School Sports and Adolescent Steroid Use: National Trends and Race-Ethnic Variations

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Abstract

"The illegal use of steroids, human growth hormone, and other performance enhancing substances by well known athletes may cause serious harm to the user. In addition, their use encourages young people to use them… Every American, not just baseball fans, ought to be shocked by that disturbing truth." (U.S. Senator George J. Mitchell 2008)

In the United States, it has been reported that 4% to 12% of male adolescents and 0.5% to 2.9% of female adolescents have used anabolic steroids to enhance sports performance or favorably alter body size. Although medical, legal, and ethical issues related to the nonmedical use of anabolic steroids have been widely publicized, a growing number of adolescents appear to be using them for nonmedical purposes. This study examines the relationship between sports participation and steroid use among Black and White high school males using data from the Monitoring the Future Surveys: 1991-2007. Our specific aims were threefold: (1) to examine whether trends in high school male adolescent steroid usage was associated with the "steroids era" in major league baseball; (2) to compare Black-White adolescent usage patterns, and (3) to determine if participation in school sports served as a protective or risk factor for steroid use. Results indicate that adolescent male steroid use increased during the "steroids era", White males reported higher prevalence of steroid use than Black males, and sport participation served as a protective factor, but only for Black males.

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Introduction

It has been suggested that athletes used various herbs and foods to improve their performance as far back as the original Olympic Games in ancient Greece (Francis 2000). For example, a winner in the 480 B.C. Olympic is said to have eaten only for 10 months prior to the Games. In addition, early attempts to increase Testosterone were documented as early as 776 BC for Olympic athletes´ who ate sheep´s testicles, which they knew to be a source of Testosterone production (Francis 2000). In the era of modern sports, athletes have used anabolic steroids since the 1950s in the hope of improving athletic performance (Bergman and Leach 1985). Anabolic steroids are synthetic derivatives of testosterone typically taken to increase muscle mass and strength. Contemporary anabolic steroid use was initially popularized by weight lifters and bodybuilders; however, they are now being used by male and female power athletes, endurance athletes, as well as nonathletes (Yesalis, Kennedy, Kopstein, and Bahrke 1993).More than 1 million people in the United States are estimated to have ever used anabolic steroids, with approximately 48% of lifetime anabolic-steroid users being 25 years of age or younger (Taylor and Black 1987; Yesalis et al 1993). Adolescents and young adults ages 25 and younger make up 54% of the population who reported using anabolic steroids during the previous year (Yesalis, et al 1993). Steroid use has become a significant concern in both intercollegiate and interscholastic athletics. However, prevalence estimates vary considerably. For example, the NCAA surveys collegiate athletes every four years regarding use and abuse habits of various drugs and their self-report rate for anabolic steroids has been about 1% over the past 12 years (Green 2007). Other estimates of the extent of steroid use among intercollegiate athletic men range from 2% to 20% (Pope, Katz, and Champoux 1988). According to a 2006 NCAA five-year report, there was a sharp decline in the number of college athletes who tested positive for anabolic steroids. Among a total of 10,094 athletes who were tested in the 2004-5 academic year, 49 athletes tested positive for steroids compared with 92 athletes five years earlier.

Steroid use among adolescents has also become an increasing concern. According to a survey by the Center for Disease Control and Prevention, steroid use among high school students more than doubled between 1991 and 2003, but declined somewhat between 2003 and 2005 (Eaton, Kahn, Kinchen, et al 2006). Slightly over 6% of 15,000 students surveyed admitted trying steroid pills or injections. It has been reported that 4% to 12% of male adolescents and 0.5% to 2.9% of female adolescents have

used anabolic steroids either to enhance sports performance, or to alter favorably body size (Bahrke et al. 1998; Buckley, et al 1988). Given that 57% of all high school students play on formal sports teams, the use of both illicit and legal performance enhancing drugs is an important policy concern. Nevertheless, it is important to note that up to one third of high school students who use anabolic steroids are nonathletes who use steroids to improve their appearance (Buckley, et al 1988).

Researchers have suggested that some students begin using anabolic steroids even before they enter high school. For example, Tanner, Miller and Alongi (1995) report that 54% of adolescent Anabolic steroids users started at 14 years of age. Nutter (1997) also found that 3% of students between 12 and 16 years of age had used or were currently using anabolic steroids. Nevertheless, obtaining accurate estimates of the prevalence of adolescent steroid abuse is difficult because many large-scale surveys that measure drug abuse, often do not gather information on steroid use. Moreover, according to a survey of athletic directors by the National Federation of State High Schools, only a small fraction of the nation´s high schools test for steroids. For example, data from the National Federation of State High School Associations indicate that only 13% of high schools perform drug testing on athletes. However, only 29% of those schools reported testing for anabolic steroids, whereas the rest tested only for illicit substances such as marijuana, opiates, and alcohol (National Federation of State High School Associations 2006).

Background

During the 1930s, scientists discovered that anabolic steroids could facilitate the growth of skeletal muscle in laboratory animals, which led to abuse of the compounds first by bodybuilders and weightlifters and then by athletes in other sports (Bergman and Leach 1985). However, research also suggests that steroid use may also be associated with adverse effects. For example, steroid use has been linked to increased risk of coronary heart disease, liver disease, testicular atrophy, prostate cancer, and breast enlargement in men and decrease in women (Bahrke et al. 1998). Additional potential psychological side effects include decreased libido, increased aggression including homicide and suicide, affective and psychotic disorders (Pope et al. 2000; Pope and Katz 1988; Riem and Hursey 1995). It is also believed to be addictive in some users (Brower et al. 1991). Because steroid users often use other illicit drugs there is increased risk of transmitting or contracting the human immunodeficiency virus the risk

for spread of hepatitis and HIV to originally low risk populations through sharing needles in steroid injection (DuRant et al. 1993a). Steroid use in adolescence may cause premature closure of the growth plates over the bones resulting in permanent short stature (Hallagan et al. 1989). Anabolic steroids use during adolescence poses additional concerns because the use of these drugs during this developmental period may result in premature closure of the growth plates over the bones resulting in permanent short stature (Hallagan et al. 1989). For all of these reasons, many health professional organizations including the American Academy of Pediatrics, the American College of Sports Medicine, and the National Strength and Conditioning Association have denounced the nonmedical use of anabolic steroids. Because anabolic steroid use is a significant health concern it is important to identify risk and protective factors for its use in adolescence.

In general, studies have indicated that substance abuse among school-age youth is a significant correlate of academic failure, absenteeism, dropout rate, and delinquency (Kandel, Simcha-Fagan, and Davies 1986; Newcomb, Maddahian, and Bentler 1986; Paulson, Coombs, and Richardson 1990; Swadi 1992). Adolescent substance use has also been associated with engaging in other risky behaviors. For example, YRBSS data from 1999 indicate that youth who reported a past or recently active history of smoking marijuana are generally more likely to have reported engaging in other recent risk-related behaviors, such as fighting, carrying a weapon, and not wearing a seat belt.

Similarly, steroid use has also been associated with other risky behaviors (Yesalis, et al 1993; Torabi and Bailey 1993). DuRant et al (1994) reported that anabolic-steroid use by ninth grade students was associated with the use of cocaine, injected drugs, alcohol, marijuana, cigarettes, and smokeless tobacco. Among male students, DuRant, Escobedo, and Heath 1995) found that anabolic-steroid use was associated with injected drug use, use of drugs other than steroids, engaging in strength-training exercises, and alcohol use, but not with participation in school sponsored sports. Research suggests that some users might turn to other drugs to alleviate some of the negative effects of anabolic steroids. For example, a study of 227 men admitted in 1999 to a private treatment center for addiction to heroin or other opiates found that 9.3 percent had abused anabolic steroids before trying any other illicit drug. Of these 9.3 percent, 86 percent first used opiates to counteract insomnia and irritability resulting from anabolic steroids ( ).

It has been suggested that participation in school sports can reduce the risks of young people's involvement in problem behavior (Miller, Sabo, Farrell, Barnes, and Melnick (1998). However, it is unclear whether participation in school-based sports serves as a risk or protection against involvement in drugs. Research on the relationship between participation in interscholastic athletics and drug use has produced inconsistent findings. Some studies indicate that athletes are less likely to use drugs than nonathletes (Escobedo, Marcus, Holtzman, and Giovino 1993; Hayes and Tevis 1977; Shields 1995; Tec 1972), while other studies reveal either greater drug use by athletes or no difference between sports participants and non-participants (Carr 1990; McGraw, Smith, Schensul, and Carrillo 1991). These inconsistent findings are due in part to substantial differences in specific substances studied, as well as different the different populations examined. For example, Rainey (1996) examined patterns of tobacco and alcohol use among athletic and non-athletic youth and found that participation on school athletic teams correlated with less cigarette smoking but more binge drinking, while other research reports lower levels of alcohol (Hayes and Tevis 1977) and marijuana (Tec 1972) use by athletes. There is also evidence of greater involvement in smokeless tobacco and cigarettes by youth who participate in athletics (McGraw, Smith, Schensul, and Carrillo 1991). In addition, variations in adolescent drug-use patterns by ethnicity, gender, geographic location, and other factors make it difficult to make broad and generalized statements about the effect of sports participation on drug use. For example, males tend to use most substances more frequently than females, Blacks typically report less use than Whites and other minority youth, and urban-rural variations have been found (Dawkins 1986 1996; Johnson and Marcos 1988; Maddahian, Newcomb, and Bentler 1986; Warheit, Biafora, Zimmerman, Gil, Vega, and Apospori 1995). The pattern for steroid use follows that seen for other drugs, with both Whites and Hispanics sharing higher prevalence values (e.g., lifetime prevalence of 2.8 percent to 3.4 percent among 12th graders). Blacks are substantially less likely to have started to use steroids (1.3 percent by 12th grade). The association between sport participation and substance use may also vary by type of sport. Research based on large national data sets have been generally unable to directly address this issue because information on type of sport is often lacking in studies such as Monitoring the Future and the Youth Risk Behavior Surveillance Surveys. However, there is some evidence that participation in specific sports, such as football and wrestling, is associated with higher prevalence of anabolic-steroid use (Terney and McLain 1990; DuRant, Ashworth, Newman, and Rickert 1994).

Reflecting on sports' protective potential against risky behavior, Miller, Sabo, Farrell, Barnes, and Melnick (1998) suggest four benefits to participating in school sports: (1) enables adolescents to be constructively engaged in activities, which provide acceptable alternatives to risky behavior; (2) fills time slots with regularly scheduled activities; (3) leads to affective attachment to coaches and teammates which helps to suppress involvement in many deviant activities; and (4) provides an incentive for avoiding behaviors that may be potentially threatening to their continued participation. Therefore, notwithstanding the powerful influence of known predictors of drug use in adolescence -- including early substance use initiation, family members' drug use and peer influence -- participation in school-based sports should contribute to the protective resources that reduce adolescent drug use. However, it is also possible that sports participation will promote drug use, especially for substances that are associated with particular sports (e.g., smokeless tobacco and, more recently, steroids in baseball), through the negative role modeling behavior of influential athletes, or via other mechanisms.

A major purpose of the present study is to address the question of whether participation in school-based sports served as a "risk" or "protective" factor for steroid use among middle- and high school males. We examine the relationship between sports participation and steroid use among Black and White high school males using data from the Monitoring the Future Surveys: 1991-2007. Our specific aims are threefold: (1) to examine whether trends in high school male adolescent steroid usage was associated with the steroids era in major league baseball; (2) to compare Black-White adolescent usage patterns, and (3) to determine if participation in school sports served as a protective or risk factor for steroid use.

Methods

Data for this study are from the Monitoring the Future Surveys: 1991-2007 (MTF). The MTF Study, funded by NIDA, is a nationally representative cross-sectional sample survey of school attending youth in the United States, administered to 8th-, 10th-, and 12th-graders, with longitudinal follow-up of subsamples as these students progress into the college years and young adulthood. MTF is conducted by the University of Michigan's Institute for Social Research. One of the major purposes of the survey is to develop an accurate picture of drug use and related attitudes and behaviors among youth (Johnston and O'Malley 1997; Johnston et al. 2001). Data presented in this report are from the MTF cross sectional

surveys only. Since 1975, the Monitoring the Future (MTF) survey has been administered annually to study the extent of and beliefs about drug use among 12th-graders. The survey was expanded in 1991 to include 8th- and 10th-graders. The goal of the survey is to collect data on daily, past-month, past-year, and lifetime drug use among students in these grade levels. Because of our focus on specific long-term trends in adolescent steroid use, our analyses is restricted to the 8th and 10th grade samples as the 12th grade surveys did not include such measures prior to 1995. For the present study, we group the MTF surveys into three periods in major league baseball: the pre-steroids era (1991-1993), the steroids era (1994-2003), and the post-steroids era (2004-2007). Chi-square statistics are used to compare steroid use rates among sports active and sports inactive, Black and White males across time periods,

Findings

Full Sample: Table 1 reports trends in steroids use among all male 8th and 10th grade students. The data are arrayed to represent the three periods in major league baseball. Steroid usage is reported in three ways: ever used in lifetime; used during past 12 months; and used during the past 30 days. The full male 8th and 10th grade sample is comprised of 212,263 students. Overall, the data show that steroids use among students who are active in sports, as well as their counterparts who are not active in sports, peaked during major league baseball's steroids era (from 1994 to 2003).

Lifetime Steroid Use: The top panel of Table 1 shows that in the pre-steroids era (from 1991 to 1993), only 2.8% male students who were active in sports reported having used steroids in their lifetimes. Among this group, the percentage who reported having used steroids in their lifetimes increased to 3.4% during steroids era. During the post-steroids era in major league baseball (from 2004 to 2007), we see a decline in the percentage male sports active students who reported having used steroids in their lifetimes. Only 2% of male students who were active in sports reported having used steroids during this period. Chi-square test shows that, for the full sample of sports active male 8th and 10th grade students, variations in steroids use are related to baseball's steroid eras, and the differences across eras are statistically significant (χ^2=276.07, p<.01). The same pattern is observed among the full sample of male 8th and 10th grade students male students who are not active in sports. In pre-steroid era, 2.1% male students who were inactive in sports reported having used steroids in their lifetime. The percentage increased to 2.9% during the steroids

era, and dropped to 1.7% in post-steroid era. Chi-square test shows that lifetime steroids use among male 8th and 10th grade students who were not involved in sports is also related to baseball's steroid eras, and the differences across eras are statistically significant (χ^2=38.20, p<.01).

Steroid Use During Past 12 Months: The middle panel of Table 1 reveals similar results regarding 8th and 10th grade male students' steroid usage in the 12 months prior to the survey. In pre-steroid era, 1.8% male students who were active in sports reported having used steroids during the 12 month period prior to the survey. Among this group of males who were active in sports, steroid use rose to 2.1% during the steroid era, and drops to 1.8% in post-steroid era. Chi-square test shows that, for the full sample of sports active male 8th and 10th grade students, variations in steroids use in the past 12 months are related to baseball's steroid eras, and the differences across eras are statistically significant (χ^2=31.50, p<.01). In the pre-steroids era, just 1.0% of male 8th and 10th graders who were not involved in sports, reported having used steroids in the past 12 months. During the steroids era the number increased to 1.6%, and declined slightly to 1.4% in post-steroid era. As was the case for sports active 8th and 10th grade males, steroids use in the past 12 months among males who were not active in sports is also correlated with the steroids era in major league baseball, and the differences across baseball eras are statistically significant (χ^2=12.625, p<.01).

Steroid Use During Past 30 Days: As shown in the bottom panel of Table 1, the prevalence rates for steroid use in the last 30 days prior to the survey is similar to that observed for lifetime usage, and usage within the past year. In the pre-steroids era, 0.9% of male 8th and 10th graders who were active in sports reported having used steroids in the 30 days prior to the survey. The number increased to 1.1% during the steroids era, and then remained the same in post-steroid era. Chi-square test shows that the trends in steroids use in the past 30 days is also related to the baseball eras, and the differences across eras are statistically significant (χ^2=14.84.50, p<.01). For male students who were inactive in sports, 0.6% reported having used steroids over the past 30 days, in pre-steroid era. The prevalence rate increased to 0.9% in steroid era. However, unlike other groups, the percentage of users among male students who were inactive in sports increased slightly to 1.0% in the post-steroid era. Steroid use, in the past 30 days, among students who were sports inactive is also correlated with the steroids era in major league baseball, and the differences across eras are statistically significant (χ^2=6.50, p<.05).

Comparing variations in the steroid use patterns of students who are active in sports and those who are sports inactive *within in each period* we find that among all male students, participation in sports is associated with higher rates of steroid use across different eras. In the pre-steroids era, 8th and 10th male students who are active in sports reported more steroids use than those who are inactive in sports in all three use behavior groups. Specifically, 2.8% male students who were active in sports reported having used steroids in their lifetimes, compared to 2.1% of male 8th and 10th graders who were inactive in sports. The differences between sports active participants and sports inactive participants are statistically significant (χ^2=9.92, p<.01). In the steroids era, 3.4% of males who were active in sports reported having used steroids during their lifetimes compared to 2.9% of males who were inactive in sports. The differences between sports active participants and sports inactive participants are statistically significant (χ^2=20.70, p<.01). In post-steroid era, 2.0% of male 8th and 10th grade students who were active in sports reported having used steroids in their lifetimes compared to 1.7% of males who were inactive in sports. The differences between sports active participants and sports inactive participants are statistically significant (χ^2=2.68, p<.1). Among males in the pre-steroids era who reported having used steroids in the last 12 months, the prevalence rate is 1.8% for those who are active in sports, and 1.0% for those who are not active in sports. This difference is also statistically significant (χ^2=18.10, p<.01). In the steroids era, the usage prevalence rate is 2.1% for those who were active in sports, and 1.6% for those who were inactive in sports. These differences are also statistically significant (χ^2=27.42, p<.01). In the post-steroid era, the steroid usage prevalence rate was 1.8% for those who are sports active in sports, and 1.4% for those who were sports inactive. Again, the differences are statistically significant (χ^2=8.06, p<.01). During the pre-steroids era, the usage prevalence was 0.9% for those who were active in sports, and 0.6% for those who were inactive in sports, among males who reported having used steroids in the last 30 days. This difference is also statistically significant (χ^2=5.47, p<.05). In steroids era, the prevalence rate was 1.1% for active sports participants, and 0.9% for those who are inactive in sports. The difference is also statistically significant (χ^2=9.58, p<.01). In post-steroids era, the steroid usage rate was 1.1% for those who are active in sports, and 1.0% for those who are inactive in sports, a non-significant difference.

Black Males: Table 2 reports trends in steroids use among Black male 8th and 10th grade students. The data are arrayed to represent the three periods in major league baseball. Steroid usage is reported in three ways: ever used in lifetime; used during past 12 months; and used during the past 30 days. The Black male 8th and 10th grade sample is comprised of 36528 students. The data in Table 2 show that, like males overall, steroids use among both sports active, and sports inactive, Black students peaked during major league baseball's steroids era.

Lifetime Steroid Use: The top panel of Table 2 shows that in the pre-steroids era, only 2.0% of Black male students who were active in sports reported having used steroids in their lifetimes. Among Black males, the percentage who reported having used steroids in their lifetimes increased to 2.4% during the steroids era. During the post-steroids era in major league baseball, we see a decline in the percentage of sports active students who reported having used steroids in their lifetimes. Only 1.8% of Black male students who were active in sports reported having used steroids during this period. Chi-square test shows that among sports active Black male 8th and 10th graders, variations in steroids use are related to baseball's steroid eras, and the differences across eras are statistically significant (χ^2=10.87, p<.01). The same pattern is observed among the sample of Black male 8th and 10th grade students who were not active in sports. In the pre-steroids era, 2.1% of Blacks who were inactive in sports reported having used steroids in their lifetimes. Those percentages increased to 2.8% during the steroids era, and dropped to 2.1% in post-steroids era. Chi-square tests show that lifetime steroids use among Black male 8th and 10th grade students who were not involved in sports is unrelated to baseball's steroids eras (χ^2=1.89, ns).

Steroid Use During Past 12 Months: The middle panel of Table 2 reveals similar results regarding 8th and 10th grade Black male students' steroid usage in the 12 months prior to the survey. In pre-steroids era, 1.1% of Black males who were active in sports reported having used steroids during the 12 month period prior to the survey. Among sports active Black males, steroid use rose to 1.4% during the steroids era, and increased slightly to 1.5% in the post-steroids era. In the pre-steroids era, just 1.5% of sports inactive Black male 8th and 10th graders reported having used steroids in the past 12 months. During the steroids era the number increased to 1.7%, and again increased slightly to 1.9% in post-steroid era. Chi-square tests for both sports active (χ^2=3.17, ns) and sports inactive

(χ^2=.49, ns) Black male 8th and 10th graders show that steroids use during the 12 month period prior to the survey is unrelated to baseball's steroids eras.

Steroid Use During Past 30 Days: As shown in the bottom panel of Table 2, the prevalence rates for Black male steroid use in the last 30 days prior to the survey is similar to that observed for lifetime usage, and usage within the past year. In the pre-steroids era, 0.6% of Black male 8th and 10th graders who were active in sports reported having used steroids in the 30 days prior to the survey. The number increased to .8% during the steroids era, and again grew slightly to 0.9% in post-steroids era. For Black male students who were inactive in sports, 0.3% reported having used steroids over the past 30 days, in pre-steroids era. The prevalence rate increased to 1.2% in the steroids era and to 1.7% in the post-steroids era. Steroid use, in the past 30 days, among students who were sports inactive is also correlated with the steroids era in major league baseball, and the differences across eras are statistically significant (χ^2=5.63, p<.1).

Based on the results in Table 2, it appears that sports participation serves as a protective factor against steroids use among Black male students, across the three eras. Among Black male 8th and 10th graders, students who reported having used steroids in their lifetime, and in the last 12 months, the steroids use prevalence rates for the sports inactive, exceeds the prevalence rates for the sports active, in all three eras. The only exception is the group who reported having used steroids in the last 30 days, in pre-steroids era. In both the steroids era, and post-steroids era, Black male students who were inactive in sports reported higher rates of steroids use. The difference is statistically significant (χ^2=4.42, p<.05) in the steroids era and the post-steroids era (χ^2=4.22, p<.05).

White Males: Table 3 reports trends in steroids use among White male 8th and 10th grade students. The data are arrayed to represent three periods in major league baseball. Steroid usage is reported in three ways: ever used in lifetime; used during past 12 months; and used during the past 30 days. The White male 8th and 10th grade sample is comprised of 175735 students. The data in Table 3 show that, like Black males, and males overall, steroids use among White sports active, and sports inactive, students peaked during major league baseball's steroids era.

Lifetime Steroid Use: The top panel of Table 3 shows that in the pre-steroids era, only 2.8% of sports active White males reported having used steroids in their lifetimes. Among sports active White males group, the percentage who reported having used steroids in their lifetimes increased to 3.6% during steroids era. During the post-steroids era, we see a decline in the percentage White male sports active students who reported having used steroids in their lifetimes. Only 2% of White male students who were active in sports reported having used steroids during this period. Chi-square test shows that for sports active White male 8th and 10th grade students, variations in steroids use are related to baseball's steroid eras, and the differences across eras are statistically significant (χ^2=207.63, p<.01). The same pattern is observed among White male 8th and 10th grade students who were not active in sports. In pre-steroids era, 1.8% of White male students who were inactive in sports reported having used steroids in their lifetimes. The percentage increased to 2.8% during the steroids era, and dropped to 1.7% in post-steroids era. Chi-square tests show that lifetime steroids use among White male 8th and 10th grade students who were not involved in sports is also related to baseball's steroid eras, and the differences across eras are statistically significant (χ^2=25.84, p<.01).

Steroid Use During Past 12 Months: The middle panel of Table 3 reveals similar results regarding White 8th and 10th grade male students' steroid usage in the 12 months prior to the survey. In pre-steroids era, 1.8% of White male students who were active in sports reported having used steroids during the 12 month period prior to the survey. Among White males who were active in sports, steroid use rose to 2.3% during the steroids era, and dropped to 1.9% in the post-steroids era. Chi-square test shows that, for sports active White male 8th and 10th grade students, variations in steroids use in the past 12 months are related to baseball's steroid eras, and the differences across eras are statistically significant (χ^2=33.00, p<.01). In the pre-steroids era, just .7% of sports inactive White male 8th and 10th graders reported having used steroids in the past 12 months. During the steroids era the number increased to 1.6%, and declined slightly to 1.3% in post-steroids era. Steroids use in the past 12 months among sports inactive White males is also correlated with the steroids era in major league baseball, and the differences across baseball eras are statistically significant (χ^2=16.38, p<.01).

Steroid Use During Past 30 Days: As shown in the bottom panel of Table 3, the White male prevalence rates for steroid use in the last 30 days prior to the survey is similar to that observed for lifetime usage, and usage within the past year. In the pre-steroids era, 0.8% of White male 8th and 10th graders who were active in sports reported having used steroids in the 30 days prior to the survey. That number increased to 1.2% during the steroids era, and dropped to 1.1% in post-steroids era. Chi-square test shows that the trends in steroids use in the past 30 days is also related to the baseball eras, and the differences across eras are statistically significant (χ^2=22.29, p<.01). For White male students who were inactive in sports, 0.5% reported having used steroids over the past 30 days, in pre-steroid era. The prevalence rate among sports inactive White male students increased to 0.8% in steroids era, and remained the same in post-steroids era. The differences across eras are not statistically significant.

Based on the results in Table 3, it appears that sports participation does *not* serve as a protective factor against steroids use among White male students, across the three eras. Among White male 8th and 10th graders, students who reported having used steroids in their lifetime, in the last 12 months, and in the last 30 days, the steroids use prevalence rates for the sports active, exceeds the prevalence rates for the sports inactive, across all three eras. In the pre-steroids era, 8th and 10th White male students who were active in sports reported greater steroid use than those who were inactive in sports in all three use behavior groups. Specifically, 2.8% of male students who were active in sports reported having used steroids in their lifetimes, compared to 2.1% of male 8th and 10th graders who were inactive in sports. The differences between sports active participants and sports inactive participants are statistically significant (χ^2=14.37, p<.01). In the steroids era, 3.6% of males who were active in sports reported having used steroids during their lifetimes compared to 2.7% of males who were inactive in sports. The differences between sports active participants and sports inactive participants are statistically significant (χ^2=27.46, p<.01). In post-steroid era, 2.0% of male 8th and 10th grade students who were active in sports reported having used steroids in their lifetimes compared to 1.7% of males who were inactive in sports. The differences between sports active participants and sports inactive participants are statistically significant (χ^2=1.81, p<.1). Among males in the pre-steroids era who reported having used steroids in the last 12 months, the prevalence rate is 1.8% for those who are active in sports, and.7% for those who are not active in sports. This difference is also statistically significant (χ^2=23.71,

p<.01). In the steroids era, the usage prevalence rate is 2.3% for those who were active in sports, and 1.6% for those who were inactive in sports. These differences are also statistically significant (χ^2=34.37, p<.01). In the post-steroid era, the steroid usage prevalence rate was 1.8% for those who are sports active in sports, and 1.4% for those who were sports inactive. Again, the differences are statistically significant (χ^2=9.52, p<.01). During the pre-steroids era, the usage prevalence was 0.8% for those who were active in sports, and 0.5% for those who were inactive in sports, among males who reported having used steroids in the last 30 days. This difference is also statistically significant (χ^2=4.86, p<.05). In steroids era, the prevalence rate was 1.2% for active sports participants, and 0.8% for those who are inactive in sports. The difference is also statistically significant (χ^2=20.04, p<.01). In post-steroids era, the steroid usage rate was 1.1% for those who are active in sports, and .8% for those who are inactive in sports, a significant difference (χ^2=5.70, p<.05).

Summary and Discussion

This study examined the relationship between sports participation and steroid use among Black and White high school males using data from the Monitoring the Future Surveys : 1991-2007. Our specific aims were threefold: First, we wanted to examine whether trends in middle and high school male adolescent steroid usage was associated with the "steroids era" in major league baseball. Second, we wanted to compare Black-White adolescent usage patterns. Third, we sought to determine if participation in school sports served as a protective or risk factor for steroid use.

With regard to the question of whether trends in high school male adolescent steroid usage was associated with the "steroids era" in major league baseball, we find quite compelling evidence that it was. Specifically, we found that self-reported steroid usage among both Black and White 8th and 10th grade males increased during the steroids era in major league baseball, and declined afterwards. Similar patterns were observed for Black and White adolescent males who were sports inactive, as well as their counterparts who were sports active, albeit at lower rates. These results lend support to the concern that steroid abuse by professional athletes may negatively affect young male adolescents who may often idolize major athletes. Since national data shows that approximately one-half of all high school males say they have athletes as role models, it is not surprising that trends in adolescent male steroid use, mirrors steroid use trends in professional baseball. Additionally, because, adolescent males

generally idolize star athletes, whether or not they themselves participate in varsity sports, it is also not surprising that steroid use prevalence rates increased among males who were sports inactive, during the "steroids era" in major league baseball.

Regarding the question of racial variations in male adolescent steroid usage patterns, we find notable differences. Specifically, we found that across the three periods examined, Black male adolescents reported lower rates of steroid use than their White counterparts. This finding is consistent with most studies of adolescent substance usage. The weaker association between Black male adolescent's steroid use and the "steroids era" trends in baseball may be in part due to declining Black male participation in major league baseball and baseball's lower popularity among Black youth compared to other major sports like football and basketball. However, the weaker association between Black male adolescents' steroid use and the "steroids era" trends in baseball may also be because fewer Black major league baseball stars have been associated with steroid abuse. For example, despite the disproportionate media attention devoted to alleged steroid abuse by home-run king Barry Bonds, the vast majority of steroid abusing (alleged or documented) players are either White or Latino.

Finally, with regard to the question of whether sport participation serves as a protective or risk factor in relation to male adolescent steroid usage we find mixed evidence. Specifically, our results show that sport participation served as a protective factor, but only for Black males. Sports active Black male adolescents reported lower rates of steroid use than Black males who were not involved in sports. In contrast, sports active White male adolescents reported higher rates of steroid use than White males who were not involved in sports. These differences may also be explained by the higher baseball participation rates among White males and their greater likelihood of having been associated with baseball steroid abuse noted above. However, these patterns need further study as they may reflect underlying race-ethnic differences in the potential for organized sport to operate as a protective factor against youth risky behaviors.

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Table 1.

Trends in Steroid Use among 8th and 10th Grade Males (All) Prior to, During, and Following the Steroids Era in Major League Baseball (1991-2007)

(N=212263)

Steroid Use	**Sport Status**	**Pre-Steroid Era** ***1991-1993***	**Steroid Era** ***1994-2003***	**Post-Steroid Era** ***2004-2007***	**Chi -square**
lifetime	Active in sports	**2.8%**	**3.4%**	**2.0%**	**276.071*** **
	Inactive in sports	2.1%	2.9%	1.7%	38.201***
	Chi-square	9.919***	20.695***	2.677*	
last 12 months	Active in sports	**1.8%**	**2.1%**	**1.8%**	**31.499*** **
	Inactive in sports	1.0%	1.6%	1.4%	12.625***
	Chi-square	18.100***	27.416***	8/063***	
last 30 days	Active in sports	**.9%**	**1.1%**	**1.1%**	**14.839*** **
	Inactive in sports	.6%	.9%	1.0%	6.499**
	Chi-square	5.465**	9.583***	1.195	**276.071*** **

Table 2.

Trends in Steroid Use among 8th and 10th Grade Black Males Prior to, During, and Following the Steroids Era in Major League Baseball (1991-2007)

(N=36528)

Steroid Use	**Sport Status**	**Pre-Steroid Era** ***1991-1993***	**Steroid Era** ***1994-2003***	**Post-Steroid Era** ***2004-2007***	**Chi-square**
lifetime	Active in sports	**2.0%**	**2.4%**	**1.8%**	**10.872*** **
	Inactive in sports	2.1%	2.8%	2.1%	1.899
	Chi-square	.064	1.542	.344	
last 12 months	Active in sports	**1.1%**	**1.4%**	**1.5%**	**3.175**
	Inactive in sports	1.5%	1.7%	1.9%	.495
	Chi-square	.629	1.477	1.058	
last 30 days	Active in sports	**.6%**	**.8%**	**.9%**	**2.819**
	Inactive in sports	.3%	1.2%	1.7%	5.625*
	Chi-square	.918	4.417**	4.219**	

Table 3.

Trends in Steroid Use among 8th and 10th Grade White Males Prior to, During, and Following the Steroids Era in Major League Baseball (1991-2007)

(N=175735)

Steroid Use	**Sport Status**	**Pre-Steroid Era** ***1991-1993***	**Steroid Era** ***1994-2003***	**Post-Steroid Era** ***2004-2007***	**Chi-square**
lifetime	Active in sports	**2.8%**	**3.6%**	**2.0%**	**207.630*** **
	Inactive in sports	1.8%	2.7%	1.7%	25.838***
	Chi-square	14.367***	27.459***	1.812*	
last 12 months	Active in sports	**1.8%**	**2.3%**	**1.9%**	**33.002*** **
	Inactive in sports	.7%	1.6%	1.3%	16.378***
	Chi-square	23.708***	34.365***	9.523***	
last 30 days	Active in sports	**.8%**	**1.2%**	**1.1%**	**22.288*** **
	Inactive in sports	.5%	.8%	.8%	3.573
	Chi-square	4.862**	20.038***	5.704**	