-91.

Namazi, K., Gwinnup, P., & Zadorozny, C. (1994). Low intensity exercise/movement program for patients with Alzhemier's Disease: the TEMP-AD Protocol. *Journal of Aging Physical Activity, 21*, 80-92.

Peila, R., Rodriguez, B. L., & Launer, L. J. (2002). Type 2 Diabetes, APOE Gene, and the risk for dementia and related pathologies: The Honolulu-Asia Study. *Diabetes, 51*, 1256-1262.

Perez, C. A., & Carral, J. M. C. (2008). Benefits of physical exercise for older adults with Alzheimer's Disease. *Geriatric Nursing, 29*(6), 384-391.

Podewils, L. J., Guallar, E., Kuller, L. H., Fried, L. P., Lopez, O. L., Carlson, M., et al. (2005). Physica activity, APOE genotype, and dementia risk: Findings from the Cardiovascular Health Cognition Study. *American Journal of Epidemiology, 161*(7), 639-651.

Regan, C., Katona, C., Walker, Z., & Livingston, G. (2005). Relationship of exercise and other risk factors to depression of Alzheimer's disease: the LASER-AD study. *International Journal of Geriatric Psychiatry, 20*, 261-268.

Rolland, Y., Pillard, F., & Klapouszczak, A. (2007). Exercise program for nursing home residents with Alzheimer's Disease: A 1-year randomized, controlled trial. *Journal of American Geriatric Society, 55*, 158-165.

Rolland, Y., Pillard, F., Klapouszczak, A., Reynish, E., Thomas, D., Andrieu, S., et al. (2007). Exercise program for nursing home residents with Alzheimer's Disease: A 1-Year randomized, controlled trial. *JAGS, 55*, 158-165.

Rovio, S., Kareholt, I., Helkala, E. L., Vitanen, M., Winblad, B., & Toumilehto, B. (2005). Leisure time physical activity at midlife and the risk of dementia and Alzheimer's Disease. *Lancet Neuro, 4*, 705-711.

Skoog, I., Lernfelt, B., Landahl, S., Palmertz, B., Andreasson, L.-A., & Nilsson, I. (1996). 15-year longitudinal study of blood pressure and dementia. *Lancet, 347*, 1141-1145.

Stanziano, D. C., Roos, B. A., Perry, A. C., Lai, Sh., & Signorile, J. F. (2009,). The effects of an active-assisted stretching program on functional performance in elderly persons: A pilot study. *Clinical Interventions in Aging, 4,* 115-120.

Steinberg, M., Leoutskos, J.-M. S., Podewils, L. J., & Lyketsos, C. G. (2008). Evaluation of a home-based exercise program in the treatment of Alzheimer's disease: Maximizing independence in dementia (MIND) study. *International Journal of Geriatric Psychiatry*.

Stevens, J., & Killeen, M. (2006). A randomised controlled trial testing the impact of exercise on cognitive symptoms and disability of residents with dementia *Contemporary Nurse*, 32-42.

Szekely, C. A., Breitner, J. C. S., & Zandi, P. P. (2007). Prevention of Alzheimer's disease. *International Review of Psychiatry, 19*, 693-706.

Teri, L., Gibbons, L. E., & McCurry, S. M. (2003). Exercise plus behavioralmanagement in patients with Alzheimer's Disease: A randomized controlled trial. *JAMA, 15*, 2015-2022.

Teri, L., Logsdon, R. G., & McCurry, S. M. (2008). Exercise interventions for dementia and cognitive impairment: the seattle protocols. *The Joutnal of Nutrition, Health & Aging, 12*(6), 391-394.

Teri, L., Logsdon, R. G., Uomoto, J., & McCurry, S. M. (1997). Behavioural treatment of depression in dementia patients: A controlled clincal trial. *Journal of Gerontology B Psychological Sciences and Social Sciences, 52*, 159-166.

Whitmer, R. A., Gunderson, E. P., Barrett-Conor, E., Jr, C. P. Q., & Yafffe, K. (2005). Obesity in middle age and future risk of dementia: A 27 Year LIngitudinal population based study. *British Medical Journal, 330*, 1360-1365.

Whitmer, R. A., Sidney, S., Selby, J., Johnston, S. C., & Yaffe, K. (2005). Midlife cardiovascular risk factors and risk of dementia in later life. *Neurology, 64*, 277-281.

Williams, C. L., & Tappen, R. M. (2007). Effect of exercise onmood in nursing home residents with Alzheimer's disease. *American Journal of Alzheimer's Disease and Other Dementias, 22*, 389-397.

Williams, C. L., & Tappen, R. M. (2008). Exercise training for depressed older adults with Alzheimer's disease. *Aging & Mental Health, 12*(1), 72-80.

Woodhead, E. L., Zarit, S. H., Braungar, E. R., Rovine, M. R., & Femia, E. E. (2005). Behavorial and psychological symptoms of dementia: The effects of physical activity at adult day service centers *American Journal of Alzheimer's Disease and Other Dementias, 20*(13), 171-179.

Yaffee, K. D., Barnes, M., Nevitt, M., Yui, L. Y., & Covinsky, K. (2001). A prospective study of physical activity and cognitive dccline in elderly women who walk. *Arch Intern Med, 161*, 1703-1708.

Yee, J. L., & Schulz, R. (2000). Gender differences in psychiatric morbidity among family caregivers: A review and analysis. *The Gerontologist, 40*, 147-164.

### Other References of Interest

Colcombe, S., and Kramer, A.F. (2003). Fitness effects on the cognitive function of older adults: A meta analytic study. *Psychological Science, 14*(2), 125-130.

Dik, M., Deeg, D.J., Visser, M., et al., (2003). Early life physical activity and cognition at old age. *Journal of Clinical and Experimental Neuropsychology*, *25*(5), 643-653.

DiPietro, L. (2001) Physical activity in aging: changes in patterns and their relationship in health and Functions. *Journals of Gerontology. Series A, Biological Sciences and Medical Sciences*, *56*(2), 13-22.

Kramer, A.F., Colcombe, S.J., and McAuley, E. (2003). Enhancing brain and cognitive function of older adults through fitness training. *Journal of Molecular Neuroscience*, *20*(3), 213-221.

Pope, S.K., Shue, V.M., and Beck, C. (2003). Will a healthy lifestyle help prevent Alzheimer's disease? *Annual Review of Public Health*, *24*, 111-132.

Research on diagnosis, treatment, and prevention. Chicago, IL: Alzheimer's Association National Office. Retrieved September 16, 2009, from http://www.alz.org/research/funded/diagnosis.asp

### II. Substance Use

Amaro, H., Blake, S.M., Schwartz, P.M., and Flinchbaugh, L.J. (2001). Developing theory-based substance abuse prevention programs for young adolescent girls. *Journal of Early Adolescence*, *21*(3), 256-293.

National Institute on Drug Abuse. (2008). NIDA Infofacts: Understanding drug abuse and addiction. Retrieved September 16, 2009, from http://www.drugabuse.gov

Johnston, L.D., O'Malley, P.M., and Bachman, J.G. (2003a). *Monitoring the future national results on adolescent drug use: Overview of key findings, 2002.* (NIH Publication No. 03-5374). Bethesda, MD: National Institute on Drug Abuse.

Substance Abuse and Mental Health Services Administration. (2002). *Summary of findings from the 2000 National Household Survey on Drug Abuse.* (Office of Applied Studies, NHSDA Series H-13, DHHS Publication No. (SMA) 01-3549). Rockville, MD: Substance Abuse and Mental Health Services Administration.

### Tobacco Use: Smoking

Abernathy, T. J., Massad, L., & Romano-Dwyer, L. (1995). The relationship between smoking and self-esteem. *Adolescence*, *30*(120), 899-907.

Aaron, D.J., Dearwater, S.R., Anderson, R., Olsen, T., Kriska, A.M., & Laporte, R.E. (1995). Physical activity and the iInitiation of high-risk health behaviors in adolescents. *Medicine and Science in Sports and Exercise*, *27*(12), 1639-1645.

Berg, C., Choi, W. S., Kaur, H., Nollen, N., & Ahluwalia, J. S. (2009). The roles of parenting, church attendance, and depression in adolescent smoking. *Journal of Community Health, (34),* 56-63.

Biederman, J., Monuteaux, M. C., Mick, E., Wilens, T. E., Fontanella, J. A., Poetzl, K. M., Kirk, T., Masse, J., & Faraone, S. V. (2005). Is cigarette smoking a gateway to alcohol and illicit drug use disorders? A study of youths with and without attention deficit hyperactivity disorder. *Biological Psychiatry*, *59*, 258-264.

Campaign for Tobacco-Free Kids. American Cancer Society Cancer Action Network, American Heart Association, American Lung Association, and Robert Wood Johnson Foundation.(2009). *Deadly in Pink: Big Tobacco Steps up its Targeting of Women and Girls*. Retrieved September 16, 2009, from http://tobaccofreekids.org/reports/women_new/report/deadlyinpink_02182009_FINAL.pdf

Castrucci, B. C., Gerlach, K. K., Kaufman, N. J., & Orleans, C. T. (2004). Tobacco use and cessation behavior among adolescents participating in organized sports. *American Journal of Health Behavior*, *28*(1), 63-71.

Centers for Disease Control and Prevention. (2008a). Smoking-attributable mortality, years of potential life lost, and productivity losses—United States, 2000-2004. *Morbidity and Mortality Weekly Report, 57*(45), 1226-1228.

Centers for Disease Control and Prevention. (2008b). Cigarette use among high school students—United States, 1991-2007. *Morbidity and Mortality Weekly Report*, *57*(25), 689-691.

Centers for Disease Control and Prevention. 2006 National Youth Tobacco Survey and key prevalence indicators (2006). Retrieved February 25, 2009, from http://www.cdc.gov/tobacco/data_statistics/surveys/NYTS/00_pdfs/indicators.pdf

Chen, X., Unger, J. B., Palmer, P., Weiner, M. D., Johnson, C. A., Wong, M. M., & Austin, G. (2002). Prior cigarette smoking initiation predicting current alcohol use: Evidence for a gateway drug effect among California adolescents from eleven ethnic groups. *Addictive Behaviors*, *27*, 799-817.

Duke, J. C., Allen, J. A., Pederson, L. L., Mowery, P. D., Xiao, H., & Sargent, J. D. (2009). Reported exposure to pro-tobacco messages in the media: Trends among youth in the United States, 2000-2004. *American Journal of Health Promotion, 23*(3), 195-202.

Faucher, M. A. (2003). Factors that influence smoking in adolescent girls. *Journal of Midwifery & Women's Health, 48*, 199-205.

Fergusson, D. M., Goodwin, R. D., & L. J. Horwood. (2003). Major depression and cigarette smoking: Results of a 21-year longitudinal study. *Psychological Medicine, 33*, 1357-1367.

French, S. A., & Perry, C. L. 1996. Smoking among adolescent girls: Prevalence and etiology. *Journal of the American Medical Women's Association, 51*(1-2), 25-28.

Kaufman, A. R., & Augustson, E. M. (2008). Predictors of regular cigarette smoking among adolescent females: Does body image matter? *Nicotine & Tobacco Research, 10*(8), 1301-1309.

Kaczynski, A. T., Mannell, R. C., & Manske, S. R. (2008a). Leisure and risky health behaviors: A review of evidence about smoking. *Journal of Leisure Research, 40,* 404-441.

Kaczynski, A. T., Manske, S. R., Mannell, R. C., & Grewal, K. (2008b). Smoking and physical activity: A systematic review. *American Journal of Health Behavior, 32*, 93-110.

Maldonado-Molina, M. M., Komro, K. A., & Prado, G. (2007). Prospective association between dieting and smoking initiation among adolescents. *American Journal of Health Promotion, 22*(1), 25-32.

Melnick, M. J., Miller, K. E., Sabo, D., Farrell, M. P. & Barnes, G. M. (2001). Tobacco use among high school athletes and nonathletes: Results of the 1997 Youth Risk Behavior Survey. *Adolescence*, *36*, 727-747.

Mercken, L., Candel, M., Willems, P., & de Vries, H. (2007). Disentangling social selection and social influence effects on adolescent smoking: The importance of reciprocity in friendships. *Addiction, 102,* 1483-1492.

Nelson, D. E., Mowery, P. Asman, K., Pederson, L. L., O'Malley, P. M., Malarcher, A., Maibach, E. W., & Pechacek, T. F. (2008). Long-term trends in adolescent and young adult smoking in the United States: Metapatterns and implications. *American Journal of Public Health, 98*(5), 905-915.

Page, R.M., Hammermeister, J., Scanlan, A., & Gilbert, L. (1998). Is school sports participation a protective factor against adolescent health risk behaviors? *Journal of Health Education, 29*(3), 186-192.

Rodriguez, D., & Audrain-McGovern, J. (2005). Physical activity, global physical self-concept, and adolescent smoking. *Annals of Behavioral Medicine, 30*(3), 251-259.

Rodriguez, D., & Audrain-McGovern, J. (2004). Team sport participation and smoking: Analysis with general growth mixture modeling. *Journal of Pediatric Psychology, 29*(4), 299-308.

Seo, D.-C., Bodde, A. E., & Torabi, M. R. (2009). Salient environmental and perceptual correlates of current and established smoking for 2 representative cohorts of Indiana adolescents. *Journal of School Health, 79*(3), 98-107.

Substance Abuse and Mental Health Services Administration. (2008). *Results from the 2007 national survey on drug use and health: national findings.* (Office of Applied Studies, NSDUH Series H-27, DHHS Publication No. SMA 05-4061.) Rockville, MD.

U.S. Department of Health and Human Services. (2001). *Women and smoking: A report of the Surgeon General.* (Public Health Service, Office of the Surgeon General.) Rockville, MD.

Vaughn, M., Wallace, J., Perron, B., Copeland, V., & Howard, M. (2008). Does marijuana use serve as a gateway to cigarette use for high-risk African-American youth? *American Journal of Drug and Alcohol Abuse, 34,* 782-791.

Verkooijen, K. T., Nielsen, G. A., & Kremers, S. P. J. (2008). The association between leisure time physical activity and smoking in adolescence: An examination of potential mediating and moderating factors. *International Journal of Behavioral Medicine, 15*, 157-163.

Wichstrom, T., & Wichstrom, L. (2009). Does sports participation during adolescence prevent later alcohol, tobacco and cannabis use? *Addiction, 104*, 138-149.

Yusko, D. A., Buckman, J. F., White, H. R., & Pandina, R. J. (2008). Alcohol, tobacco, illicit drugs, and performance enhancers: A comparison of use by college student athletes and nonathletes. *Journal of American College Health, 57*(3), 281-289.

## Tobacco Use: Smokeless Tobacco

Arabi, Z. (2007). An epidemic that deserves more attention: Epidemiology, prevention, and treatment of smokeless tobacco. *Southern Medical Journal, 100*(9), 890-894.

Campaign for Tobacco-Free Kids. (2008). *Smokeless tobacco and kids*. Retrieved September 16, 2009, from http://tobaccofreekids.org/research/factsheets/pdf/0003.pdf

Castrucci, B. C., Gerlach, K. K., Kaufman, N. J., & Orleans, C. T. (2004). Tobacco use and cessation behavior among adolescents participating in organized sports. *American Journal of Health Behavior, 28*(1), 63-71.

Centers for Disease Control and Prevention. (2008). Youth risk behavior surveillance—United States, 2007. *Morbidity and Mortality Weekly Report (MMWR) Surveillance Summaries 57*(SS-4), 1-131.

Everett, S. A., Malarcher, A. M., Sharp, D. J., Husten, C. G., & Giovino, G. A. (2000). Relationship between cigarette, smokeless tobacco, and cigar use, and other health risk behaviors among U.S. high school students. *Journal of School Health, 70*(6), 234-240.

International Agency for Research on Cancer. (2007). Smokeless tobacco and some tobacco-specific N-nitrosamines. *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, 89*, 1-641.

Morrison, M. A., Krugman, D. M., & Park, P. (2008). Under the radar: Smokeless tobacco advertising in magazines with substantial youth readership. *American Journal of Public Health, 98*(3), 543-548.

National Collegiate Athletic Association. (2006). *NCAA study of substance use habits of college student-athletes.* Report presented to the National Collegiate Athletic Association Committee on Competitive Safeguards and Medical Aspects of Sports. Indianapolis, IA: NCAA.

Nemours Foundation. (2008). *Smokeless tobacco*. Web site: http://www.kidshealth.org/teen/drug_alcohol/tobacco/smokeless.html

Severson, H. H., Forrester, K. K., & Biglan, A. (2007). Use of smokeless tobacco is a risk factor for cigarette smoking. *Nicotine & Tobacco Research, 9*(12), 1331-1337.

Severson, H. H., Klein, K., Lichtensein, E., Kaufman, N., & Orleans, C. T. (2005). Smokeless tobacco use among professional baseball players: Survey results, 1998–2003. *Tobacco Control, 14*(1), 31-36.

Tomar, S. L. (2007). Epidemiologic perspectives on smokeless tobacco marketing and population harm. *American Journal of Preventive Medicine, 33*(6), S387-S397.

Tomar, S. L. (2003). Is use of smokeless tobacco a risk factor for cigarette smoking? The U.S. experience. *Nicotine & Tobacco Research, 5*, 561-569.

Tomar, S. L, & Hatsukami, D. (2007). Perceived risk of harm from cigarettes and smokeless tobacco among U.S. high school seniors. *Nicotine & Tobacco Research, 9*(11), 1191-1196.

## Alcohol Use

American College of Sports Medicine. (2000). *Current comment: alcohol and athletic performance*. Retrieved September 16, 2009, from http://www.acsm.org.

American Medical Association. (2004). *Girlie drinks... women's diseases.* Retrieved September 16, 2009, from http://www.alcoholpolicymd.com/pdf/girlie_drinks_survey%20.pdf

Brenner, J., & Swanik, K. (2007). High-risk drinking characteristics in collegiate athletes. *Journal of American College Health, 56*(3), 267-272.

Center on Alcohol Marketing and Youth. (2003). *Drops in the bucket: Alcohol industry "responsibility" advertising on television in 2001.* Washington, DC: Center on Alcohol Marketing and Youth.

Center on Alcohol Marketing and Youth. (2002). *Overexposed: Youth a target of alcohol advertising in magazines.* Washington, DC: Center on Alcohol Marketing and Youth.

Centers for Disease Control and Prevention. (2008). Youth Risk Behavior Surveillance—United States, 2007. *Morbidity and Mortality Weekly Report (MMWR) Surveillance Summaries 57*(SS-4), 1-131.

Dams-O'Connor, K., Martin, J. L., & Martens, M. P. (2007). Social norms and alcohol consumption among intercollegiate athletes: The role of athlete and nonathlete reference groups. *Addictive Behaviors, 32*, 2657-2666.

Davis, K. C., Hendershot, C. S., George, W. H., Norris, J., & Heiman, J. R. (2007). Alcohol's effects on sexual decision Making: An integration of alcohol myopia and individual differences. *Journal of Studies on Alcohol and Drugs, 68*, 843-851.

Eitle, D., Turner, R. J., & Eitle, T. M. (2003). The deterrence hypothesis reexamined: Sports participation and substance use among young adults. *Journal of Drug Issues, 33*, 193-221.

Ellickson, P., Tucker, J., & Klein, D. (2003). Ten-year prospective study of public health problems associated with early drinking. *Pediatrics, 111*(5), 949-955.

Ford, J. A. (2007). Substance use among college athletes: A comparison based on sport/team affiliation. *Journal of American College Health, 55(*6), 367-373.

Fredricks, J. A., & Eccles, J. S. (2006). Is extracurricular participation associated with beneficial outcomes? Concurrent and longitudinal relations. *Developmental Psychology, 42*, 698-713.

Hildebrand, K.M., Johnson, D.J., & Bogle, K. (2001). Comparison of patterns of alcohol use between high School and college athletes and non-athletes. *College Student Journal, 35*(3), 358-365.

Hoffman, J. P. (2006). Extracurricular activities, athletic participation, and adolescent alcohol use: Gender-differentiated and school-contextual effects. *Journal of Health and Social Behavior*, 47, 275-290.

Jersild, D. (2002, May 31). Alcohol in the vulnerable lives of college women. *Chronicle of Higher Education, 48*(38), B10.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2008). *Monitoring the future national survey results on drug use, 1975-2007. Volume I: Secondary school students* (NIH Publication No. 08-6418A). Bethesda, MD: National Institute on Drug Abuse.

Kandel, D. B. (Ed.). (2002). *Stages and pathways of drug involvement: Examining the gateway hypothesis*. New York, NY: Cambridge University Press.

Keyes, K. M., Grant, B. F., & Hasin, D. S. (2008). Evidence for a closing gender gap in alcohol use, abuse, and dependence in the United States population. *Drug and Alcohol Dependence,* 93, 21-29.

Martens, M. P., Watson, J. C., & Beck, N. C. (2006). Sport-type differences in alcohol use among intercollegiate athletes. *Journal of Applied Sport Psychology,* 18, 136-150.

Mays, D., & Thompson, N. J. (2009). Alcohol-related risk behaviors and sports participation among adolescents: An analysis of 2005 Youth Risk Behavior Survey data. *Journal of Adolescent Health*, 44, 87-89.

Miller, B.E., Miller, M.N., Verhegge, R., Linville, H.H., & Pumariega, A.J. (2002). Alcohol misuse among college athletes: Self-medication for psychiatric symptoms? *Journal of Drug Education, 32*(1), 41-52.

Miller, K. E., Hoffman, J. H., Barnes, G. M., Farrell, M. P., Sabo, D., & Melnick, M. J. (2003). Jocks, gender, race, and adolescent problem drinking. *Journal of Drug Education, 33*(4), 445-462.

Miller, T. R., Levy, D. T., Spicer, R. S., and Taylor, D. M. (2006). Societal costs of underage drinking. *Journal of Studies on Alcohol, 67*(4), 519-528.

National Academy of Sciences, Institute of Medicine. (2004). *Reducing underage drinking: A collective responsibility*. Washington, DC: National Academies Press.

National Center on Addiction and Substance Use (CASA). (2003). *The formative years: Pathways to substance abuse among girls and young women ages 8-22.* New York: CASA.

National Collegiate Athletic Association. (2006). *NCAA study of substance use habits of college student-athletes*. Report presented to the National Collegiate Athletic Association Committee on Competitive Safeguards and Medical Aspects of Sports. Indianapolis, IA.

National Institute on Alcohol Abuse and Alcoholism. (2003). Alcohol: A women's health issue (NIH Publication No. 03-4956). Rockville, MD: National Institutes of Health, U.S. Department of Health and Human Services.

Neal, D. J., Sugarman, D. E., Hustad, J. P., Caska, C. M., & Carey, K. B. (2005). It's all fun and games...or is it? Collegiate sporting events and celebratory drinking. *Journal of Studies on Alcohol,* 66, 291-294.

Nelson, T.F. & Wechsler, H. (2001). Alcohol and college athletes. *Medicine & Science in Sports & Exercise, 33*(1), 43-47.

Nelson, T. F., & Wechsler, H. (2003). School spirits: Alcohol and collegiate sports fans. *Addictive Behaviors,* 28, 1-11.

Nolen-Hoeksema, S. (2004). Gender differences in risk factors and consequences for alcohol use and problems. *Clinical Psychology Review,* 24, 981-1010.

O'Brien, K. S., Hunter, J., Kypri, K., & Ali, A. (2008). Gender equality in university sportspeople's drinking. *Drug and Alcohol Review*, 27, 659-665.

Peck, S. C., Vida, M., & Eccles, J. S. (2008). Adolescent pathways to adulthood drinking: Sport activity involvement is not necessarily risky or protective. *Addiction, 103*(Suppl.1), 69-83.

Shirreffs, S. M., & Maughan, R. J. (2006). The effect of alcohol on athletic performance. *Current Sports Medicine Reports*, 5, 192-196.

Storch, E. A., Storch, J. B., Killiany, E. M., & Roberti, J. W. (2005). Self-reported psychopathology in athletes: A comparison of intercollegiate student-athletes and non-athletes. *Journal of Sport Behavior*, 28(1), 86-98.

Substance Abuse and Mental Health Services Administration. (2008). *Results from the 2007 national survey on drug use and health: national findings* (Office of Applied Studies, NSDUH Series H-34, DHHS Publication No. SMA 08-4343). Rockville, MD: Substance Abuse and Mental Health Services Administration.

U.S. Department of Health and Human Services. (2007). *The Surgeon General's call to action to prevent and reduce underage drinking.* Retrieved September 16, 2009, from http://www.surgeongeneral.gov/topics/underagedrinking/calltoaction.pdf

Wichstrom, T., & Wichstrom, L. (2009). Does sports participation during adolescence prevent later alcohol, tobacco and cannabis use? *Addiction, 104*, 138-149.

Willner, P. (2001). A view through the gateway: Expectancies as a possible pathway from alcohol to cannabis. *Addiction, 96*(5), 691-703.

Wilson, G. S., Pritchard, M. E., & Schaffer, J. (2004). Athletic status and drinking behavior in college students: The influence of gender and coping style. *Journal of American College Health*, 52(6), 269—273.

Yusko, D. A., Buckman, J. F., White, H. R., & Pandina, R. J. (2008). Alcohol, tobacco, illicit drugs, and performance enhancers: A comparison of use by college student athletes and nonathletes. *Journal of American College Health, 57*(3), 281-289.

## Other References of Interest

Barnes, G.M., Welte, J.W., Hoffman, J.H., &Dintcheff, B.A. (1997). Changes in alcohol use and alcohol-related problems among 7th to 12th grade students in New York State, 1983-1994. *Alcoholism: Clinical and Experimental Research*, *21*(5), 916-922.

Chassin, L., & DeLucia, C. (1996). Drinking during adolescence. *Alcohol Health and Research World, 20*(3), 175-180.

Collins, R.L., & McNair, L.D. (2002). Minority women and alcohol use. *Alcohol Research and Health, 26*(4), 251-256.

Green, E.K., Burke, K.L., Nix, C.L., Lambrecht, K.W., & Mason, DC (1995). Psychological factors associated with alcohol use by high school athletes. *Journal of Sport Behavior, 18*(3), 195-208.

Higher Education Center for Alcohol and Other Drug Prevention. (2002). College athletes and alcohol and other drug use. Retrieved September 16, 2009, from http://www.edc.org/hec.

Hingson, R.W., Heeren, T., Zakocs, R.C., Kopstein, A., & Wechsler, H. (2002). Magnitude of alcohol-related mortality and morbidity among U.S. college students ages 18-24. *Journal of Studies on Alcohol,* 63, 136-144.

Jones, S.E., Oeltmann, J., Wilson, T.W., Brener, N.D., & Hill, C.V. (2001). Binge drinking among undergraduate college students in the United States: Implications for other substance use*. Journal of American College Health*, 50, 33-38.

Kunz, J.L. (1997). Drink and be active? The associations between drinking and participation in sports. Addiction Research, 5(6), 439-450.

National Center on Addiction and Substance Abuse at Columbia University. (1994). Rethinking rites of passage: Substance abuse on America's campuses. New York: Columbia University.

National College Athletic Association. (1997). NCAA Study of Substance Use and Abuse Habits of College Student-Athletes. Presented to the National Collegiate Athletic Association Committee on Competitive Safeguards and Medical Aspects of Sports. Retrieved September 16, 2009, from http://www.ncaa.org/library/research/substance_use_habits/1997/199709abuse.pdf

O'Malley, P.M., & Johnston, L.D. (2002). Epidemiology of alcohol and other drug use among American college students. *Journal of Studies on Alcohol, Suppl. 14*, 23-39.

Perkins, H.W. (2002). Surveying the damage: A review of research on consequences of alcohol misuse in college populations. *Journal of Studies on Alcohol, Suppl. 14*, 91-100.

Spear, L.P. (2002). Alcohol's effects on adolescents. *Alcohol Research and Health, 26*(4), 287-291.

Wechsler, H., Lee, J.E., Kuo, M., & Lee, H. (2000). College binge drinking in the 1990s: A continuing problem. *Journal of American College Health, 48*, 199-210.

Wechsler, H., Lee, J.E., Kuo, M., Seibring, M., Nelson, T.F., & Lee, H. (2002). Trends in college binge drinking during a period of increased prevention efforts. *Journal of American College Health, 50*(5), 203-217.

Windle, M. (2003). Alcohol use among adolescents and young adults. *Alcohol Research and Health, 27*(1), 79-85.

Windle, M., Shope, J.T., & Bukstein, O. 1996. *Alcohol use*. In R.J. DiClemente, W.B. Hansen, & L.E. Ponton (Eds.). Handbook of adolescent health risk behavior, pp. 115-159. New York: Plenum Press.

## Illicit Drug Use

Amaro, H., Blake, S.M., Schwartz, P.M., & Flinchbaugh, L.J. (2001). Developing theory-based substance abuse prevention programs for young adolescent girls. *Journal of Early Adolescence, 21*(3), 256-293.

Ewing, B.T. (1998). High school athletes and marijuana use. *Journal of Drug Education, 28*(2), 147-157.

Ford, J. A. (2008). Nonmedical prescription drug use among college students: A comparison between athletes and nonathletes. *Journal of American College Health, 57*(2), 211-219.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2008). *Monitoring the Future national survey results on drug use, 1975-2007. Volume I: Secondary school students* (NIH Publication No. 08-6418A). Bethesda, MD: National Institute on Drug Abuse.

Kurtzman, T. L., Otsuka, K. N., & Wahl, R. A. (2001). Inhalant abuse by adolescents. *Journal of Adolescent Health, 28*, 170-180.

McCabe, S. E., Morales, M., Cranford, J. A., Delva, J., McPherson, M. D., & Boyd, C. J. (2007). Race/ethnicity and gender differences in drug use and abuse among college students. *Journal of Ethnicity in Substance Abuse, 6*(2), 75-95.

Miller, K.E., Sabo, D.F., Melnick, M.J., Farrell, M.P., & Barnes, G.M. (2001). *The Women's Sports Foundation report: Health risks and the teen athlete*. East Meadow, NY: Women's Sports Foundation.

Mustaine, E. E., & Tewksbury, R. (2004). Profiling the druggie lifestyle: Characteristics related to Southern college students' use of illicit drugs. *Sociological Spectrum, 24*, 157-189.

National Collegiate Athletic Association. (2006). *NCAA study of substance use habits of college student-athletes*. Report presented to the National Collegiate Athletic Association Committee on Competititve Safeguards and Medical Aspects of Sports. Indianapolis, IA: NCAA.

National Center on Addiction and Substance Abuse (CASA). (2005). *Under the counter: The diversion and abuse of controlled prescription drugs in the U.S.* New York, NY: Columbia University.

Naylor, A.H., Gardner, D., & Zaichkowsky, L. (2001). Drug use patterns among high school athletes and nonathletes. *Adolescence, 36*(144), 627-639.

Office of National Drug Control Policy (2001). *The Economic Costs of Drug Abuse in the*

*United States, 1992-1998* (Publication No. NCJ-190636). Washington, DC: Executive Office of the President.

Office of National Drug Control Policy. (2003). Start a 'Student Athlete Leadership Team" (SALT). Retrieved September 16, 2009, from http://www.ondcp.gov/prevent/sports/salt.html

Page, R.M., Hammermeister, J., Scanlan, A., & Gilbert, L. (1998). Is school sports participation a protective factor against adolescent health risk behaviors? *Journal of Health Education, 29*(3), 186-192.

Pate, R.R., Trost, S.G., Levin, S., & Dowda, M. (2000). Sports participation and health-related behaviors among U.S. youth. *Archives of Pediatric and Adolescent Medicine, 154,* 904-911.

Rome, E. S. (2001). It's a rave new world: Rave culture and illicit drug use in the young. *Cleveland Clinic Journal of Medicine, 68*(6), 541-560.

Substance Abuse and Mental Health Services Administration. (2008). *Misuse of over-the-counter cough and cold medications among persons aged 12 to 25.* Rockville, MD: Author.

Substance Abuse and Mental Health Services Administration. (2001). *Summary of findings from the 2000 National Household Survey on Drug Abuse* (NHSDA Series: H-13, DHHS Publication No. SMA 01-3549). Rockville, MD: Author.

U.S. Department of Justice. (1992). *Team up: A drug prevention manual for high school athletic coaches*. Washington, DC: U.S. Department of Justice, Drug Enforcement Administration, Demand Reduction Section.

U.S. Department of Justice. (n.d.). *Coach's playbook against drugs*. Washington, DC: U.S. Department of Justice, Office of Juvenile Programs, Office of Juvenile Justice and Delinquency. Retrieved September 16, 2009, from http://ojjdp.ncjrs.org/pubs/coachesplaybook

Wallace, J.M., Jr., Bachman, J.G., O'Malley, P.M., Schulenberg, J.E., Cooper, S.M., & Johnston, L.D. (2003). Gender and ethnic differences in smoking, drinking, and illicit drug use among American 8th, 10th and 12th grade students, 1976-2000. *Addiction, 98*, 225-234.

Yusko, D. A., Buckman, J. F., White, H. R., & Pandina, R. J. (2008). Alcohol, tobacco, illicit drugs, and performance enhancers: A comparison of use by college student athletes and nonathletes. *Journal of American College Health, 57*(3), 281-289.

## Other References of Interest

Aaron, D.J., Dearwater, S.R., Anderson, R., Olsen, T., Andrea M. Kriska, A.M., & LaPorte, R.E. (1995). Physical activity and the initiation of high-risk health behaviors in adolescents. *Medicine and Science in Sports and Exercise, 27*(12), 1639-1645.

Bachman, J.G., Johnston, L.D., & O'Malley, P.M. (1998). Explaining recent increases in students= marijuana use: Impacts of perceived risks and disapproval, 1976-1996. *American Journal of Public Health, 88*(6), 887-892.

Baumert, P.W., Jr., Henderson, J.M., & Thompson, N.J. (1998). Health risk behaviors of adolescent participants in organized sports. *Journal of Adolescent Health, 22*, 460-465.

Bell, J.A., & Doege, T.C. (1987). Athletes' use and abuse of drugs. *Physician and Sports Medicine, 15*(3), 99-108.

Bell, R., Wechsler, H., & Johnston, L.D. (1997). Correlates of college student marijuana use: Results of a U.S. national survey. *Addiction, 92*(5), 571-581.

Buckhalt, J.A., Halpin, G., Noel, R., & Meadows, M.E. (1992). Relationship of drug use to involvement in school, home, and community activities: Results of a large survey of adolescents. *Psychological Reports, 70*, 139-146.

Carlini-Cotrim, B., & de Carvalho, V.A. (1993). Extracurricular activities: Are they an effective strategy against drug consumption? *Journal of Drug Education, 23*(1), 97-104.

Crabbe, T. (2000). A sporting chance?: Using sport to tackle drug use. *Drugs: Education, Prevention and Policy, 7*(4), 381-391.

Diacin, M.J., Parks, J.B., & Allison, P.C. (2003). Voices of male athletes on drug use, drug testing, and the existing order in intercollegiate athletics. *Journal of Sport Behavior, 26*(1), 1-16.

Ferron, C., Narring, F., Cauderay, M., & Michaud, P.A. (1999). Sport activity in adolescence: Associations with health perceptions and experimental behaviors. *Health Education Research, 14*(2), 225-233.

Higher Education Center for Alcohol and Other Drug Prevention. (2002). *College athletes and alcohol and other drug use*. Retrieved September 16, 2009, from http://www.edc.org/hec.

Johnston, L.D., O'Malley, P.M., & Bachman, J.G. (2002b). *Monitoring the Future national survey results on drug use, 1975-2001 Volume I: secondary school students* (NIH Publication No. 02-5106). Bethesda, MD: National Institute on Drug Abuse.

Leonard, W.M. (1998). The influence of physical activity and theoretically relevant variables in the use of drugs: The deterrence hypothesis revisited. *Journal of Sport Behavior, 21*(4), 421-435.

National College Athletic Association (1997). *NCAA study of substance use and abuse habits of college student-athletes.* Presented to the National Collegiate Athletic Association Committee on Competitive Safeguards and Medical Aspects of Sports. Retrieved September 16, 2009, from http://www.ncaa.org/library/research/substance_use_habits/1997/199709abuse.pdf

Nattiv, A., & Puffer, J.C. (1991). Lifestyles and health risks of collegiate athletes. *Journal of Family Practice, 33*(6), 585-590.

Peretti-Watel, P., Beck, F., & Legleye. S. (2002). Beyond the u-curve: The relationship between sport and alcohol, cigarette and cannabis use in adolescents. *Addiction*, 97, 707-716.

Peretti-Watel, P., Guagliardo, V., Verger, P., Pruvost, J., Mignon, P., & Obadia, Y. (2003). Sporting activity and drug use: Alcohol, cigarette and cannabis use among elite student athletes. *Addiction*, 98, 1249-1256.

Steiner, H., McQuivey, R.W., Pavelski, R., Pitts, T., & Kraemer, H. (2000). Adolescents and sports: Risk or benefit? *Clinical Pediatrics,* 39, 161-166.

Strote, J., Lee, J.E., & Wechsler, H. (2002). Increasing MDMA use among college students: Results of a national survey. *Journal of Adolescent Health*, 30, 64-72.

Tricker, R., & Connolly, D. (1997). Drugs and the college athlete: An analysis of the attitudes of student athletes at risk. *Journal of Drug Education, 27*(2), 105-119.

Waddington, I. (2000). *Sport, health and drugs: A critical sociological perspective*. London: Taylor and Francis.

Wechsler, Henry, Davenport, Andrea E., Dowdall, George W., Grossman, Susan J., & Zanakos, Sophia I. (1997). Binge drinking, tobacco, and illicit drug use and involvement in college athletics: A survey of students at 140 American colleges. *Journal of American College Health*, 45,195-200.

Weinberg, N.Z., Rahdert, E., Colliver, J.D., & Glantz, M.D. (1998). Adolescent substance abuse: A review of the past 10 years. *Journal of the American Academy of Child and Adolescent Psychiatry, 37*(3), 252-261.

Weiss, Stephen M. 1999. A comparison of maladaptive behaviors of athletes and nonathletes. *Journal of Psychology, 133*(3), 315-322.

Winnail, S.D., Valois, R.F., Dowda, M., McKeown, R.E., Saunders, R.P., & Pate, R.R. (1997). Athletics and substance use among public high school students in a southern state. *American Journal of Health Studies, 13*(4), 187-194.

Zill, Nichoas, Winquist Nord, Christine, & Spencer Loomis, Laura. 1995. *Adolescent time use, risky behavior, and outcomes: An analysis of national data.* Rockville, MD: Westat, Inc.

## Anabolic-Androgenic Steroid Use

American College of Sports Medicine (1987). The use of anabolic-androgenic steroids in sports. *Medicine and Science in Sports and Exercise, 19*(5), 534-539.

Bahrke, M.S., Yesalis, C.E., Kopstein, A.N., & Stephens, J.A. (2000). Risk factors associated with anabolic-androgenic steroid use among adolescents. *Sports Medicine, 29* (6), 397-405.

Centers for Disease Control and Prevention. (2008). Youth risk behavior surveillance—United States, 2007. *Morbidity and Mortality Weekly Report (MMWR) Surveillance Summaries 57*(SS-4), 1-131.

Committee on Oversight and Government Reform. (2005). Committee holds hearing on steroid use among women. Retrieved September 16, 2009, from http://oversight.house.gov/story.asp?ID=868

Committee on Sports Medicine and Fitness, American Academy of Pediatrics. (1997). Adolescents and anabolic steroids: A subject review. *Pediatrics, 99*(6), 904-908.

Denham, B. E., Hawkins, K. W., Jones, K. O., & Billings, A. C. (2007). Anabolic-androgenic steroid use as a complicating factor in the female athlete triad: Behavioral implications for sport psychology. *Journal of Applied Sport Psychology, 19,* 457-470.

Elliot, D. L., Cheong, J., Moe, E. L., & Goldberg, L. (2007). Cross-sectional study of female students reporting anabolic steroid use. *Archives of Pediatric and Adolescent Medicine, 161*, 572-577.

Elliot, D. L., & Goldberg, L. (2000). Women and anabolic steroids. In C. E. Yesalis (Ed.), *Anabolic steroids in sport and exercise*, 2nd ed, pp. 225-246. Champaign, IL: Human Kinetics.

Elliot, D. L., Moe, E. L., Goldberg, L., DeFrancesco, C. A., Durham, M. B., & Hix-Small, H. (2006). Definition and outcome of a curriculum to prevent disordered eating and body-shaping drug use. *Journal of School Health, 76*(2), 67-73.

Goldberg, L., MacKinnon, D. P., Elliot, D. L., Moe, E. S., Clarke, G., & Cheong, J. (2000). The Adolescents Training and Learning to Avoid Steroids program: Preventing drug use and promoting health behaviors. *Archives of Pediatric and Adolescent Medicine, 154*, 332-338.

Gruber, A.J. & Pope, H.G., Jr. (2000). Psychiatric and medical effects of anabolic-androgenic steroid use in women. *Psychotherapy and Psychosomatics, 69*, 19-26.

Hall, R. C., Hall, R. C., & Chapman, M. J. (2005). Psychiatric complications of anabolic steroid abuse. *Psychosomatics, 46*, 285-290.

Irving, L., Wall, M., Neumark-Sztainer, D., & Story, M. (2002). Steroid use among adolescents: Findings from Project EAT. *Journal of Adolescent Health, 30*, 243-252.

Johnston, L. D., O'Malley, P. M., Bachman, J. G., & Schulenberg, J. E. (2008). *Monitoring the Future national survey results on drug use, 1975-2007. Volume I: Secondary school students* (NIH Publication No. 08-6418A). Bethesda, MD: National Institute on Drug Abuse.

Miller, K. E., Hoffman, J. H., Barnes, G. M., Sabo, D., Melnick, M. J., & Farrell, M. P. (2005). Adolescent anabolic steroid use, gender, physical activity, and other problem behaviors. *Substance Use & Misuse, 40*, 1637-1657.

Miller, K. E., Barnes, G.M., Sabo, D.F., Melnick M.J., & Farrell, M.P. (2002a). A comparison of health risk behavior in adolescent users of anabolic-androgenic steroids, by gender and athlete status. *Sociology of Sport Journal, 19*, 385-402.

Miller, K. E., Barnes, G.M., Sabo, D.F., Melnick M.J., & Farrell, M.P. (2002b). Anabolic-androgenic steroid use and other adolescent problem behaviors: Rethinking the male athlete assumption. *Sociological Perspectives, 45*(4), 467-489.

National Institute on Drug Abuse, National Institutes of Health, U.S. Dept. of Health and Human Services. 2000. *Research report series: Anabolic steroid abuse*. (NIH Publication #00-3721). Washington, DC: NIH.

Otis, C. T., Drinkwater, B. L., Johnson, M., Loucks, A., & Wilmore, J. (1997). American College of Sports Medicine position stand on female athlete triad. *Medicine & Science in Sport & Exercise, 21*, i-ix.

U.S. Department of Justice. (2004). *Steroid abuse in today's society: A guide for understanding steroids and related substances*. Washington, DC: U.S. Department of Justice, Drug Enforcement Administration, Office of Diversion Control.

Wichstrom, L. & Pedersen, W. (2001). Use of anabolic-androgenic steroids in adolescence: Winning, looking good or being bad? *Journal of Studies on Alcohol, 62*, 5-13.

Wood, R. I. (2006). Anabolic steroids: A fatal attraction? *Journal of Neuroendocrinology, 18*(3), 227-228.

Wright, S., Grogan, S., & Hunter, G. (2001). Body-builders attitudes toward steroid use. *Drugs: Education, Prevention and Policy, 8*(1), 91-95.

Yesalis, C. E. (2000). *Anabolic steroids in sports and exercise*, (2nd ed.). Champaign, IL: Human Kinetics.

## Other References of Interest

Anshel, M.H., & Russell, K.G. (1997). Examining athletes' attitudes toward using anabolic steroids and their knowledge of the possible effects. *Journal of Drug Education*, 27(2), 121-145.

Bahrke, M.S., Yesalis, C.E., & Brower, K.J. (1998). Anabolic-androgenic steroid abuse and performance-enhancing drugs among adolescents. *Sport Psychiatry, 7*(4), 821-838.

Bamberger, M., & Yaeger, D. (1997). Over the edge. *Sports Illustrated*, 86(15), 60-67.

Buckley, W.E., Yesalis, C.E., Friedl, K.E., Anderson, W.A., Streit, A.L., & Wright, J.E. (1988). Estimated prevalence of anabolic steroid use among male high school seniors. *JAMA, 260*(23), 3441-3445.

Clarke, G., Elliot, D., Goldberg, L., Moe, E., Wolf, S., Poole, L., & Perrin, N. (1996). The ATHENA (Athletes Targeting Healthy Exercise and Nutrition Alternatives) program: Targeting sport teams for drug prevention and health promotion. Annual meeting abstract: Paper presented at the annual meeting of the American College of Sports Medicine. *Medicine and Science in Sports and Exercise, 28*(5), Supp.154.

Committee on Sports Medicine, American Academy of Pediatrics. (1989). Anabolic steroids and the adolescent athlete. *Pediatrics, 83*(1), 127-128.

Drewnowski, A., Kurth, C.L., & Krahn, D.D. (1995). Effects of body image on dieting, exercise, and anabolic steroid use in adolescent males. *International Journal of Eating Disorders, 17*(4), 381-386.

DuRant, R.H., Rickert, V.I., Ashworth, C.S., Newman, C., & Slavens, G. (1993). Use of multiple drugs among adolescents who use anabolic steroids. *New England Journal of Medicine, 328*(13), 922-926.

Elliot, D.L., & Goldberg, L. (1996). Intervention and prevention of steroid use in adolescents. *American Journal of Sports Medicine, 24*(6), S46-47.

Goldberg, L., Elliot, D., Clarke, G., Mackinnon, D., Moe, E., Zoref, L., Green, C., Wolf, S., Greffrath, E., Miller, D., & Lapin, A. (1996). Effects of a multidimensional anabolic steroid prevention intervention: The Adolescents Training and Learning to Avoid Steroids (ATLAS) program. *JAMA, 276*(19), 1555-1562.

Gruber, A.J., & Pope, H.G., Jr. (1999). Compulsive weight lifting and anabolic drug abuse among women rape victims. *Comprehensive Psychiatry, 40*(4), 273-277.

Kindlundh, A.M.S., Isacson, D.G.L., Berglund, L., & Nyberg, F. (1999). Factors associated with adolescent use of doping agents: Anabolic-androgenic steroids. *Addiction, 94*(4), 543-553.

Komoroski, E., & Rickert, V. (1992). Adolescent body image and attitudes to anabolic steroid use. *American Journal of Child Diseases, 146*, 823-828.

Middleman, A.B., & DuRant, R.H. (1996). Anabolic steroid use and associated health risk behaviors. *Sports Medicine, 21*(4), 251-5.

National Institute on Drug Abuse, National Institutes of Health, U.S. Dept. of Health and Human Services. (2000). *Research report series: Anabolic steroid abuse*. (NIH Publication #00-3721). Washington, DC: National Institutes of Health.

Schrof, J.M. (1992). Pumped up. *U.S. News and World Report, 112*(21), 54-60.

Terney, R., & McLain, L.G. (1990). The use of anabolic steroids in high school students. *American Journal of Diseases of Children, 144*, 99-103.

Trenhaile, J., Choi, H.S., Proctor, T.B., & Work, P. (1998). The effect of anabolic steroid education on knowledge and attitudes of at-risk preadolescents. *Journal of Alcohol and Drug Education, 43*(2), 20-35.

Windsor, R., & Dumitru, D. (1989). Prevalence of anabolic steroid use by male and female adolescents. *Medicine and Science in Sports and Exercise*, 21, 494-7.

Wesely, J.K. (1999, August 6-10). *Built bodies, natural bodies: The social and physical construction of gender.* Paper presented at the annual meeting of the American Sociological Association, Chicago, IL.

Yesalis, C.E., Bahrke, M.S., & Wright, J.E. (2000). Societal alternatives to anabolic steroid use. *Clinical Journal of Sports Medicine, 10*(1), 1-6.

Yesalis, C.E., Kennedy, N.J., Kopstein, A.N., & Bahrke, M.S. (1993). Anabolic-androgenic steroid use in the United States. *JAMA, 270*(10), 1217-21.

Zickler, P. (2000). NIDA initiative targets increasing teen use of anabolic steroids. *NIDA Notes, 15*(3), 1.6-7.

## III. Sexual Risk Prevention

Abma, J. C., Martinez, G. M., Mosher, W. D., & Dawson, B. S. (2004). Teenagers in the United States: Sexual activity, contraceptive use, and childbearing, 2002. National Center for Health Statistics. Vital Health Statistics, 23(24), 1-87.

Albert, B. (2007). With one voice: America's adults and teens sound off about teen pregnancy. Washington, DC: National Campaign to Prevent Teen Pregnancy.

Athletes for Sexual Responsibility. (2009). Smart sex posters. Retrieved April 14, 2009, from http://www.umaine.edu/athletesforsexualresponsibility/smart_sex_posters.htm

Brady, S. S., & Halpern-Felsher, B. L. (2007). Adolescents' reported consequences of having oral sex versus vaginal sex. *Pediatrics, 119*(2), 229-236.

Centers for Disease Control and Prevention [CDC]. (2008a). Trends in HIV- and STD-related risk behaviors among high school students—United States, 1991-2007. *Morbidity and Mortality Weekly Report (MMWR), 57*(30), 817-822.

Centers for Disease Control and Prevention. (2008). Youth risk behavior surveillance—United States, 2007. *Morbidity and Mortality Weekly Report (MMWR) Surveillance Summaries, 57*(SS-4), 1-131.

Chesson, H. W., Blandford, J. M., Gift, T. L., Tao, G., & Irwin, K. L. (2004). The estimated direct medical cost of sexually transmitted diseases among American youth, 2000. *Perspectives on Sexual and Reproductive Health, 36*(3), 11-19.

Dodge, T. & Jaccard, J. (2002). Participation in athletics and female sexual risk behavior: The evaluation of four causal structures. *Journal of Adolescent Research, 17*, 42-67.

Eitle, T.M. & Eitle, D.J. (2002). Just don't do it: High school sports participation and young female adult sexual behavior. *Sociology of Sport Journal, 19*, 403-418.

Erkut, S. & Tracy, A.J. (2000). Protective effects of sports participation on girls' sexual behavior. *Working Paper Series #301*. Wellesley, MA: Center for Research on Women.

Fasting, K., Brackenridge, C. H., Miller, K. E., & Sabo, D. (2008). Participation in college sports and protection from sexual victimization. *International Journal of Sport and Exercise Psychology, 6,* 427-441.

Halpern-Felsher, B. L., Cornell, J. L., Kropp, R. Y., & Tschann, J. M. (2005). Oral versus vaginal sex among adolescents: Perceptions, attitudes, and behavior. *Pediatrics, 115*(4), 845-851.

Hoff, T., Green, L., & Davis, J. (2003). *National survey of adolescents and young adults: Sexual health knowledge, attitudes and experience.* Menlo Park, CA: Henry J. Kaiser Family Foundation.

Holcombe, E., Manlove, J., & Ikramullah, E. (2008). *Forced sexual intercourse among young adult women.* Washington, DC: Child Trends.

Kirby, D. (2007). *Emerging answers: Research findings on programs to reduce teen pregnancy.* Washington, DC: National Campaign to Prevent Teen Pregnancy.

Kokotailo, P.K., Koscik, R.E., Henry, B.C., Fleming, M.F., & Landry, G.L. (1998). Health risk taking and human immunodeficiency virus risk in collegiate female athletes. *Journal of American College Health, 46*(6), 263-268.

Lehman, S. J., & Koerner, S. S. (2004). Adolescent women's sports involvement and sexual behavior/ health: A process-level investigation. *Journal of Youth and Adolescence, 33*(5), 443-455.

Lindberg, L. D., Jones, R., & Santelli, J. S. (2008). Noncoital sexual activities among adolescents. *Journal of Adolescent health, 43*(3), 231-238.

Miller, K.E., Barnes, G.M., Melnick, M.J., Sabo, D., & Farrell, M.P. (2002). Gender and racial/ethnic differences in predicting adolescent sexual risk: Athletic participation vs. exercise. *Journal of Health & Social Behavior, 43*, 436-450.

Misra, D. (2001). Women's health data book: A profile of women's health in the United States, 3rd edition. Washington, DC: Jacobs Institute of Women's Health and the Henry J. Kaiser Family Foundation.

Panchaud, C., Singh, S., Feivelson, D., & Darroch, J. E. (2000). Sexually transmitted diseases among adolescents in developed countries. *Family Planning Perspectives*, 32(1), 24-32, 45.

Terry-Humen, E., Manlove, J., & Cottingham, S. (2006). *Trends and recent estimates: Sexual activity among U.S. teens.* Washington, DC: Child Trends.

Weinstock, H., Berman, S., & Cates, W., Jr. (2004). Sexually transmitted diseases among American youth: Incidence and prevalence estimates, 2000. *Perspectives on Sexual and Reproductive Health, 36*(1), 6-10.

## Other References of Interest

Cooper, M.L., Shapiro, C.M., & Powers, A.M. (1998). Motivations for sex and risky sexual behavior among adolescents and young adults: A functional perspective. *Journal of Personality and Social Psychology, 75*(6), 1528-1558.

Desiderato, L.L., & Crawford, H.J. (1995). Risky sexual behavior in college students: Relationships between number of sexual partners, disclosure of previous risky behavior, and alcohol use. *Journal of Youth and Adolescence, 24*(1), 55-68.

Duncan, S.C., Strycker, L.A., & Duncan, T.E. (1999). Exploring associations in developmental trends of adolescent substance use and risky sexual behavior in a high-risk population. *Journal of Behavioral Medicine, 22*(1), 21-34.

Eyre, S.L., & Millstein, S.G. (1999). What leads to sex? Adolescent preferred partners and reasons for sex. *Journal of Research on Adolescence, 9*(3), 277-307.

Harvey, S.M., & Spigner, C. (1995). Factors associated with sexual behavior among adolescents: A multivariate analysis. *Adolescence, 30*(118), 253-264.

Levinson, R.A., Jaccard, J., & Beamer, L. (1995). Older adolescents' engagement in casual sex: Impact of risk perception and psychosocial motivations. *Journal of Youth and Adolescence, 24*(3), 349-364.

Santelli, J.S., Lindberg, L.D., Abma, J., McNeely, C.S., & Resnick, M. (2000). Adolescent sexual behavior: Estimates and trends from four nationally representative surveys. *Family Planning Perspectives, 32*(4), 156-165,194.

Serovich, J.M., & Greene, K. (1997). Predictors of adolescent sexual risk taking behaviors which put them at risk for contracting HIV. *Journal of Youth and Adolescence, 26*(4), 429-444.

Taylor-Seehafer, M., & Rew, L. (2000). Risky sexual behavior among adolescent women. *Journal of the Society of Pediatric Nurses, 5*(1), 15-25.

## Teen Pregnancy Prevention

Abma, J. C., Martinez, G. M., Mosher, W. D., & Dawson, B. S. (2002). Teenagers in the United States: Sexual activity, contraceptive use, and childbearing, 2002. National Center for Health Statistics. *Vital Health Statistics, 23*(24), 1-87.

Chandra, A., Martino, S. C., Collins, R. L., Elliott, M. N., Berry, S. H., Kanouse, D. E., & Miu, A. (2008). Does watching sex on television predict teen pregnancy? Findings from a national longitudinal survey of youth. *Pediatrics, 122*, 1047-1054.

Crosby, R. A., & Holtgrave, D. R. (2006). The protective value of social capital against teen pregnancy: A state-level analysis. *Journal of Adolescent Health, 38*, 556-559.

Darroch, J. E., Frost, J. J., & Singh, S. (2001). Teenage sexual and reproductive behavior in developed countries: Can more progress be made? *Occasional Report No. 3*. New York: Alan Guttmacher Institute.

Dodge, T. & Jaccard, J. (2002). Participation in athletics and female sexual risk behavior: The evaluation of four causal structures. *Journal of Adolescent Research, 17*, 42-67.

Eitle, T.M. & Eitle, D.J. (2002). Just don't do it: High school sports participation and young female adult sexual behavior. *Sociology of Sport Journal, 19*, 403-418.

Hamilton, B. E., Martin, J. A., & Ventura, S. J. (2009). Births: Preliminary data for 2007. *National Vital Statistics Reports, 57*(12), 1-23.

Hoffman, S. (2006). *By the numbers: The public costs of teen childbearing*. Washington, DC: National Campaign to Prevent Teen Pregnancy.

Kirby, D. (2007). *Emerging answers 2007: Research findings on programs to reduce teen pregnancy and sexually transmitted diseases*. Washington, DC: National Campaign to Prevent Teen and Unplanned Pregnancy.

Kokotailo, P.K., Koscik, R.E., Henry, B.C., Fleming, M.F., & Landry, G.L. (1998). Health risk taking and human immunodeficiency virus risk in collegiate female athletes. *Journal of American College Health, 46*(6), 263-268.

Martin, J. A., Hamilton, B. E., Sutton, P. D., Ventura, S. J., Menacker, F., Kirmeyer, S., & Mathews, T. J (2009). Births: Final data for 2006. *National Vital Statistics Reports, 57*(7), 1-102.

Miller, K.E., Barnes, G.M., Melnick, M.J., Sabo, D., & Farrell, M.P. (2002). Gender and racial/ethnic differences in predicting adolescent sexual risk: Athletic participation vs. exercise. *Journal of Health & Social Behavior, 43*, 436-450.

Miller, K.E., Sabo, D., Farrell, M.P., Barnes, G.M., & Melnick, M.J. (1999). Sports, sexual activity, contraceptive use, and pregnancy among female and male high school students: Testing cultural resource theory. *Sociology of Sport Journal, 16*, 366-387.

Moore, K. A. (2008). *Teen births: Examining the recent increase*. Washington, DC: National Campaign to Prevent Teen and Unplanned Pregnancy.

Page, R.M., Hammermeister, J., Scanlan, A., & Gilbert, L. (1998). Is school sports participation a protective factor against adolescent health risk behaviors? *Journal of Health Education, 29*(3), 186-192.

Rome, E.S., Rybicki, L.A., & Durant, R.H. (1998). Pregnancy and other risk behaviors among adolescent girls in Ohio. *Journal of Adolescent Health, 22*, 50-55.

Sabo, D., Miller, K.E., Farrell, M.P., Barnes, G.M., & Melnick, M.J. (1998). *The Women's Sports Foundation Report: Sport and Teen Pregnancy*. East Meadow, NY: Women's Sports Foundation.

Sabo, D., Miller, K.E., Farrell, M.P., Melnick, M.J., & Barnes, G.M. (1999). High school athletic participation, sexual behavior and adolescent pregnancy: A regional study. *Journal of Adolescent Health, 25*, 207-216.

Santelli, J. S., Lindberg, L. D., Finer, L. B., & Singh, S. (2007). Explaining recent declines in adolescent pregnancy in the United States: The contribution of abstinence and improved contraceptive use. *American Journal of Public Health, 97*(1), 150-156.

Shakib, S. (2003). Female basketball participation: Negotiating the conflation of peer status and gender status from childhood through puberty. *American Behavioral Scientist, 46*(10), 1405-1422.

Singh, S., & Darroch, J. E. (2000). Adolescent pregnancy and childbearing: Levels and trends in developed countries. *Family Planning Perspectives, 32*(1), 14-23.

Suellentrop, K. (2006). *Teen contraceptive use*. Washington, DC: National Campaign to Prevent Teen Pregnancy.

Terry-Humen, E., Manlove, J., & Moore, K. A. (2005). *Playing catch-up: How children born to teen mothers fare*. Washington, DC: National Campaign to Prevent Teen Pregnancy.

Ventura, S. J., Abma, J. C., Mosher, W. D., & Henshaw, S. K. (2008). Estimated pregnancy rates by outcome for the United States, 1990-2004. *National Vital Statistics Report, 56*(15).

## Other References of Interest

Coley, R.L., & Chase-Lansdale, P.L. (1998). Adolescent pregnancy and parenthood: Recent evidence sand future directions. *American Psychologist, 53*(2):152-166.

DuPlessis, H.M., Bell, R., & Richards, T. (1997). Adolescent pregnancy: Understanding the impact of age and race on outcomes. *Journal of Adolescent Health, 20*, 187-197.

Franklin, C., Grant, D., Corcoran, J., Miller, P.O., & Bultman, L. (1997). Effectiveness of prevention programs for adolescent pregnancy: A meta-analysis. *Journal of Marriage and the Family, 59*, 551-567.

Henshaw, S.K. (1998). Unintended pregnancy in the United States. *Family Planning Perspectives, 30*(1), 24-29, 46.

Kirby, D. (2002). *Do abstinence-only programs delay the initiation of sex among young people and reduce teen pregnancy?* Washington, DC: National Campaign to Prevent Teen Pregnancy.

Kivisto, P. (2001). Teenagers, pregnancy, and childbearing in a risk society: How do high-risk teens differ from their age peers? *Journal of Family Issues, 22*(8), 1044-1065.

Martyn, K.K., and Hutchinson, S.A. (2001). Low-income African American adolescents who avoid pregnancy: Tough girls who rewrite negative scripts. *Qualitative Health Research, 11*(2), 238-256.

Miller, B.C. (1998). *Families matter: A research synthesis of family influences on adolescent pregnancy*. Washington, DC: National Campaign to Prevent Teen Pregnancy.

Nitz, K. (1999). Adolescent pregnancy prevention: A review of interventions and programs. *Clinical Psychology Review, 19*(4), 457-471.

Piccinino, L.J., and Mosher, W.D. (1998). Trends in contraceptive use in the United States: 1982-1995. *Family Planning Perspectives, 30*(1), 4-10, 46.

Robinson, R.B., and Frank, D.I. (1994). The relation between self-esteem, sexual activity, and pregnancy. *Adolescence, 29*(113), 27-35.

## IV. Mental Health and Well-Being
### References for Depression

Ahmadi, J., Samavat, F., Sayyad, M., & Ghanizadeh, A. (2002). Various types of exercise and scores on the Beck Depression Inventory. *Psychological Reports, 90*(3), 821-822.

Armstrong, S., & Ooman-Early, J. (2009). Social connectedness, self-esteem, and depression symptomatoloty among collegiate athletes versus nonathletes. *Journal of American College Health, 57*, 521-526.

Boone, E. M., & Leadbeater, B. J. (2006). Game on: Diminishing risks for depressive symptoms in early adolescence through positive involvement in team sports. *Journal of Research on Adolescence, 16*, 79-90.

Brown, W. J., Ford, J. H., Burton, N. W., Marshall, A. L., & Dobson, A. J. (2005). Prospective study of physical activity and depressive symptoms in middle-aged women. *American Journal of Preventive Medicine, 29*, 265-272.

Cassano, P., & Fava, M. (2002). Depression and public health, an overview. *Journal of Psychosomatic Research, 53*, 849-857.

Craft, L. L. (2005). Exercise and clinical depression: Examining two psychological mechanisms. *Psychology of Sport and Exercise, 6*, 151-171.

Cripps, F. (2008). Exercise your mind: Physical activity as a therapeutic technique for depression. *International Journal of Therapy and Rehabilitation, 15*, 460-465.

Cyranowski, J.M., Frank, E., Young, E., & Shear, M.K. (2000). Adolescent onset of the gender difference in lifetime rates of major depression: A theoretical model. *Archives of General Psychiatry, 57*(1), 21-27.

Devane, C. L., Chiao, E., Franklin, M., & Kruep, E. J. (2005). Anxiety disorders in the 21st century: Status, challenges, opportunities, and comorbidity with depression. *American Journal of Managed Care, 11*, S344-S353.

Dishman, R. K., Hales, D. P., Pfeiffer, K. A., Felton, G., Saunders, R., Ward, D. S., Dowda, M., & Pate, R. R. (2006). Physical self-concept and self-esteem mediate cross-sectional relations of physical activity and sport participation with depression symptoms among adolescent girls. *Health Psychology, 25*, 396-407.

Dunn, A.L., Trivedi, M. H., Kampert, J. B., Clark, C. G., & Chambliss, H. O. (2005). Exercise treatment for depression: Efficacy and dose response. *American Journal of Preventive Medicine, 28*, 1-8.

Gore, S., Farrell, F., & Gordon, J. (2001). Sports involvement as protection against depressed mood. *Journal of Research on Adolescence, 11*(1), 119-130.

Greenberg, P. E., Kessler, R. C., Birnbaum, H. G., Leong, S. A., Lowe, S. W., Berglund, P. A., & Corey-Lisle, P. K. (2003). The economic burden of depression in the United States: How did it change between 1990 and 2000? *Journal of Clinical Psychiatry, 64*, 1465-1475.

Hyde, J. S., Mezulis, A. H., & Abramson, L. Y. (2008). The ABCs of depression: Integrating affective, biological, and cognitive models to explain the emergence of the gender difference in depression. *Psychological Review, 115*, 291-313.

Johnson, C. C., Murray, D. M., Elder, J. P., Jobe, J. B., Dunn, A. L., Kubik, M., Voorhees, C., & Schachter, K. (2008). Depressive symptoms and physical activity in adolescent girls. *Medicine & Science in Sports & Exercise, 40*, 818-826.

Katon, W., & Ciechanowski, P. (2002). Impact of major depression on chronic medical illness. *Journal of Psychosomatic Research, 53*, 859-863.

Kessler, R. C., Barker, P. R., Colpa, L. J., Epstein, J. F., Gfroerer, J. C., Hiripi, E., Howes, M. J., Normand, S. L., Manderscheid, R. W., Walters, E. E., & Zaslavsky, A. M. (2003). Screening for serious mental illness in the general population. *Archives of General Psychiatry, 60*, 184-189.

Lawlor, D. A., & Hopker, S. W. (2001). The effectiveness of exercise as an intervention in the management of depression: Systematic review and meta-regression analysis of randomised controlled trials. *British Medical Journal, 322*, 1-8.

Mazure, C.M., Keita, G.P., & Blehar, M.C. (2002). *Summit on women and depression: Proceedings and recommendations*. Washington, DC: American Psychological Association.

McKercher, C. M., Schmidt, M. D., Sanderson, K. A., Patton, G. C., Dwyer, T., & Venn, A. J. (2009). Physical activity and depression in young adults. *American Journal of Preventive Medicine, 36*, 161-164.

Mental Health America. (2008a). Do you know the facts? Breaking down the myths about depression. Retrieved September 16, 2009, from http://www.mentalhealthamerica.net

Mental Health America (2008b). *Fact sheet: Depression in women*. Retrieved September 16, 2009, from http://www.mentalhealthamerica.net

National Institute of Mental Health. (2008). *Women and depression: Discovering hope*. (NIH Publication No. 00-4779). Bethesda, MD: National Institute of Mental Health, National Institutes of Health, U.S. Department of Health and Human Services.
Sallis, J. P., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine & Science in Sports & Exercise, 32*, 963-975.

Sanders, C.E., Field, T.M., Diego, M., & Kaplan, M. (2000). Moderate involvement in sports is related to lower depression levels in adolescents. *Adolescence, 35*(140), 793-797.

Strawbridge, W. J., Deleger, S., Roberts, R., & Kaplan, G. A. (2002). Physical activity reduces the risk of subsequent depression for older adults. *American Journal of Epidemiology, 156*, 328-334.

Substance Abuse and Mental Health Services Administration. (2008). *Results from the 2007 National Survey on Drug Abuse and Health: National findings* (Office of Applied Studies, NSDUH Series: H-34, DHHS Publication No. SMA 08-4343). Rockville, MD: Author.

Taliaferro, L. A., Rienzo, B. A., Pigg, M., Jr., Miller, M. D., & Dodd, V. J. (2008). Associations between physical activity and reduced rates of hopelessness, depression, and suicidal behavior among college students. *Journal of American College Health, 57*, 427-435.

Teychenne, M., Ball, K., & Salmon, J. (2008). Physical activity and likelihood of depression in adults: A review. *Preventive Medicine, 46*, 397-411.

World Health Organization. (2001). *World health report 2001*: *Mental health: New understanding, new hope*. Geneva, Switzerland: World Health Organization.

Wyshak, G. (2001). Women's college physical activity and self-reports of physician-diagnosed depression and of current symptoms of psychiatric distress. *Journal of Women's Health & Gender-Based Medicine, 10*, 363-370.

Suicide American Association of Suicidology. (2006). *Youth suicide fact sheet*. Retrieved September 16, 2009, from http://www.suicidology.org.

Bae, S., Ye, R., Chen, S., Rivers, P., & Singh, K. (2005). Risky behaviors and factors associated with suicide attempts in adolescents. *Archives of Suicide Research, 9*, 193-202.

Barrios, L.C., Everett, S.A., Simon, T.R., & Brener, N.D. (2000). Suicide ideation among U.S. college students: Associations with other injury risk behaviors. *Journal of American College Health, 48*, 229-233.

Brown, D.R. & Blanton, C.J. (2002). Physical activity, sports participation, and suicidal behavior among college students. *Medicine & Science in Sports & Exercise, 34*(7), 1087-1096.

Brown, D. R., Galuska, D. A., Zhang, J., Eaton, D. K., Fulton, J. E., Lowry, R., & Maynard, L. M. (2007). Physical activity, sport participation, and suicidal behavior: U.S. high school students. *Medicine & Science in Sports & Exercise, 39*, 2248-2257.

Centers for Disease Control and Prevention. (2008). Youth risk behavior surveillance, United States, 2007. *Morbidity and Mortality Weekly Report (MMWR) Surveillance Summaries, 57*(SS-4), 1-131.

Centers for Disease Control and Prevention. (2007). Suicide trends among youths and young adults aged 10-24 years, United States, 1990-2004. *Morbidity and Mortality Weekly Reports, 56*(35), 905-908.

Ferron, C., Narring, F.C., Cauderay, M., & Michaud, P.-A. (1999). Sport activity in adolescence: Associations with health perceptions and experimental behaviors. *Health Education Research: Theory & Practice, 14*, 225-233.

Hallfors, D. D., Waller, M. W., Ford, C. A., Halpern, C. T., Brodish, P. H., & Iritani, B. (2004). Adolescent depression and suicide risk: Association with sex and drug behavior. *American Journal of Preventive Medicine, 27*(3), 224-230.

Harrison, P. A., & Narayan, G. (2003). Differences in behavior, psychological factors, and environmental factors associated with participation in school sports and other activities in adolescence. *Journal of School Health, 73*, 113-120.

Institute of Medicine. (2002). *Reducing suicide: A national imperative*. Washington, DC: National Academies Press.

Miller, K. E., & Hoffman, J. H. (2009). Mental well-being and sport-related identities in college students. *Sociology of Sport Journal* (forthcoming).

National Adolescent Health Information Center. (2006). *Fact sheet on suicide: Adolescents & young adults*. San Francisco, CA: National Adolescent Health Information Center.

Oler, M.J., Mainous, A.G., III, Martin, C.A., Richardson, E., Haney, A., Wilson, D., & Adams, T. (1994). Depression, suicidal ideation, and substance use among adolescents: Are athletes at less risk? *Archives of Family Medicine, 3*, 781-785.

Page, R.M., Hammermeister, J., Scanlan, A., & Gilbert, L. (1998). Is school sports participation a protective factor against adolescent health risk behaviors? *Journal of Health Education, 29*(3), 186-192.

Sabo, D., Miller, K.E., Melnick, M.J., Farrell, M.P., & Barnes, G.M. (2005). High school athletic participation and adolescent suicide: A nationwide study. *International Review for the Sociology of Sport, 40*, 5-23.

Schilling, E. A., Aseltine, R. H., Glanovsky, J. L., James, A., & Jacobs, D. (2009). Adolescent alcohol use, suicidal ideation, and suicide attempts. *Journal of Adolescent Health, 44*, 335-341.

Simon, T. R., Powell, K. E., & Swann, A. C. (2004). Involvement in physical activity and risk for nearly lethal suicide attempts. *American Journal of Preventive Medicine, 27*, 310-315.

Substance Abuse and Mental Health Services Administration. (2008). Results from the 2007 National Survey on Drug Abuse and Health: National findings. (DHHS Publication No. SMA 08-4343). Office of Applied Studies, NSDUH Series: H-34, Rockville, MD: Author.

Taliaferro, L. A., Rienzo, B. A., Miller, M. D., Pigg, R. M., Jr., & Dodd, V. J. (2008a). High school youth and suicide risk: Exploring protection afforded through physical activity and sport participation. *Journal of School Health, 78*, 545-553.

Taliaferro, L. A., Rienzo, B. A., Pigg, R. M., Jr., Miller, M. D., & Dodd, V. J. (2008b). Associations between physical activity and reduced rates of hopelessness, depression, and suicidal behavior among college students. *Journal of American College Health, 57*, 427-435.

Thome, J., & Espelage, D. (2004). Relations among exercise, coping, disordered eating, and psychological health among college students. *Eating Behavior, 5*, 337-351.

Thompson, M. P., Kingree, J. B., & Ho, C. (2006). Associations between delinquency and suicidal behaviors in a nationally representative sample of adolescents. *Suicide and Life-Threatening Behavior, 36*(1), 57-64.

Tomori, M. & Zalar, B. (2000). Sport and physical activity as possible protective factors in relation to adolescent suicide attempts. *International Journal of Sport Psychology, 31*, 405-413.

Unger, J.B. (1997). Physical activity, participation in team sports, and risk of suicidal behavior in adolescents. *American Journal of Health Promotion, 12*, 90-93.

## Other References of Interest

King, K.A. (2000). Do emotional connections protect university students from suicide? *Research Quarterly for Exercise and Sport*, *71* (Suppl):A-40.

Mazza, J.J., and Eggert, L.L. (2001). Activity involvement among suicidal and nonsuicidal high-risk and typical adolescents. *Suicide and Life-Threatening Behavior, 31*(3), 265-281.

Portner, J. (2001). *One in Thirteen: The Silent Epidemic of Teen Suicide*. Beltsville, MD: Gryphon House.

Price, J.H., Dake, J.A., and Kucharewski, R. (2001). Assets as predictors of suicide attempts in African American inner-city youths. *American Journal of Health Behavior, 25*(4), 367-375.

Zhang, J. (2000). Gender differences in athletic performance and their implications in gender ratios of suicide: A comparison between the U.S.A and China. *Omega, The Journal of Death and Dying, 41*(2), 117–123.

## Body Image


Ackard, D. M., Croll, J. K., & Kearney-Cooke, A. (2002). Dieting frequency among college females: Association with disordered eating, body image, and related psychological problems. *Journal of Psychosomatic Research, 52*, 129-136.

Adams, M. (2005). U.S. weight loss market worth $46.3 billion in 2004—forecast to reach $61 billion by 2008. *Natural News, 3/30/05*. Retrieved April 9, 2009, from http://www.naturalnews.com/006133.html

Austin, S. B., & Gortmaker, S. L. (2001). Dieting and smoking initiation in early adolescent girls and boys: A prospective study. *American Journal of Public Health, 91*, 446–450.

Bearman, S. K., & Stice, E. (2008). Testing a gender additive model: The role of body image in adolescent depression. *Journal of Abnormal Child Psychology, 36*, 1251-1263.

Brausch, A. M., & Gutierrez, P. M. (2009). The role of body image and disordered eating as risk factors for depression and suicidal ideation in adolescents. *Suicide and Life-Threatening Behavior, 39*, 58-71.

Cash, T. F., & Pruzinski, T. (Eds.). (2002). *Body image: A handbook of theory, research, and clinical practice*. New York: Guilford Press.

Ciccomascolo, L. E., & Grossi, L. M. (2008). The effect of an 8-week educational curriculum and physical activity program on attitudes toward physical activity and body image of urban adolescent girls. *Women in Sport and Physical Activity Journal, 17*, 17-23.

Clark, M. M., Croghan, I. T., Reading, S., Schroeder, D. R., Stoner, S. M., Patten, C. A., & Vickers, K. S. (2005). The relationship of body image dissatisfaction to cigarette smoking in college students. *Body Image,* 2263-270.

Clark, L., & Tiggemann, M. (2006). Appearance culture in nine- to 12-year-old girls: Media and peer influences on body dissatisfaction. *Social Development, 15*, 628-643.

Clay, D., Vignoles, V. L., & Dittmar, H. (2005). Body image and self-esteem among adolescent girls: Testing the influence of sociocultural factors. *Journal of Research on Adolescence, 15*, 451-477.

Crissey, S. R., & Honea, J. C. (2006). The relationship between athletic participation and perceptions of body size and weight control in adolescent girls: The role of sport type. *Sociology of Sport Journal, 23*, 248-272.

Davison, K. K., Markey, C. N., & Birch, L. L. (2000). Etiology of body dissatisfaction and weight concerns among 5-year-old girls. *Appetite, 35*, 143-151.

Dittmar, H., Halliwell, E., & Ive, S. (2006). Does Barbie make girls want to be thin? The effect of experimental exposure to images of dolls on the body image of 5- to 8-year-old girls. *Developmental Psychology, 42,* 283-292.

Frederick, D. A., Peplau, L. A., & Lever, J. (2006). The swimsuit issue: Correlates of body image in a sample of 52,677 heterosexual adults. *Body Image, 3*, 413-419.

Groesz, L., Levine, M. P., & Murnen, S. K. (2002). The effect of experimental presentation of thin media images on body satisfaction: A meta-analytic review. *International Journal of Eating Disorders, 31*, 1-16.

Hausenblas, H. A., Brewer, B. W., & Van Raalte, J. L. (2004). Self-presentation and exercise. *Journal of Applied Sport Psychology, 16,* 3-18.

Hausenblas, H. A., & Downs, D. S. (2001). Comparison of body image between athletes and nonathletes: A meta-analytic reivew. *Journal of Applied Sport Psychology, 13*, 323-339.

Henry, R. N., Anshel, M. H., & Michael, T. (2006). Effects of aerobic and circuit training on fitness and body image among women. *Journal of Sport Behavior, 29*, 281-303.

Huang, J. S., Norman, G. J., Zabinski, M. F., Calfas, K., & Patrick, K. (2007). Body image and self-esteem among adolescents undergoing an intervention targeting dietary and physical activity behaviors. *Journal of Adolescent Health, 40*, 245-251.

James, K. (2000). You can feel them looking at you: The experiences of adolescent girls in swimming pools. *Journal of Leisure Research, 32*, 262-280.

Kendzor, D. E., Copeland, A. L., Stewart, T. M., Businelle, M. S., & Williamson, D. A. (2007). Weight-related concerns associated with smoking in young children. *Addictive Behaviors, 32*, 598-607.

Kilbourne, J. (2004). 'The more you subtract, the more you add': Cutting girls down to size. In Kasser, T., & Kanner, A. D. (Eds.), *Psychology and consumer culture*, (pp. 251-270). Washington, DC: American Psychological Association.

King, T. K., Matacin, M., White, K. S., & Marcus, B. H. (2005). A prospective examination of body image and smoking cessation in women. *Body Image, 2*, 19-28.

Lamb, S., & Brown, L. (2006). *Packaging girlhood: Rescuing our daughters from marketers' schemes*. New York: St. Martin's Press.

Lowes, J., & Tiggemann, M. (2003). Body dissatisfaction, dieting awareness, and the impact of parental influence in young children. *British Journal of Health Psychology, 8*, 135-147.

Miller, K. E., Sabo, D. F., Melnick, M. J., Farrell, M. P., & Barnes, G. M. (2000). *Women's Sports Foundation report: Health risks and the teen athlete*. East Meadow, NY: Women's Sports Foundation.

Musher-Eizenman, D., Holub, S., Edward-Leeper, L., Persson, A., & Goldstein, S. (2003). The narrow range of acceptable body types of preschoolers and their mothers. *Applied Developmental Psychology, 24*, 259-272.

Neumark-Sztainer, D., & Hannon, P. J. (2000). Weight-related behaviors among adolescent girls and boys. *Archives of Pediatrics & Adolescent Medicine, 154*, 569–577.

Niven, A., Fawkner, S., Knowles, A.-M., Henretty, J., & Stephenson, C. (2009). Social physique anxiety and physical activity in early adolescent girls: The influence of maturation and physical activity motives. *Journal of Sports Sciences, 27*, 299-305.

Norton, K. I., Olds, T. S., Olive, S., & Dank, S. (1996). Ken and Barbie at life size. *Sex Roles, 34*, 287-294.

Parkes, S. A., Saewyc, E. M., Cox, D. N., & MacKay, L. J. (2008). Relationship between body image and stimulant use among Canadian adolescents. *Journal of Adolescent Health, 43*, 616-618.

Parsons, E. M., & Betz, N. E. (2001). The relationship of participation in sports and physical activity to body objectification, instrumentality, and locus of control among young women. *Psychology of Women Quarterly, 25*, 209-222.

Prichard, I., & Tiggemann, M. (2008). Relations among exercise type, self-objectification, and body image in the fitness centre environment: The role of reasons for exercise. *Psychology of Sport and Exercise, 9*, 855-866.

Ricciardelli, L. A., & McCabe, M. P. (2001). Children's body image concerns and eating disturbance: A review of the literature. *Clinical Psychology Review, 21*, 325-344.

Richman, E. L., & Shaffer, D. R. (2000). "If you let me play sports:" How might sport participation influence the self-esteem of adolescent females? *Psychology of Women Quarterly, 24*, 189-199.

Rogers, A. (1999). *Barbie culture*. Thousand Oaks, CA: Sage.

Sabo, D., & Velez, P. (2008). *Go Out and Play: Youth Sports in America.* Eisenhower Park, NY: Women's Sports Foundation.

Sands, E. R., & Wardle, J. (2003). Internalization of ideal body shapes in 9-12-year-old girls. *International Journal of Eating Disorders, 33*, 193-204.

Smolak, L. (2004). Body image in children and adolescents: Where do we go from here? *Body Image, 1*, 15-28.

U.S. Food and Drug Administration. (1992). *The facts about weight loss products and programs.* (DHHS Publication No. 92-1189). Washington, DC: Department of Health and Human Services.

Wolf, N. (2002). *The beauty myth: How images of female beauty are used against women*. New York: William Morrow. (Original publication 1991.)

Yamamiya, Y., Cash, T. F., Melnyk, S. E., Posavac, H. D., & Posavac, S. S. (2005). Women's exposure to thin-and-beautiful media images: Body image effects of media-ideal internalization and impact-reduction interventions. *Body Image, 2*, 74-80.

## Self-Esteem

American Psychological Association, Task Force on the Sexualization of Girls. (2007). *Report of the APA Task Force on the Sexualization of Girls*. Washington, DC: American Psychological Association.

Armstrong, S., & Ooman-Early, J. (2009). Social connectedness, self-esteem, and depression symptomatoloty among collegiate athletes versus nonathletes. *Journal of American College Health, 57*, 521-526.

Baldwin, S. A. & Hoffman, J. P. (2002). The dynamics of self-esteem: A growth-curve analysis. *Journal of Youth and Adolescence*, 31: 101-113.

Biro, F. M., Striegel-Moore, R. H., Franko, D. L., Padgett, J., & Bean, J. A. (2006). Self-esteem in adolescent females. *Journal of Adolescent Health, 39*, 510-507.

Boden, J. M., Fergusson, D. M., & Horwood, L. J. (2008). Does adolescent self-esteem predict later life outcomes? A test of the causal role of self-esteem. *Development and Psychopathology, 20*, 319-339.

Bowker, A. (2006). The relationship between sports participation and self-esteem during early adolescence. *Canadian Journal of Behavioural Science, 38*, 214-229.

Bowker, A., Gadbois, S., & Cornock, B. (2003). Sports participation and self-esteem: Variations as a function of gender and gender role orientation. *Sex Roles, 49*, 47-58.

Daniels, E., & Leaper, C. (2006). A longitudinal investigation of sport participation, peer acceptance, and self-esteem among adolescent girls and boys. *Sex Roles, 55*, 875-880.

Dishman, R. K., Hales, D. P., Pfeiffer, K. A., Felton, G., Saunders, R., Ward, D. S., Dowda, M., & Pate, R. R. (2006). Physical self-concept and self-esteem mediate cross-sectional relations of physical activity and sport participation with depression symptoms among adolescent girls. *Health Psychology, 25*, 396-407.

Dunton, G. F., Jamner, M. S. & Cooper, D. M. (2003). Physical self-concept in adolescent girls: Behavioral and physiological correlates. *Research Quarterly for Exercise and Sport*, 74: 360-365.

Ethier, K. A., Kershaw, T. S., Lewis, J. B., Milan, S., Niccolai, L. M., & Ickovics, J. R. (2006). Self-esteem, emotional distress and sexual behavior among adolescent females: Inter-relationships and temporal effects. *Journal of Adolescent Health, 38*, 268-274.

Fox, K. R. (2000). Self-esteem, self-perceptions and exercise. *International Journal of Sport Psychology*, 31: 228-240.

Gentile, B., Grabe, S., Dolan-Pascoe, B., Twenge, J. M., Wells, B. E., & Maitino, A. (2009). Gender differences in domain-specific self-esteem: A meta-analysis. *Review of General Psychology, 13*, 34-45.

Goodson, P., Buhi, E. R., & Dunsmore, S. C. (2006). Self-esteem and adolescent sexual behaviors, attitudes, and intentions: A systematic review. *Journal of Adolescent Health, 38*, 310-319.

Jacobs, J. E., Lanza, S., Osgood, D. W., Eccles, J. S., & Wigfield, A. (2002). Changes in children's self-competence and values: Gender and domain differences across grades one through twelve. *Child Development, 73*, 509-527.

Klomsten, A. T., Skaalvik, E. M., & Espnes, G. A. (2004). Physical self-concept and sports: Do gender differences still exist? *Sex Roles, 50*, 119-127.

Martyn-Nemeth, P., Penckofer, S., Gulanick, M., Velsor-Friedrich, B., & Bryant, F. B. (2009). The relationships among self-esteem, stress, coping, eating behavior, and depressive mood in adolescents. *Research in Nursing & Health, 32*, 96-109.

McGee, R., & Williams, S. (2000). Does low self-esteem predict health-compromising behaviors among adolescents? *Journal of Adolescence, 23*, 569-582.

McHale, J. P., Vinden, P. G., Bush, L., Richer, D., Shaw, D., & Smith, B. (2005). Patterns of personal and social adjustment among sport-involved and noninvolved urban middle-school children. *Sociology of Sport Journal, 22*, 119-136.

Orth, U., Robins, R. W., & Roberts, B. W. (2008). Low self-esteem prospectively predicts depression in adolescence and young adulthood. *Journal of Personality and Social Psychology, 95*, 695-708.

Pedersen, S., & Seidman, E. (2004). Team sports achievement and self-esteem development among urban adolescent girls. *Psychology of Women Quarterly, 28*, 412-422.

Quatman, T., & Watson, C. M. (2001). Gender differences in adolescent self-esteem: An exploration of domains. *Journal of Genetic Psychology, 162*, 93-117.

Richman, E. L. & Shaffer, D. R. (2000). 'If you let me play sport': How might sport participation influence the self-esteem of adolescent females? *Psychology of Women Quarterly*, 24: 189-199.

Rosenberg, M. (1989). *Society and the adolescent self-image*. Revised edition. Middletown, CT: Wesleyan University Press.

Schmalz, D. L., Deane, G. D., Birch, L. L., & Davison, K. K. (2007). A longitudinal assessment of the links between physical activity and self-esteem in early adolescent non-Hispanic females. *Journal of Adolescent Health, 41*, 559-565.

Shaffer, D. R., & Wittes, E. (2006). Women's precollege sports participation, enjoyment of sports, and self-esteem. *Sex Roles, 55*, 225-232.

Slutzky, C. B.,, & Simpkins, S. D. (2009). The link between children's sport participation and self-esteem: Exploring the mediating role of sport self-concept. *Psychology of Sport and Exercise, 10*, 381-389.

Spencer, Jennifer M., Zimet, G. D.,,, Aalsma, M. C., , & Orr, D. P. (2002). Self-esteem as a Predictor of Initiation of Coitus in Early Adolescents. *Pediatrics 109*(4), 581-584.

Swaim, Randall C. and Jeffrey C. Wayman. 2004. Multidimensional self-esteem and alcohol use among Mexican American and White Non-Latino Adolescents: Concurrent and prospective effects." *American Journal of Orthopsychiatry 74*(4), 559-570.

Tiggemann, M. & Williamson, S. (2000). The effect of exercise on body satisfaction and self-esteem as a function of gender and age. *Sex Roles*, 43, 119-127.

Tracy, A. J., & Erkut, S. (2002). Gender and race patterns in the pathways from sports participation to self-esteem. *Sociological Perspectives, 45*, 445-466.

Wild, Lauren G., Fisher, A. J., Bhana, A., & Lombard, C. . (2004a). Associations among Adolescent Risk Behaviours and Self-Esteem in Six Domains. *Journal of Child Psychology and Psychiatry 45*(8):1454-1467.

Wild, L. G., Flisher, A. J., & Lombard, C. (2004b). Suicidal ideation and attempts in adolescents: Associations with depression and six domains of self-esteem. *Journal of Adolescence, 27*, 611-624.

Williams, K. L., & Galliher, R. V. (2006). Predicting depression and self-esteem from social connectedness, support, and competence. *Journal of Social and Clinical Psychology, 25*, 855-874.

## Pathogenic Weight Loss Behavior

Academy for Eating Disorders. (2009). About eating disorders. Retrieved April 10, 2009, from http://www.aedweb.org

American College of Sports Medicine. (2007). Position stand: The female athlete triad. *Medicine & Science in Sports & Exercise, 39*, 1867-1882.

Beals, K. A., & Manore, M. M. (2002). Disorders of the female athlete triad among collegiate athletes. *International Journal of Sport Nutrition and Exercise Metabolism, 12*, 281-293.

Bonci, C. M., Bonci, L. J., Granger, L. R., Johnson, C. L., Malina, R. M., Milne, L. W., Ryan, R. R., & Vanderbunt, E. M. (2008). National Athletic Trainers' Association position statement: Preventing, detecting, and managing disordered eating in athletes. *Journal of Athletic Training, 43*, 80-108.

Centers for Disease Control and Prevention. (2008). Youth risk behavior surveillance—United States, 2007. Morbidity and Mortality Weekly Report (MMWR) Surveillance Summaries 57(SS-4), 1-131.

Courtney, E. A., Gamboz, J., & Johnson, J. G. (2008). Problematic eating behaviors in adolescents with low self-esteem and elevated depressive symptoms. *Eating Behaviors, 9*, 408-414.

Crago, M., & Shisslak, C. M. (2003). Ethnic differences in dieting, binge eating, and purging behaviors among American females: A review. *Eating Disorders, 11*, 289-304.

De Bruin, K. A. P., Bakker, F. C., & Oudejans, R. R. D. (2009). Achievement goal theory and disordered eating: Relationships of disordered eating with goal orientations and motivational climate in female gymnasts and dancers. *Psychology of Sport and Exercise, 10*, 72-79.

Eating Disorders Coalition. (2009). Eating disorders fact sheet. Retrieved April 10, 2009, from http://www.eatingdisorderscoalition.org

Engel, S. G., Johnson, C., Powers, P. S., Crosby, R. D., Wonderlich, S. A., Wittrock, D. A., & Mitchell, J. E. (2003). Predictors of disordered eating in a sample of elite Division I college athletes. *Eating Behaviors, 4*, 333-343.

Fairburn, C. G., & Harrison, P. J. (2003). Eating disorders. *The Lancet, 361*, 407-416.

Greenleaf, C., Petrie, T. A., Carter, J., & Reel, J. J. (2009). Female collegiate athletes: Prevalence of eating disorders and disordered eating behaviors. *Journal of American College Health, 57*, 489-495.

Greydanus, D. E., & Patel, D. R. (2004). Medical aspects of the female athlete at puberty. *International SportMed Journal, 5*, 1-25.

Gulker, M. G., Laskis, T. A., & Kuba, S. A. (2001). Do excessive exercisers have a higher rate of obsessive-compulsive symptomatology? *Psychology, Health & Medicine, 6*, 387-398.

Hoek, H. W., & van Hoeken, D. (2003). Review of the prevalence and incidence of eating disorders. *International Journal of Eating Disorders, 34*, 383-396.

Holm-Denoma, J. M., Scaringi, V., Gordon, K. H., Van Orden, K. A., & Joiner, T. E. (2009). Eating disorder symptoms among undergraduate varsity athletes, club athletes, independent exercisers, and nonexercisers. *International Journal of Eating Disorders, 42*, 47-53.

Hopkinson, R. A., & Lock, J. (2004). Athletics, perfectionism, and disordered eating. *Eating and Weight Disorders, 9*, 99-106.

Hudson, J. I., Hiripi, E., Pope, H. G., & Kessler, R. C. (2007). The prevalence and correlates of eating disorders in the national comorbidity survey replication. *Biological Psychiatry, 61*, 348-358.

Johnson, C., Powers, P.S., & Dick, R. (1999). Athletes and eating disorders: The National Collegiate Athletic Association study. *International Journal of Eating Disorders, 26*, 179-188.

LePage, M. L., Crowther, J. H., Harrington, E. F., & Engler, P. (2008). Psychological correlates of fasting and vigorous exercise as compensatory strategies in undergraduate women. *Eating Behaviors, 9*, 423-429.

Manore, M. M., Kam, L. C., & Loucks, A. B. (2007). The female athlete triad: Components, nutrition issues, and health consequences. *Journal of Sports Sciences, 25*, S61-S71.

Mitchell, A. M., & Bulik, C. M. (2006). Eating disorders and women's health: An update. *Journal of Midwifery & Women's Health, 51*, 193-201.

Muscat, A. C., & Long, B. C. (2008). Critical comments about body shape and weight: Disordered eating of female athletes and sport participants. *Journal of Applied Sport Psychology, 20*, 1-24.

National Association of Anorexia Nervosa and Associated Disorders (2009). General information: Facts about eating disorders. Retrieved April 10, 2009, from http://www.anad.org.

National Eating Disorders Association. (2009). Statistics: Eating disorders and their precursors. Retrieved April 10, 2009, from http://www.nationaleatingdisorders.org

Neumark-Sztainer, D. (2005). *I'm, like, SO fat!* New York: Guilford Press.

Neumark-Sztainer, D., Wall, M. M., Haines, J. I., Story, M. T., Sherwood, N. E., & van den Berg, P. (2007). Shared risk and protective factors for overweight and disordered eating in adolescents. *American Journal of Preventive Medicine, 33*, 359-369.

Perez, M., & Joiner, T. E. (2003). Body image dissatisfaction and disordered eating in black and white women. *International Journal of Eating Disorders, 33,* 342-350.

Pernick, Y., Nichols, J. F., Rauh, M. J., Kern, M., Ji, M., Lawson, M., & Wilfley, D. (2006). Disordered eating among a multi-racial/ethnic sample of female high-school athletes. *Journal of Adolescent Health, 38*, 689-695.

Reinking, M. F., & Alexander, L. E. (2005). Prevalence of disordered-eating behavior in undergraduate female collegiate athletes and nonathletes. *Journal of Athletic Training, 40*, 47-51.

Ricciardelli, L. A., & McCabe, M. P. (2001). Children's body image concerns and eating disturbance: A review of the literature. *Clinical Psychology Review, 21*, 325-344.

Ryan, J. (1995). *Little girls in pretty boxes: The making and breaking of elite gymnasts and figure skaters*. New York: Warner Books.

Smolak, L., Murnen, S. K., & Ruble, A. E. (2000). Female athletes and eating problems: A meta-analysis. *International Journal of Eating Disorders, 27*, 371-380.

Striegel-Moore, R. H., Dohm, F. A., Kraemer, H. C., Taylor, C. B., Daniels, S., Crawford, P. B., & Schreiber, G. B. (2003). Eating disorders in white and black women. *American Journal of Psychiatry, 160,* 1326-1331.

Sundgot-Borgen, J., & Torstveit, M. K. (2004). Prevalence of eating disorders in elite athletes is higher than in the general population. *Clinical Journal of Sport Medicine, 14*, 25-32.

Taylor, J. Y., Caldwell, C. H., Baser, R. E., Faison, N., & Jackson, J. S. (2007). Prevalence of eating disorders among blacks in the National Survey of American Life. *International Journal of Eating Disorders, 40,* S10-S14.

Vertalino, M., Eisenberg, M. E., Story, M., & Neumark-Sztainer, D. (2007). Participation in weight-related sports is associated with higher use of unhealthful weight-control behaviors and steroid use. *Journal of the American Dietetic Association, 107*, 434-440.

## Other References of Interest

Black, D.R., & Burckes-Miller, M.E. (1988). Male and female college athletes: Use of anorexia nervosa and bulimia nervosa weight loss methods. *Research Quarterly for Exercise and Sport*, *59*(3), 252-256.

Brownell, K.D. (1995). Eating disorders in athletes. In Brownell, K. D., & Fairburn, C. (Eds). *Eating disorders and obesity: A comprehensive handbook*, pp. 191-196. New York: Guilford Press.

Davison, K.K., Earnest, M.B., & Birch, L.L. (2002). Participation in aesthetic sports and girls' weight concerns at ages 5 and 7 years. *International Journal of Eating Disorders*, 31,312-317.

Dummer, G.M., Rosen, L.W., Heusner, W.W., Roberts, P.J., & Counsilman, J.E. (1987). Pathogenic weight-control behaviors of young competitive swimmers. *The Physician and Sportsmedicine, 15*(5),75-78, 83-84.

Fairbanks, G. (1987). Eating disorders among athletes. *Physical Educator, 44*, 377-380.

Marcus, M.D., and Kalarchian, M.A. (2003). Binge eating in children and adolescents. *International Journal of Eating Disorders, 34,*S47-S57.

Parker, S., Nichter, M., Nichter M., Vuckovic, N., Sims, C., & Ritenbaugh, C. (1995). Body image and weight concerns among African American and white adolescent females: Differences that make a difference. *Human Organizations, 54*(2), 103-114.

Rainey, C.J., McKeown, R.E., Sargent, R.G., & Valois, R.F. (1998). Adolescent athleticism, exercise, body image, and dietary practices. *American Journal of Health Behavior, 22*(30), 193-205.

Rhea, D.J. (1998). Physical activity and body image of female adolescents. *Journal of Physical Education, Recreation, and Dance, 69*(5), 27-31.

Selby, R., Weinstein, H.M., & Bird, T.S. (1990). The health of university athletes: Attitudes, behaviors, and stressors. *Journal of American College Health, 39*, 11-18.

Shisslak, C.M., & Crago, M. (1992). Eating disorders among athletes. Lemberg, R. (Ed.). *Controlling eating disorders with facts, advice, and resources*, pp. 29-36. Phoenix, AZ: Oryx Press.

Skolnick, A.A. (1993). Female athlete triad' risk for women. *Journal of the American Medical Association, 270*(8), 921-923.

Sundgot-Borgen, J., & Corbin, C.B. (1987). Eating disorders among female athletes. *The Physician and Sportsmedicine*, *15*(2), 89-95.

Thornton, J.S. (1990). Feast or famine: Eating disorders in athletes. *The Physician and Sportsmedicine, 18*(4), 116-122.

Warren, B.J., Stanton, A.L., & Blessing, D.L. (1990). Disordered eating patterns in competitive female athletes. *International Journal of Eating Disorders, 9*(5), 565-569.

Weight, L.M., & Noakes, T.D. (1987). Is running an analog of anorexia?: A survey of the incidence of eating disorders in female distance runners. *Medicine and Science in Sports and Exercise, 19*(3), 213-217.

## V. Educational and Social Dimensions
### Sport and Academic Gains


Action for Healthy Kids (2003). Building the argument: The need for physical education and physical activity in our schools. Online. Retrieved September 16, 2009, from http://www.ActionForHealthyKids.org

Barber, B.L., Eccles, J.S., & Stone, M.R. (2001). Whatever happened to the jock, the brain, and the princess? Young adult pathways linked to adolescent activity involvement and social identity. *Journal of Adolescent Research, 16*(5), 429-455.

Broh, B. (2002). Linking extracurricular programming to academic achievement: Who benefits and why? *Sociology of Education, 75,* 69-91.

Barron, J.M., Ewing, B.T., & Waddell, G.R. (2000). The effects of high school athletic participation on education and labor market outcomes. *Review of Economics and Statistics, 82* (3), 409-421.

Boys' academic slide calls for accelerated attention, *USA Today*, December 22, 2003. p. 17A.

Centers for Disease Control and Prevention (2003). Physical activity and good nutrition: Essential elements to prevent chronic diseases and obesity At a Glance.

Centers for Disease Control and Prevention (2002). Surveillance summaries. *Morbidity and Mortality Weekly Report*, *51*. (No. SS-4).

Christianson, E. (2008, October). NCAA student-athletes graduating at highest rates ever. Press release. Indianapolis, IN: National Collegiate Athletic Association. Retrieved July 31, 2009, from http://www.ncaa.org.

Crosnoe, R. (2001). The social world of male and female athletes in high school. *Sociological Studies of Children and Youth, 8,* 89-110.

Crosnoe, R. (2002). Academic and health-related trajectories in adolescence: The intersection of gender and athletics. *Journal of Health and Social Behavior, 43,* 317-335.

Curtis, J.W., McTeen, W., & White, P. (2003). Do high school athletes earn more pay? Youth sports participation and earnings as an adult. *Sociology of Sport Journal, 20*(1), 348-385.

Damarin, S.K. (2000). The mathematically able as a markedcategory. *Gender and Education*, *12*, 69-85.

Danish, S. J. (2002). Teaching life skills through sports, pp. 49-60. In Gatz, M., Messner, M.A., & Ball-Rokech, S. J. (Eds.). *Paradoxes of youth and sport.* Albany, NY: SUNY Press.

Darling, N., Caldwell, L. L., & Smith, R. (2005). Participation in school-based extracurricular activities and adolescent adjustment. *Journal of Leisure Research, 37* (1), 51-76.

Eccles, J.S., and Barber, B.L. (1999). Student council, volunteering, basketball, or marching band: What kind of extracurricular involvement matters? *Journal of Adolescent Research, 14*(1), 10-43.

Eccles, J. S., Barber, B. L., Stone, M., & Hunt, J. (2003). Extracurricular activities and adolescent development. *Journal of Social Issues, 59* (4), 865-889.

Eitle, T. M., & Eitle, D. J. (2002). Race, cultural capital, and the educational effects of participation in sports. *Sociology of Education, 75* (20, 123-146.

Etnier, J.L., Salazar, W., Landers, D M., Petruzzello, S.J., Han, M., & Nowell, P. (1997). The influence of physical fitness and exercise upon cognitive functioning: A meta-analysis. *Journal of Sport and Exercise Psychology, 19*(3), 249-277.

Ewing, B.T., (1995). High school athletics and the wages of black males. *Review of Black Political Economy, 24(*1), 65-65.

Ewing, B. T. (2007). The labor market effects of high school athletic participation evidence from wage and fringe benefits differentials. *Journal of Sports Economics, 8* (3), 255-265.

Fejgin, N. (1994). Participation in high school competitive sports: A subversion of school mission or contribution to academic goals? *Sociology of Sport Journal, 11*, 211-230.

Fisher, M., Juszczak, L., & Friedman, S. (1996). Sports participation in an urban high school: Academic and psychological correlates. *Journal of Adolescent Health, 18* (5), 329-334.

Hanson, S.L., & Krauss, R.S. (1998). Women, sports, science: Do female athletes have an advantage? *Sociology of Education, 71*, 93-110.

Hartmann, D. (2008). High school sports participation and educational attainment: Recognizing, assessing, and utilizing the relationship. A report to the LA84 Foundation. Los Angeles, CA: LA84 Foundation. Retrieved July 31, 2009, from http://www.la84foundation.org/3ce/HighSchoolSportsParticipation.pdf

Howell, F.M., Miracle, A.W., & Rees, C.R. (1984). Do high school athletics pay? The effects of varsity participation on socioeconomic attainment. *Sociology of Sport Journal, 1*(1), 15-25.

Kaylor, M., & Flores, M. M. (2007). Increasing academic motivation in culturally and linguistically diverse students from low socioeconomic backgrounds. *Journal of Advanced Academics, 19* (1).

Lapchick, R., Johnson , W., Lopresti, C., & Reshard, N. (2009). Keeping score when it counts: Graduate rates and academic progress rates (APR for 2009 NCAA Men's and Women's Division I Basketball Tournament teams. Retrieved July 31, 2009, from http://www.tidesport.org/Grad%20Rates/2009_Mens_and_Womens_Sweet16_PR.pdf

Lipscomb, S. (2006). Secondary school extracurricular involvement and academic achievement: A fixed effects approach. *Economics of Education Review, 26*(4), 463-472.

Marsh, H.W. (1992). Extracurricular activities: Beneficial extension of the traditional curriculum or subversion of academic goals? *Journal or Educational Psychology, 84*(4), 553-562.

Marsh, H.W. (1993). The effects of participation in sport during the last two years of high school. *Sociology of Sport Journal, 10*, 18-43.

Marsh, H.W. and Kleitman, S. (2003). School athletic participation: Mostly gain with little pain. *Journal of Sport and Exercise Psychology, 25*, 205-228.

Melnick, M., Vanfossen, B., & Sabo, D. (1988). Developmental effects of athletic participation among high school girls. *Sociology of Sport Journal, 5,* 22-36.

Miller, K. E., Melnick, M. J., Barnes, G. M., Farrell, M. P., & Sabo, D. (2005). Untangling the links among athletic involvement, gender, race, and adolescent academic outcomes. *Sociology of Sport Journal, 22* (2), 178-193.

NCAA. (2008). NCAA Division I Federal Graduate Rate data 2001-2002 cohort. Retrieved July 31, 2009, from http://web1.ncaa.org//app_data/instAggr2008/1_0.pdf

Sabo, D., Melnick, M., and Vanfossen, B. (1989). *The Women's Sports Foundation Report: Minorities in Sports*. New York: Women's Sports Foundation.

Sabo, D., Melnick, M., & Vanfossen, B. (1993). High school athletic participation and postsecondary educational and occupational mobility: A focus on race and gender. *Sociology of Sport Journal, 10*(1), 44-56.

Simons, H. D., Bosworth, C., Fujita, S., & Jensen, M. (2007). The athlete stigma in higher education. *College Student Journal, 41* (2), 251-273.

Troutman, K.P., & Dufur, M.J. (2007). From high school jocks to college grads: Assessing the long-term effects of high school sport participation on females' educational attainment. *Youth and Society, 38*(4), 443-462.

U.S. Bureau of the Census (2000). Statistical Abstract of the United States, 1999. Washington, DC: U.S. Government Printing Office.

U.S. Bureau of the Census (2007). *A half-century of learning: Historical statistics on educational attainment in the United States, 1940 to 2000.* Washington, DC: U.S. Government Printing Office. Retrieved September 16, 2009, from http://www.census.gov/population/www/socdemo/education/introphct41.html

U.S. Bureau of the Census (2009). Educational attainment in the United States. Retrieved April 22, 2009, from http://www. census.gov/prod/2009pubs/p20-560.pdf

Videon, T. M. (2002). Who plays and who benefits: Gender, interscholastic athletics, and academic outcomes. *Sociological Perspectives, 45*(4), 415-444.

## Mathematics and Science Achievement

American Association of University Women. *Shortchanging girls,shortchanging America.* Washington, DC, 1991.

California Department of Education. (2002). The relationship between physical fitness and academic achievement. 2001 PFT/SAT-9 Study, Sacramento, CA.

Carlson, S. A., Fulton, J. E., Lee, S. M., Maynard, L. M., Brown, D. R., Kohl, H. W., & Dietz, W. H. (2008, April). *American Journal of Public Health, 98* (4), 721-727.

Chomitz, V. R., Slining, M. M., McGowan, R. J., Mitchell, S. E., Dawson, G. F., & Hacker, K. A. (2009). Is there a relationship between physical fitness and academic achievement? Positive results from public school children in the Northeastern United States. *Journal of School Health, 79* (1), 30-37.

Crissey, S. R., Pearson, J., & Riegle-Crumb, C. (2005). Gender differences in the effects of sports participation on academic outcomes. Paper presented at the annual meeting of the American Sociology Association, Marriott Hotel, Loews Philadelphia Hotel, Philadelphia, PA. Retrieved July 31, 2009, from http://www.allacademic.com/meta/p21189_index.html

Dwyer, T., Coonan, W.E., Leitch, D.R., Hetzel, B.S., & Baghurst, R.A., (1983). An investigation of the effects of daily physical activity on the health of primary school students in South Australia. *International Journal of Epidemiology, 12,* 308-313.

Eitle, T. M. (2005). Do gender and race matter? Explaining the relationship between sports participation and achievement. *Sociological Spectrum, 25*, 177-195.

Eveland-Sayers, B. M., Farley, R. S., Fuller, D. K., Morgan, D. W., & Caputo, J. L. (2009, January). Physical fitness and academic achievement in elementary school children. *Journal of Physical Activity & Health, 6* (1), 99-104.

Girls Incorporated (2004). *Girls Incorporated.* New York, NY: Girls Inc.

Halpern, D., Aronson, J., Reimer, N., Simpkins, S., Star, J., & Wentzel, K. (2007). *Encouraging girls in math and science* (NCER 2007-2003). Washington, DC: National Center for Education Research, Institute of Education Services, U.S. Department of Education. Retrieved July 31, 2009, from http://www.ncer.ed.gov.

Hanson, S.L., and Kraus, R.S. (1998). Women, sports, and science: Do female athletes have an advantage? *Sociology of Education, 71,* 93-110.

Hanson, S.L., and Kraus, R.S. (1999). Women in male domains: Sport and science. *Sociology of Sport Journal, 16,* 92-110.

Hyde, J. S., & Mertz, J. E. (2009, June). Gender, culture, and mathematics performance. *Proceedings of the National Academy of Sciences in the United States of America.* Retrieved July 31, 2009, from http://www.pnas.org/content/early/2009/06/01/0901265106.abstract

Kiefer, A. K., & Sekaquaptewa, D. (2006). Implicit stereotypes and women's math performance: How implicit gender-math stereotypes influence women's

susceptibility to stereotype threat. *Journal of Experimental Social Psychology.* Retrieved July 31, 2009, from http://sitemaker.umich.edu/kiefera/files/kiefer___sekaquaptewa__jesp_in_press.pdf

Kiefer, A. K., & Sekaquaptewa, D. (2007). Implicit stereotypes, gender

identification, and math performance: A prospective study of female math

students. *Psychological Science*, *18* (1), 13-18.

Lacampagne, C., Campbell, P. B., Damarin, S., Herzig, A., & Vogt, C. (2007). Gender equity in mathematics, pp. 235-254. In Klein, S. (General Editor). *Handbook for achieving gender equity through education.* Mahwah, N.J.: Lawrence Erlbaum Associates Inc.

Lipscomb, S. (2006). Secondary school extracurricular involvement and academic achievement: A fixed effects approach. *Economics of Education Review, 26*(4), 463-472.

Marlino, D., & Wilson, F. (2003). Teen girls on business: Are they being empowered? National Study from the Committee of 200 and Simmons College School of Management. Boston, MA: Kaufman Foundation.

National Association for Sport and Physical Education (2006). *Shape of the nation report: Status of physical education in the USA.* Reston, VA: Author.

National Girls Collaborative Project (2009). Girls in science, technology, engineering, and math (STEM): Where are we today? Washington, DC: American Association of University Women. Retrieved July 31, 2009, from www.aauw.org/education/.../NGCP_STEM_AAUW_PPT_Mar09.ppt

National Science Foundation/Division of Science Resources Statistics. Survey of Earned Doctorates, (Table 2:2000.)

National Science Foundation. (2003). Women, minorities, and persons with disabilities in sicence and engineering. (NSF 03-312). Arlington, VA: Author.

Nelson, M.C. & Gordon-Larson, P. (2006). Physical activity and sedentary behavior patterns are associated with selected adolescent health risk behaviors. *Pediatrics, 117*, 1281-1290.

Sax, L. J., Arms, E., Riggers, T., & Eagan, K. (2009). *Women graduates of single-sex and coeducational high schools: Differences in their characteristics and the transition to college.* Los Angeles, CA: The Sudikoff Family Insitute for Education & New Media, UCLA Graduate School of Education and Information Studies. Retrieved September 16, 2009, from http://www.heri.ucla.edu/PDFs/Sax_FINAL%20REPORT_Sing_1F02B4.pdf

Shephard, R. J. (1997). Curricular physical activity and academic performance. *Pediatric Exercise Science, 9*, 113-126.

Shephard, R.J., Volle, M., Lavalee, M., LaBarre, R., Jequier, J.C., & Rajic, M. (1984). Required physical activity and academic grades: A controlled longitudinal study. In Limarinen and Valimaki (Eds.). *Children and Sport*. Berlin: Springer Verlag, 58-63.

Stevens, T., To, Y., Stevenson, S., & Lochbaum, M. (2008). The importance of physical activity and physical education in the prediction of academic achievement. *Journal of Sport Behavior, 4,* 1-21.

Symons, C.W., Cinelli, B., James, T.C., & Groff, P. (1997). Bridging student health risks and academic achievement through comprehensive school health programs. *Journal of School Health, 67(*6), 200-227.

The College Board. (2003). College bound seniors: A profile of SAT program test takers. Retrieved October 30, 2003, from http://www.collegeboard.com/prod_downloads/about/news_info/cbsenior/yr2003/2003_NEW_JERSEY.pdf.

Vanneman, A., Hamilton, L., Baldwin, A. J., & Rahman, T. (2009). *Achievement gaps: How Black and White students in public schools perform in mathematics and reading in the National Assessment of Educational Progress* (NCES 2009-455). Washington, DC: National Center for Education Statistics, Institute of Education Sciences, U.S. Department of Education.

## Exercise and Learning

Aaron, D.J., Kriska, A.M., Dearwater, S.R., et al.,(1993). The epidemiology of leisure physical activity in the adolescent population. *Medicine and Science in Sports and Exercise, 25*, 847-853.

Action for Healthy Kids (2003). Building the Argument: The Need for Physical Education and Physical Activity in Our Schools. Online. Retrieved September 16, 2009, from http://www.ActionForHealthyKids.org

California Department of Education. (2002). The relationship between physical fitness and academic achievement. 2001 PFT/SAT-9 Study, Sacramento, CA.

Castelli, D.M., Hillman, C.H., Buck, S.M., & Erwin, H.E. (2007). Physical fitness and academic achievement in third-and fifth-grade students. *Journal of Sport and Exercise Psychology, 29*, 239-252.

Centers for Disease Control and Prevention (2002). Surveillance summaries. Morbidity and Mortality Weekly Report, 51(SS-4).

Centers for Disease Control and Prevention (2003). Physical activity and good nutrition: Essential elements to prevent chronic diseases and obesity. At a Glance.

Cocke, A. (2002). Brain may also pump up from workout. Society for Neuroscience Annual Meeting. Retrieved April 11, 2003, from http://neurosurgery.medsch.ucla.edu/whastnew/societyforneuroscience.htm

Collingwood, T.R., Sunderlin, J., & Reynolds, R. (2000). Physical training as a substance abuse prevention intervention for youth. *Journal of Drug Education, 30*(4). 435-451.

Colocombe, K.I., Erickson, N., Raz, A.G., Webb, N.J., Cohen, E., McAuley, & Kramer (2003). Aerobic fitness reduces brain tissue loss in aging humans. *Journals of Gerontology, Series A Biological Sciences and Medical Sciences, 58*(2), 176-180.

Crespo, C.J., Ainsworth, B.E., Keteyian, S.J., Heath, G.W., & Smit, E. (1999). Prevalence of physical inactivity and its relation to social class in U.S. adults: Results from the Third National Health and Nutrition Examination Survey, 1988-1994. *Medicine and Science in Sport and Exercise, 31,* 1821-1827.

Crespo, C.J., Smit, E., Andersen, R.E., Carter-Pokras, O., & Ainsworth, B.E. (2000). Race/ethnicity, social class and their relation to physical inactivity during leisure time: Results from the Third National Health and Nutrition Examination Survey, 1988-1994. *American Journal of Preventive Medicine, 18,* 46-53.

Davis, C.L., Tkacz, J., & Tomporowski, P.D. (2007). Effects of aerobic training dose on overweight children's cognition and achievement: A randomized controlled trial. The Obesity Society Conference. New Orleans, LA. October 20-24 (Poster Presentation).

Department of Health and Human Services (1996). Physical activity and health: A report of the Surgeon General." Atlanta: Department of Health and Human Services, Center for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.

Dwyer, T., Blizzard, L., & Dean, K. (1996). Physical activity and performance in children. *Nutrition Reviews, 54*, S27-S31.

Dwyer, T., Coonan, W., Leitch, D., Hetzel, B., & Baghurst, R. (1983). An investigation of the effects of daily physical activity on the health of primary school students in South Australia. *International Journal of Epidemiologists, 12*(3), 308-313.

Dwyer, T., Sallis, J.F., Blizzard, L., Lazarus, R., & Dean, K. (2001). Relation of academic performance to physical activity and fitness in children. *Pediatric Exercise Science, 13,* 225-238.

Endres, M., Gertz, K., Lindauer, U., Katchanov, J., Schultze, J., Schrock, H., Nickenig, G., Kuschinsky, W., Dirnagl, U., & Laufs, U. (2003). Mechanisms of stroke protection by physical activity. *Annals of Neurology, 54*, 582-590.

Etnier, J.L., Salazar, W., Landers, D.M., Petruzzello, S.J., Han, M., and Nowell, P. (1997). The influence of physical fitness and exercise upon cognitive functioning: A meta-analysis. *Journal of Sport and Exercise Psychology, 19,* 259-277.

Field, T., Diego, M., & Sanders, C.E. (2001). Exercise is positively related to adolescents' relationships and academics. *Adolescence, 36*, 105-110.

Heath, G.W., Pratt, M., Warren, C.W., & Kahn, L. (1994). Physical activity patterns in American high school students: Results from the 1990 Youth Risk Behavior Survey. *Archives of Pediatric and Adolescent Medicine, 148,* 1131-1136.

Hellmich, N. (2007). Exercise builds strong brains: Study documents link in children. *USA Today*, p.4D.

Hillman, C.H., Erickson, K.L., & Kramer, A.F. (2008). Be smart, exercise your heart: Exercise effects on brain and cognition. *Nature Reviews Neuroscience, 9*(1), 58-65.

Kim, H.Y.P., Frongillo, E.A., Han, S.S., Oh, S.Y., Kim, W.K., Jang, Y.A., Won, H.S., Lee, H.S., & Kim, S.H. (2003). Academic performance of Korean children is associated with dietary behaviours and physical status. *Asia Pacific Journal of Clinical Nutrition, 12*, 186-192.

King, D. (1999). Exercise Seen Boosting Children's Brain Function. *Boston Globe*, p. A1.

Knight, D. & Rizzuto, T. (1993). Relations for children in grades 2, 3, and 4 between balance skills and academic performance. *Perceptual and Motor Skills, 76*, 1296-1298.

Kolbe, L.J., Green, L., Foreyt, J., Darnell, L., Goodrick, K., Williams, H., Ward, D., Korton, A.S., Karacan, I., Widmeyer, R., & Stainbrook G. (1986). Appropriate functions of health education in schools: Improving health and cognitive performance. In N. Krairweer, J. Arasteli, & M. Cataldo (Eds.) *Child Health Behavior: A Behavioral Pediatrics Perspective*. New York: John Wiley & Sons.

Lee, S., Burgeson, C., Fulton, J., & Spain, C. (2007). Physical education and physical activity: Results from the School Health Policies and Programs Study 2006. *Journal of School Health, 77*, 435-463.

Linder, K.J. (1999). Sport participation and perceived academic performance of school children and youth. *Pediatric Exercise Science, 11,* 129-144.

Linder, K.J. (2002). The physical activity participation-academic performance relationship revisited: Perceived and actual performance and the effect of banding (academic tracking). *Pediatric Exercise Science, 14*, 155-170.

Mahar, M.T., Murphy, S.K., Rowe, D.A., Golden, J., Shields, A.T., & Raedke, T.D. (2006). Effects of a classroom-based program on physical activity and on-task behavior. *Medicine and Science in Sports and Exercise, 38,* 2086-2094.

Moss, M., Franks, M., Briggs, P., Kennedy, D., & Scholey A. (2005). Compromised arterial oxygen saturation in elderly asthma sufferers results in selective cognitive impairment. *Journal of Clinical and Experimental Neuropsychology, 27*(2), 139-150.

National Center for Education Statistics (2003). The nation's report card: Mathematics highlights 2003. Retrieved November 14, 2003, from http://www.nces.ed.gov/nationsreportcard/ mathematics/results2003/natscalescore.asp

Pellegrini, A.D. & Smith, P.K., (1998). Physical activity play: The nature and function of a neglected aspect of play. *Child Development, 69*, 577-598.

Perico, C.A., Skaf, C.R., Yamada, A., Duran, F., Buchpiguel, C.A., Castro, C.C., Soares, J.C., & Busatto, G.F. (2005). Relationship between regional cerebral blood flow and separate symptom clusters of major depression: A single photon emission computed tomography study using statistical parametric mapping. *Neuroscience Letters, 384*(3), 265-270.

Ratey, J.J. (2008). *SPARK: The revolutionary new science of exercise and the brain*. Little Brown:London.

Sallis, J.F., Alcaraz, J.E., McKenzie, T.L., & Hovell, M.F. (1999). Predictors of change in children's physical activity over 20 months: Variations by gender and level of adiposity. *American Journal or Preventive Medicine, 16*, 222-229.

Sallis, J.F., Zakarian, J.M., Hovell, M.F., & Hofstetter, C.R. (1996). Ethnic, socioeconomic, and sex differences in physical activity among adolescents. *Journal of Clinical Epidemiology, 49*, 125-134.

Shephard, R.J. (1997). Curricular physical activity and academic performance. *Pediatric Exercise Science, 9,* 113-126.

Shephard, R.J., Volle, M., Lavalee, M., LaBarre, R., Jequier, J.C., and Rajic, M. (1984). Required physical activity and academic grades: A controlled longitudinal study. In Limarinen, M. Valimaki (Eds.). *Children and Sport*. Berlin: Springer Verlag, 58-63.

Sibley, B.A. & Etnier, J.L. (2003). The relationship between physical activity and cognition in children: A meta-analysis. *Pediatric Exercise Science, 15*, 243-256.

Sohn, J.H., Chung, S.C., & Jang, E.H. (2005). 30% oxygen inhalation enhances cognitive performance through robust activation in the brain. *Journal of Physiological Anthropology and Applied Human Science, 24(*1), 51-53.

Sue, Y.S., Kimm, M.D., Glynn, N.W., Kriska, A.M., Barton, B.A., Kronsberg, S.S., Daniels, S.R., Crawford, P.B., Sabry, Z.I., & Liu, K. (2002). "Decline in physical activity in black girls and white girls during adolescence." *New England Journal of Medicine, 347*, 709-715.

Swain, R.A., Harris, A.B., Wiener, E.C., Dutka, M.V., Morris, H.D., Theien, B.E., Konda, S., Engberg, K., Lauterbur, P.C., & Greenough, W.T. (2003). "Prolonged exercise induces angiogenesis and increases cerebral blood volume in primary motor cortex of the rat." *Neuroscience, 117*(4), 1037-1046.

Symons, C.W., Cinellik , B., James, T.C., and Groff, P. (1997). Bridging student health risks and academic achievement through comprehensive school health programs. *Journal of School Health, 6,* 220-227.

Tomporowski, P.D. (2003). Cognitive and behavioral responses to acute exercise in youths: A review. *Pediatric Exercise Science, 15*, 348-359.

Tremblay, R.E., Inman, J.W., & Willms, J.D. (2000). The relationship between physical activity, self-esteem, and academic achievement in 12-year-old children. *Pediatric Exercise Science, 12*, 312-324.

Trost, S.G., Pate, R.R., Saunders, R., Ward, D.S., Dowda, M., & Felton, G. (1997). A prospective study of the determinants of physical activity in rural fifth-grade children. *Preventive Medicine, 26,* 257-263.

Washburn, R.A., Kline, G., Lackland, D.T., & Wheeler, F.C. (1992). Leisure time physical activity: Are there black/white differences? *Preventive Medicine, 21*, 127-135.

Wolf, A.M., Gortmaker, S.L., Cheung, L., Gray, H.M., Herzog, D.B., & Colditz, G.A. (1993). Activity, inactivity, and obesity: Racial, ethnic, and age differences among schoolgirls. *American Journal of Public Health, 83*, 1625-1627.

Zheng, H., Liu, Y., Li, W., Yang, B., Chen, D., Wang, X., Jiang, Z., Wang, H., Wang, Z., Cornelisson, G., & Halberg, F. (2005). Beneficial effects of exercise and its molecular mechanisms on depression in rats. *Behavioral Brain Research, 168*(1), 47-55.

### Exercise and Learning

Action for Healthy Kids (2003). Building the argument: The need for physical education and physical activity in our schools. Retrieved July 20, 2009, from http://www.ActionForHealthyKids.org

Centers for Disease Control and Prevention (2002). Surveillance summaries. Morbidity and Mortality Weekly Report 51, SS-4.

Centers for Disease Control and Prevention (2003). Physical activity and good nutrition: Essential elements to prevent chronic diseases and obesity. At a Glance.

Etnier, J.L., Salazar, W., Landers, D.M., Petruzzello, S.J., Han, M., & Nowell, P. (1997). The influence of physical fitness and exercise upon cognitive functioning: A meta-analysis. *Journal of Sport and Exercise Psychology 19,* 259-277.

King, D. (1999). Exercise Seen Boosting Children's Brain Function. *Boston Globe.* Retrieved July 20, 2009, from http://www.edupr.com/hedline1.html.

Shephard, R.J. (1997). Curricular physical activity and academic performance. *Pediatric Exercise Science* 9, 113-126.

Shephard, R.J., Volle, M., Lavalee, M., LaBarre, R., Jequier, J. C., & Rajic, M. (1984). Required physical activity and academic grades: A controlled longitudinal study. In Limarinen, M. & Valimaki (Eds.). Children and Sport. Berlin: Springer Verlag, 58-63.

Symons, C.W., Cinellik , B., James, T.C., & Groff, P. (1997). Bridging student health risks and academic achievement through comprehensive school health programs. *Journal of School Health 6,* 220-227.

## VI. Athletic Interest and Participation

### Interest in Sports

Allen, J.B. (2003). Social motivation in youth sport. *Journal of Sport and Exercise Psychology 25,* 551-567.

Brustad, R.J. (1996). Attraction to physical activity in urban school children: Parental socialization and gender influences. *Research Quarterly for Exercise and Sport, 67*, 316-323.

Carter-Pokras, O., Crespo, C. J., Kelly, E., Mora, S., Motta, M., & Rivera, I. (2006). Supporting physical fitness for Latina adolescents. *Journal of Latino-Latin American Studies, 2* (2), 33-47.

Green, B.C., and Chalip, L. (1997). Enduring involvement in youth soccer: The socialization of parent and child. *Journal of Leisure Research, 29*, 61-77.

Guiliano, T.A., Popp, K.E., and Knight, J.L. (2000). Footballs versus Barbies: Childhood play activities as predictors of sport participation by women. *Sex Roles, 42*, 159-181.

Leff, S.S., and Hoyle, R.H. (1995). Young athletes' perceptions of parental support and pressure. *Journal of Youth and Adolescence, 24*, 187-203.

Martin, D.E. (1997). Interscholastic sport participation: Reasons for maintaining or terminating participation. *Journal of Sport Behavior, 20*, 94-104.

Patrick, H., Ryanb, A.M., Alfeld-Liro, C., and Fredericks, J.A. (1999). Adolescents' commitment to development talent: The role of peers in continuing motivation for sports and the arts. *Journal of Youth and Adolescence, 28*, 741-763.

Place, K.A. (2004). *Attracting and engaging urban girls of color in physical activity and sport*. A thesis submitted to the Department of Exercise and Sport Studies, Smith College.

Prochaska, J.J., Rodgers, M.W., and Sallis, J.F. (2002). Association of parent and peer support with adolescent physical activity. *Research Quarterly for Exercise and Sport, 73*,206-210.

Smith, A.L. (1999). Perceptions of peer relationships and physical activity participation in early adolescence. *Journal of Sport and Exercise Psychology, 21*, 329-350.

Stewart, C., & Taylor, J. (2000). Why female athletes quit: Implications for coach education. *The Physical Educator, 57*,170-177.

Weiss, W.M., & Weiss, M.R. (2003). Attraction- and entrapment-based commitment among competitive female gymnasts. *Journal of Sport and Exercise Psychology, 25*,229-247.

Women's Sports Foundation. (1988). *The Wilson Report: Moms, Dads, Daughters and Sports.* East Meadow, NY: Women's Sports Foundation.

## Youth Sport and Physical Activity

Sabo, D., & Velez, P. (2008). *Go out and play: Youth sports in America.* Eisenhower Park, NY: Women's Sports Foundation.

## High School Sports and Physical Activity

Baker, R., Freedman, M., and Furano, K. (1997). *Leveling the playing field: An exploration into youth sports for the Walter Haas Jr. Fund.* Philadelphia: Public/Private Ventures.

Brady, E. (2003). More girls are wrestling, playing football, baseball. *USA Today*, p. 2C.

Brady, E., and Sylwester, M. (2003). More and more girls got game. *USA Today*, p. 2C.

Bunker, L. (1988). Life-long Benefits of Youth Sport Participation for Girls and Women, Presented at the Sport Psychology Conference, University of Virginia, Charlottesville, VA.

Centers for Disease Control and Prevention (1999). Youth Risk Behavior Surveillance System Survey (1999). Unpublished data for New York City.

Centers for Disease Control and Prevention (2002). "Surveillance Summaries." Morbidity and Mortality Weekly Report, 51 (No. SS-4).

Constantinou, P. , Manson, M., & Silverman, S. (2009). Female students' perceptions toward gender-role stereotypes in physical education. *The Physical Educator, 66* (2), 85-96.

Cradock, A., El Ayadi, A., Gortmaker, S., Hannon, C., Sobol, A., & Wiecha, J. (2002, December). Play Across Boston: Summary Report. Harvard Prevention Research Center Active Facts Report #01-2002.

Easton, d. K., Kann, L., Kinchen, S., Shanklin, S., Ross, J., Hawkins, J., Harris, W. A., Lowry, R., McManus, T., Chyen, D., Lim, C., Brener, N. C., & Wechsler, H. (2008). Youth risk behavior surveillance – United States, 2007. *Morbidity and Mortality Weekly Report, 57.* Retrieved July 31, 2009, from http://www.cdc.gov/HealthyYouth/yrbs/pdf/yrbss07_mmwr.pdf

Halpern, R., (2003). Physical (in)activity among low-income children and youth. New Brunswick, NJ: Robert Wood Johnson Foundation After School Project.

Johnston, L. D., Delva, J., & O'Malley, P.M. (2007, October). Sports participation and physical education in American secondary schools: Current levels and racial/ethnic and socioeconomic disparities. *American Journal of Preventive Medicine, 33* (4) Supplement:S195-5208.

Kaestner, R., & Xu, X. (2006). Effects of Title IX and sports participation on girls' physical activity and weight. *Advances in Health Economics and Health Services Research, 17,* 79-111.

Kimm, S., Glynn, N., Kriska, A., Barton, B., Kronsberg, S., Daniels, S., Crawford, P., Sabry, Z., and Liu, K. (2002). Decline in physical activity in black girls and white girls during adolescence. *The New England Journal of Medicine, 347*, 709-715.

Lewis, D. (2007). Effects of Title IX and sports participation on girls' physical activity and weight: Research highlight. *Robert Wood Johnson Policy Perspective, 29.* Retrieved July 31, 2009, from http://www.rwjf.org/files/publications/Research%20Highlight%2029%5B4%5D.pdf

National Federation of State High School Associations (2003). *NFHS Handbook 2003-04*. Indianapolis, IN: National Federation of State High School Associations.

National Federation of State High School Associations (2008). *NFHS high school athletics participation survey 2007-2008.* Indianapolis, IN: National Federation of State High School Associations.

Shakib, S. (2003). Female basketball participation: Negotiating the conflation of peer status and gender status from childhood through puberty. *American Behavioral Scientist, 45* (10), 1405-1422.

Shakib, S. , & Dunbar, M. D. (2004). How high school athletes talk about maternal and paternal sporting experiences. *International Review for the Sociology of Sport, 39* (3), 275-299.

Surgeon General of the United States (1996). *Physical activity and health.* Washington, DC: The President's Council on Physical Fitness and Sports. Retrieved September 16, 2009, from http://www.fitness.gov/adoles.html.

Sylwester, M. (2003). Taking a head count not as easy as it might appear. *USA Today,* p. 2C.

Team up for Youth (2002). Cited in Halpern, R. (2003). Physical (in)activity among low-income children and youth. New Brunswick, NJ: Robert Wood Johnson Foundation After School Project.

U.S. Department of Health and Human Services. (2008). *2008 physical activity guidelines for Americans.* Retrieved on July 31, 2009, from http://www.health.gov/paguidelines/pdf/paguide.pdf

U.S. Secretary of Health and Human Services and U.S. Secretary of Education (2000). Promoting better health for young people through physical activity and sports: A report to the president. Section II: Psychological dimensions. Atlanta, GA: Centers for Disease Control and Prevention.

## College Sports Participation

Acosta, R.V., & Carpenter, L.J. (2004). Women in intercollegiate sport: A longitudinal study—Twenty-seven year update, 1977-2004. West Brookfield, MA: Brooklyn College.

Acosta, R. V., & Carpenter, L. J. (2008). Women in intercollegiate sport: A longitudinal study-Thirty-one year update, 1977-2008. West Brookfield, MA: Brooklyn College.

Bracken, N. (2009). *2007-2008 NCAA study of perceived barriers to women in intercollegiate athletics careers (Barriers 2007-2008).* Indianapolis, IN: NCAA. Retrieved September 16, 2009, from http://www.ncaa.org.

Cheslock, J. (2007). *Who's Playing College Sports? Trends in Participation*. East Meadow, NY: Women's Sports Foundation.

Cheslock, J. (2008). *Who's Playing College Sports? Money, Race and Gender.* East Meadow, NY: Women's Sports Foundation.

DeHaas, D. M. (2008). *2005-2006 NCAA gender equity report.* Retrieved July 31, 2009, from http://www.ncaa.org

DeHaas, D. M. (2009). *1981-82 to 2007-2008 NCAA sports sponsorship and participation rates report.* Retrieved July 31, 2009, from http://www.ncaapublications.com/Uploads/PDF/ParticipationRates2009c2f40573-60aa-4a08-874d-1aff4192c5e4.pdf

National Collegiate Athletic Association (2000). The 1999-2000 NCAA Gender-Equity Report.

National Collegiate Athletic Association (2001-2002). National Collegiate Athletic Student-Athlete Ethnicity Report.

Staurowsky, E. J. (in press). Gender equity in two-year athletic departments: Part I. In Hagedorn, L., & Horton, D. (Eds.). *New directions for community colleges.* New York, NY: Jossey Bass.

Women's Sports Foundation (2003). *The Women's Sports Foundation Report: Title IX and Race in Intercollegiate Sport*. East Meadow, NY: Women's Sports Foundation. Retrieved September 16, 2009, from http://www.womenssportsfoundation.org

## Incentives for Future Careers in Sport

Acosta, R.V., & Carpenter, L.J. ( 2004). Women in intercollegiate sport: A longitudinal study—Twenty-seven year update, 1977-2004. West Brookfield, MA: Brooklyn College.

Acosta, R. V., & Carpenter, L. J. (2008). Women in intercollegiate sport: A longitudinal study—Thirty-one year update, 1977-2008. West Brookfield, MA: Brooklyn College. Retrieved July 31, 2009, from http://www.acostacarpenter.org/

Bracken, N. (2009). *Race and gender demographics: 2007-2008 NCAA member institutions' personnel report.* Indianapolis, IN: NCAA. Retrieved July 31, 2009, from http://www.ncaapublications.com/ProductsDetailView.aspx?sku=RGDMEMB09

Bruening, J.E. & Dixon, M.A. (2008). Situating Work-Family Negotiations within a Life Course Perspective: Insights on the Gendered Experiences of NCAA Division I Head Coaching Mothers. *Sex Roles, 58,* 10-23.

Bruening, J.E. & Dixon, M.A. (2007). The Quest for Work-Family Balance: Managing Role Conflict. *Journal of Sport Management, 21,* 377-406.

Cruz, C. (2009). *Gender games: Why women coaches are losing the field.* Saaurbrucken, Germany: VDM Verlag.

DeHaas, D. (2008). *2005-2006 NCAA gender equity report.* Indianapolis, IN: NCAA. Retrieved July 31, 2009, from http://www.ncaa.org

Dixon, M.A. & Bruening, J.E. (2007). The Quest for Work-Family Balance: A Top-Down Perspective. *Journal of Sport Management*, 21, 471-496.

Drago, R., Henninghausen, L., Rogers, J., Vescio, & Stauffer, K. D. (2005). Final report for CAGE: The coaching and gender equity project. Retrieved July 31, 2009, from http://lser.la.psu.edu/workfam/CAGE.htm

Kamphoff, C., & Gill, D. (2008). Collegiate athletes' perceptions of the coaching profession. *International Journal of Sports Science & Coaching, 3* (1), 55-72.

Lapchick, R., Bowey, N. & Zahn, J. (2008). *The 2008 racial and gender report card: Major League Soccer.* Retrieved on July 31, 2009, from http://www.tidesport.org.

Lapchick, R., Diaz-Calderon, A., & McMechan, D. (2009). *The 2009 racial and gender report card: Major League Baseball.* Retrieved on July 31, 2009, from http://www.tidesport.org

Lapchick, R., Hansen, J., Harless, C., & Johnson, W. (2009). *The 2009 racial and gender report card: National Basketball Association.* Retrieved July 31, 2009, from http://www.tidesport.org

Lapchick, R., Lerner, C., & Zahn, J. (2008). *The 2008 Women's National Basketball Association racial and gender report card.* Retrieved on July 31, 2009, from http://www.tidesport.org

Lapchick, R., Little, E. & Lerner, C. (2008). *The 2008 racial and gender report card: National Football League.* Retrieved on July 31, 2009, from http://www.tidesport.org/RGRC/2008/2008_NFL_RGRC_PR.pdf

Lapchick, R., Little, E., Lerner, C. & Matthew, R. (2009). *The 2008 racial and gender report card: College sport.* Retrieved on July 31, 2009, from http://www.tidesport.org/RGRC/2008/2008CollegeRGRC.pdf.

Lapchick, R., Lopresti, C. L., & Reshard, N. (2009). *The 2009 racial and gender report card: Women's National Basketball Association.*

Miller, J.J., Whisenant, W.A., & Pedersen, P.M. (2007). The communication of opportunities and barriers to prospective applicants: An analysis of interscholastic athletic administrative job announcements. *The Physical Educator, 64*(2), 73-80.

Pedersen, P. M. & Whisenant, W. A. (2005). Successful when given the opportunity: Investigating gender representation and success rates of interscholastic athletic directors. *The Physical Educator, 62* (4), 178-186.

Staurowsky, E. J., Morris, H., Paule, A., & Reese, J. (2007). Travelers on the Title IX compliance highway: How are Ohio's colleges and universities faring? *Women in Sport and Physical Activity.*

## Female Athlete Triad

American Academy of Pediatrics. Committee on Sports Medicine and Fitness (2000). Medical concerns in the female athlete. *Pediatrics* 106(3), 610-613.

American Psychiatric Association Work Group on Eating Disorders. (2000). Practice guideline for the treatment of patients with eating disorders (revision). *American Journal of Psychiatry 167* (1).

American Society of Reproductive Medicine Practice Committee (2004). Current evaluation of amenorrhea. *Fertility & Sterility 82*, 266–272.

Beals, K. A., & Hill, A. K. (2006). The prevalence of disordered eating, menstrual dysfunction, and low bone mineral density among U.S. collegiate athletes. *International Journal of Sport, Nutrition, & Exercise Metabolism 16* (1), 1-23.

Bennell, K., Matheson, G., Meeuwisse, W., & Brukner, P. (1999). Risk factors for stress fractures. *Sports Medicine 28* (2), 91-122.

Byrne, S., & McClean, N. (2002). Elite athletes: effects of the pressure to be thin. *Journal of Science & Medicine in Sport* 5, 80–94.

Castelo-Branco, C., Reina, F., Montivero, A.D., Colodrón, M., & Vanrell J.A. (2006). Influence of high-intensity training and of dietetic and anthropometric factors on menstrual cycle disorders in ballet dancers. *Gynecological Endocrynology: The Journal 22* (1), 31-5.

De Souza, M. J. & Williams, N. I. (2004). Physiological aspects and clinical sequelae of energy deficiency and hypoestrogenism in exercising women. *Human Reproduction Update 10,* 433-448.

De Souza, M. J., Miller B. E., Loucks A. B., Luciano A. A., Pescatello L. S., Campbell C. G., & Lasley B. L. (1998). High frequency of luteal phase deficiency and anovulation in recreational women runners: blunted elevation in follicle-stimulating hormone observed during luteal-follicular transition. *Journal of Clinical Endocrinology and Metabolism 83*(4): 220-4, 232.

De Souza, M. J., West, S. L., Jamal, S. A., Hawker, G. A., Gundberg, C. M., & Williams, N. I. (2008). The presence of both an energy deficiency and estrogen deficiency exacerbate alterations of bone metabolism in exercising women. *Bone 43* (1): 140-148.

Drinkwater, B. L., Nilson, K. , Chestnut, C. H., Bremmer, W. J., Shainholtz, S., & Southworth, M. B. (1984). orrheic athletes. *New England Journal of Medicine 311,* 277–281.

Drinkwater, B., Bruemner, B., & Chestnut, C. H. (1990). Menstrual history as a determinant of current bone density in young athletes. *Journal of the American Medical Association 263,* 545-548.

Golden, H. H., & Carlson, J. L. (2008). The pathophysiology of amenorrhea in the adolescent. *Annals of New York Academy of Science 1135,* 163-178.

Johnson, C., Powers, P.S., & Dick, R. (1999). Athletes and eating disorders: the National Collegiate Athletic Association study. *International Journal of Eating Disorders 26,* 179–188.

Keen, A. D., & Drinkwater, B. L. (1997). Irreversible Bone Loss in Former Amenorrheic Athletes. *Osteoporosis International 7,* 311-315.

Khan, K. M., Liu-Ambrose, T., Sran, M. M., Ashe, M. C., Donaldson, M. G., & Wark, J. D. (2002). New criteria for female athlete triad syndrome? As osteoporosis is rare, should osteopenia be among the criteria for defining the female athlete triad syndrome? *British Journal of Sports Medicine 36,* 10–13.

Liu, S. L., & Lebrun, C. M. (2006). Effect of oral contraceptives and hormone replacement therapy on bone mineral density in premenopausal and perimenopausal women: a systematic review. *British Journal of Sports Medicine 40* (1), 11-24.

Loucks, A. B., Verdun, M., & Heath, E. M. (1998). Low energy availability, not stress of exercise, alters LH pulsatility in exercising women. *Journal of Applied Physiology* 84: 37-46.

Manore, M. M. (1999). Nutritional needs of the female athlete. *Clinical Sports Medicine Journal 18,*549–563.

Nattiv, A., Loucks, A. B., Manore, M. M., Sanborn, C. F., Sundgot-Borgen, J., & Warren, M. P. (2007). American College of Sports Medicine position stand. The female athlete triad. *Medicine & Science in Sports & Exercise 39*(10), 1867-82.

Nichols, J. F., Rauh, J. J., Lawson, J. J., Ji, M., & Barkai, H. S. (2006). Prevalence of the female athlete triad syndrome among high school athletes. *Archives of Pediatrics & Adolescent Medicine 160* (2), 137.

Rome, E. S., Ammerman, S., Rosen, D. S., Keller, R. J., Lock, J., Mammel, K. A., O'Toole, J., Rees, J. M., Sanders, M. J., Sawyer, S. M., Schneider, M., Sigel, #., & Silber, T. J. (2003). Children and adolescents with eating disorders: the state of the art. *Pediatrics 111*, e98–e108.

Sundgot-Borgen, J. (1994). Risk and trigger factors for the development of eating disorders in female elite athletes. *Medicine & Science in Sports & Exercise 26,* 414–419.

Sundgot-Borgen, J., & Torstveit, M. K. (2004). Prevalence of eating disorders in elite athletes is higher than in the general population. *Clinical Journal of Sport Medicine, 14,* 25–32.

The IOC Medical Commission Working Group Women in Sport. (2006). Position Stand on the Female Athlete Triad. Lausanne, Switzerland: International Olympic Committee.

Torstveit, M. K., & Sundgot-Borgen, J. (2005). The female athlete triad exists in both elite athletes and controls. *Medicine & Science in Sports & Exercise, 37,* 1449–1459.

Wade, G. N., Schneider, J. E, & Li, H.Y. (1996). Control of fertility by metabolic cues. *American Journal of Physiology, 270,* E1–E19.

## Female Athletes & Injury


Agel, J., Arendt, E. A., & Bershadsky, B. (2005). Anterior cruciate ligament injury in national collegiate athletic association basketball and soccer: A 13-year review. *The American Journal of Sports Medicine*, 33(4), 524-530.

Agel, J., Arendt, E. A., & Bershadsky, B. (2005). Anterior cruciate ligament injury in national collegiate athletic association basketball and soccer: A 13-year review. *The American Journal of Sports Medicine*, *33*(4), 524-530.

Arendt, E., & Dick, R. (1995). Knee injury patterns among men and women in collegiate basketball and soccer. NCAA data and review of literature. *The American Journal of Sports Medicine, 23*(6), 694-701.

Arendt, E. A. (2007). Musculoskeletal injuries of the knee: Are females at greater risk? *Minnesota Medicine, 90*(6), 38-40.

Arendt, E. A. (1994). Orthopaedic issues for active and athletic women. *Clinics in Sports Medicine, 13*(2), 483-503.

Covassin, T., Swanik, C. B., & Sachs, M. L. (2003). Sex differences and the incidence of concussions among collegiate athletes. *Journal of Athletic Training, 38*(3), 238-244.

Covassin, T., Swanik, C. B., & Sachs, M. L. (2003). Epidemiological considerations of concussions among intercollegiate athletes. *Applied Neuropsychology, 10*(1), 12-22.

Garrett W. (2005). Congruence between existing prevention programs and research on risk factors and mechanisms of noncontact ACL injury. Paper presented at: Hunt Valley II meeting; January, Atlanta, GA.

Gessel, L. M., Fields, S. K., Collins, C. L., Dick, R. W., & Comstock, R. D. (2007). Concussions among united states high school and collegiate athletes. *Journal of Athletic Training, 42*(4), 495-503.

Giugliano, D. N., & Solomon, J. L. (2007). ACL tears in female athletes. *Physical Medicine and Rehabilitation Clinics of North America, 18*(3), 417-38, viii.

Griffin, L. Y., Agel, J., Albohm, M. J., Arendt, E. A., Dick, R. W., Garrett, W. E., et al.,(2000). Noncontact anterior cruciate ligament injuries: Risk factors and prevention strategies. *The Journal of the American Academy of Orthopaedic Surgeons, 8*(3), 141-150.

Griffin, L. Y., Albohm, M. J., Arendt, E. A., Bahr, R., Beynnon, B. D., Demaio, M., et al.,(2006). Understanding and preventing noncontact anterior cruciate ligament injuries: A review of the Hunt Valley II meeting, January 2005. *The American Journal of Sports Medicine, 34*(9), 1512-1532.

Gwinn, D. E., Wilckens, J. H., McDevitt, E. R., Ross, G., & Kao, T. C. (2000). The relative incidence of anterior cruciate ligament injury in men and women at the united states naval academy. *The American Journal of Sports Medicine, 28*(1), 98-102.

Hewett, T. E., Ford, K. R., & Myer, G. D. (2006). Anterior cruciate ligament injuries in female athletes: Part 2, a meta-analysis of neuromuscular interventions aimed at injury prevention. *The American Journal of Sports Medicine, 34*(3), 490-498.

Hewett, T. E., Myer, G. D., & Ford, K. R. (2006). Anterior cruciate ligament injuries in female athletes: Part 1, mechanisms and risk factors. *The American Journal of Sports Medicine, 34*(2), 299-311.

Hootman, Dick, R., & Agel, J. (2007). Epidemiology of Collegiate Injuries for 15 Sports: Summary and Recommendations for Injury Prevention Strategies. *Journal of Athletic Training 42* (2): 311-319.

Huston, L. J., Greenfield, M. L., & Wojtys, E. M. (2000). Anterior cruciate ligament injuries in the female athlete. potential risk factors. *Clinical Orthopaedics and Related Research, 372*, 50-63.

Ingram, J. G., Fields, S. K., Yard, E. E., & Comstock, R. D. (2008). Epidemiology of knee injuries among boys and girls in U.S. high school athletics. *The American Journal of Sports Medicine, 36*(6), 1116-1122.

Ireland, M. L. (2002). The female ACL: Why is it more prone to injury? *The Orthopedic Clinics of North America, 33*(4), 637-651.

Ireland, M. L., & Ott, S. M. (2004). Special concerns of the female athlete. *Clinics in Sports Medicine, 23*(2), 281-98, vii.

Kelly, A. K. (2008). Anterior cruciate ligament injury prevention. *Current Sports Medicine Reports, 7*(5), 255-262.

Louw, Q. A., Manilall, J., & Grimmer, K. A. (2008). Epidemiology of knee injuries among adolescents: A systematic review. *British Journal of Sports Medicine, 42*(1), 2-10.

Madden, M. (2007). Women and ACL Injuries. pp. 125-128 in J. O'Reilly & S.K. Cahn (eds.) *Women and Sports in the United States*. Boston: Northeastern University press.

McClay Davis, I., & Ireland, M. L. (2003). ACL injuries--the gender bias. *The Journal of Orthopaedic and Sports Physical Therapy, 33*(8), A2-8.

McKeever, C. K., & Schatz, P. (2003). Current issues in the identification, assessment, and management of concussions in sports-related injuries. *Applied Neuropsychology, 10*(1), 4-11.

McLean, S. G. (2008). The ACL injury enigma: We can't prevent what we don't understand. *Journal of Athletic Training, 43*(5), 538-540.

Mountcastle, S. B., Posner, M., Kragh, J. F., Jr, & Taylor, D.C. (2007). Gender differences in anterior cruciate ligament injury vary with activity: Epidemiology of anterior cruciate ligament injuries in a young, athletic population. *The American Journal of Sports Medicine, 35*(10), 1635-1642.

Mountcastle, S. B., Posner, M., Kragh, J. F.,Jr, & Taylor, D. C. (2007). Gender differences in anterior cruciate ligament injury vary with activity: Epidemiology of anterior cruciate ligament injuries in a young, athletic population. *The American Journal of Sports Medicine, 35*(10), 1635-1642.

Perrin, D., & Shultz, S.J. (2005). Physical Rehabilitation and the Challenge of Anterior Cruciate Ligament Injury in the Physically Active Female. *Quest*, 57, 154-161.

Renstrom, P., Ljungqvist, A., Arendt, E., Beynnon, B., Fukubayashi, T., Garrett, W., et al., (2008). Non-contact ACL injuries in female athletes: An International Olympic Committee current concepts statement. *British Journal of Sports Medicine, 42*(6), 394-412.

Sokolove, M. (2008). *Warrior Girls: Protecting Our Daughters Against the Injury Epidemic in Women's Sports*. New York: Simon and Schuster.

Shultz, S. J. (2008). ACL injury in the female athlete: A multifactorial problem that remains poorly understood. *Journal of Athletic Training, 43*(5), 455.

Shultz, S. J., Schmitz, R. J., & Nguyen, A. D. (2008). Research retreat IV: ACL injuries--—the gender bias: April 3-5, 2008 Greensboro, NC. *Journal of Athletic Training, 43*(5), 530-531.

Theberge, N. (2008). 'Just a normal bad part of what I do': Elite athletes' accounts of the relationship between sport participation and health. *Sociology of Sport Journal*, 25 (2), 206-222.

Tosi, L. L. (2000). Women and the orthopaedic surgeon: Changing the relationship. *Clinical Orthopaedics and Related Research, 372,* 17-31.

Uhorchak, J. M., Scoville, C. R., Williams, G. N., Arciero, R. A., St Pierre, P., & Taylor, D. C. (2003). Risk factors associated with noncontact injury of the anterior cruciate ligament: A prospective four-year evaluation of 859 West Point cadets. *The American Journal of Sports Medicine, 31*(6), 831-842.

Young, K., (ed.). (2004). *SportingbBodies, damaged selves: SociologicalsStudies ofsSports-related injury*. London: Elsevier.

## Energy Drinks

Chang, S. (2009, July 17). Shocking truth about teens and energy drinks. *Daily Health Updates,* ABC Local. Retrieved September 16, 2009, from http://www.abclocal.com/kgo/story?section=view_from_the_bay/health_fitness&id=6920297.

Froiland, K., Koszewski, W., Hingst, J., & Kopecky, L. (2004, February). Nutritional supplement use among college athletes and their sources of information. *International Journal of Sport Nutrition and Exercise Metabolism, 14* (1), 104-120.

How women's energy drinks work (n.d.). *Careerfair.com*. Retrieved September 16, 2009, from http://www.careerfair.com.

Laskowski, E. R. (2009, August). Energy drinks: OK for athletes? *MayoClinic.com.* Retrieved September 16, 2009, from http://www.mayoclinic.com

Miller, K. E. (2008). Wired: Energy drinks, jock identity, masculine norms, and risk taking. *Journal of American College Health, 56* (5), 481-489.

Miller, K. E. (2009). Sport-related identities and the "toxic jock". *Journal of Sport Behavior, 32* (1), 69-90.

National Federation of State High School Associations. (2008, October). *Position statement and recommendations for the use of energy drinks by young athletes.* Retrieved August 14, 2009, from http://www.chsaa.org/sports/medicine/2Energy%20Drink%20Statement.pdf

Obert, R. (2009, April 30). Energy drinks pose health concerns for athletes. *The Arizona Republic.* Retrieved August 14, 2009, from http://www.azcentral.com/sports/preps/articles/2009/04/30/20090430spt-hsenergydrink.html.

Paddock, R. (2008). Energy drinks' effects on student-athletes and implications for athletic departments. *The Sport Journal.* Retrieved on August 14, 2009, from http://www.thesportjournal.org/article/energy-drinks-effects-student-athletes-and-implications-athletic-departments

Parker-Pope, T. (2008, May 26). Energy drinks may put teenagers at risk. *The New York Times.* Redorbit. (2008). Children should stay away from energy drinks. *Redorbit.com.*

Reissing, C. J., Strain, E. C., & Griffiths, R. R. (2008). Caffeinated energy drinks—A growing problem. *Drug and Alcohol Dependence.*

Wiehl, L. (2007). Miller, Anheuser-Busch may be illegally targeting teens with energy drinks. Retrieved August 14, 2009, from http://www.foxnews.com

WOMEN'S SPORTS FOUNDATION
equal play.

**Women's Sports Foundation**
founded by Billie Jean King

Eisenhower Park
1899 Hempstead Turnpike, Suite 400
East Meadow, New York 11554

**t** 516.542.4700 • 800.227.3988
info@WomensSportsFoundation.org
www.WomensSportsFoundation.org

A Women's Sports Foundation Research Report