

Smokeless Tobacco in Sport and Use Among Adolescents



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Main Findings

- *Smokeless tobacco use substantially increases the risk of oral and pancreatic cancer, gum disease, nicotine addiction, and initiation of cigarette smoking among adolescents.*
- *Nearly 15% of U.S. high school males currently use smokeless tobacco, and use prevalence is higher among high school students who participate in organized sports than among non-athlete peers.*
- *There is little evidence that smokeless tobacco improves athletic performance, yet use among participants in certain sports and athletic events, such as ice hockey, baseball, wrestling, and rodeo, far exceed levels observed in the general population.*
- *Modeling of smokeless tobacco use by family, friends, respected coaches, and elite athletes is strongly associated with smokeless tobacco initiation among adolescent males.*
- *Competitive organized baseball, including professional leagues, exhibits exceptionally high levels of smokeless tobacco use among its players.*
- *On-camera use at the major league level is broadcast to millions of viewers: an implicit product endorsement to children and adolescents.*
- *An environmental context that embraces smokeless tobacco as normative within athletic culture stimulates greater smokeless tobacco initiation and continued use on the part of young male athletes.*

Smokeless tobacco, which includes both oral moist snuff and chewing tobacco, imbues substantial health risks, not limited to increased chances of oral and pancreatic cancer, gum disease, nicotine addiction, and, among adolescents, increased likelihood of smoking initiation. There is little evidence that use of smokeless tobacco enhances athletic performance; yet, sporting events and athletic participation are consistently identified as key contexts associated with smokeless tobacco use. The tobacco industry has long marketed smokeless tobacco products at sporting events and targeted elite athletes for product endorsements in order to integrate smokeless tobacco into the sporting culture. Young males, whether striving to gain the acceptance of admired peers or to emulate respected athletes and coaches, often engage in smokeless tobacco experimentation and continued use during sports participation or attendance at sporting events. In the United States, male high school athletes are significantly more likely to use smokeless tobacco than their

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non-athlete counterparts. The same holds true for female high school athletes, although smokeless tobacco use is much less common among females overall. In contrast, cigarette smoking is less prevalent among high school athletes than non-athletes. Baseball, in particular, is one of several sports, including rodeo, wrestling, ice hockey, and football, that are associated with high levels of smokeless tobacco use among its participants, extending across the high school, college, and professional ranks. Smokeless tobacco use is prohibited on the field of play in college baseball and in the minor leagues. Major League Baseball bars its players from carrying smokeless tobacco products in their uniforms but does not ban use during play, which results in the broadcast of implicit product endorsements to millions of viewers worldwide.

Smokeless Tobacco and Health Risks

The term smokeless tobacco includes oral tobacco products that are placed in the mouth and absorbed through the oral tissues, as well as powder tobacco mixtures that are inhaled and absorbed in the nose [1]. The predominant forms of smokeless tobacco used by U.S. adolescents and adults are oral moist snuff (known as dip) and chewing tobacco [2]. Oral snuff is a finely ground tobacco leaf, packaged either loose or in a tea-bag-like sachet. Snuff users place a small amount of oral snuff between the cheek and the gum. Chewing tobacco is a more coarsely shredded tobacco leaf. Tobacco chewers place a “chaw” of loose-leaf tobacco or a “plug” of compressed tobacco in the cheek. Oral snuff and chewing tobacco users generally spit out the tobacco juices and generated saliva, but sometimes such users swallow them. Many smokeless tobacco products contain much larger amounts of cancer-causing chemicals (nitrosamines) than those commonly found in cigarettes [3]. Manufacturers control the amount of free nicotine available for uptake into the body by controlling the acidity (pH) of their products, as nicotine is absorbed more readily under less acidic (more alkaline) conditions [4]. This product feature serves as part of a broader strategy to tailor products to specific groups of users [5]. For example, the low-pH (more acidic) Skoal Bandits product was introduced in the 1980s, allowing new users to initiate with a low-nicotine product and avoid the unpleasant side effects of nicotine toxicity (e.g., nausea, vomiting) [6-8]. Users commonly graduate to higher nicotine, more alkaline products that are highly addictive and difficult to quit [9].

The high prevalence of smokeless tobacco use among young males puts them at risk for serious adverse health effects. Smokeless tobacco use increases the likelihood of smoking onset in adolescent males [10-13] and is associated with an increased risk of oral [14], esophageal [14], and pancreatic cancer [15-18], nicotine dependence [19], and possibly cardiovascular disease [20,21]. Other negative health effects of smokeless tobacco use include gingival and periodontal disease (gum disease), dental caries (cavities), tooth staining, tooth wear (erosion), mouth sores, and salivary gland abnormalities [22-27]. In a national study of U.S. middle and high school students, oral lesions (mouth sores) were present in 27% of those adolescents who reported use of oral snuff or chewing tobacco at least once in the prior 30 days [28].

Dual use of smokeless tobacco along with other forms of tobacco, such as cigarettes, is associated with a heightened risk of adverse health effects, greater nicotine dependence, and reduced smoking cessation [29-31]. Adolescents dependent on nicotine are less likely

to successfully quit and are more likely to smoke as adults, thereby increasing associated mortality and costs [32-34]. Estimates of the percentage of high school males who used smokeless tobacco in the past 30 days and also smoked cigarettes are as high as 60% [31,35].

Smokeless Tobacco Use: Youth Prevalence and Trends

Although smoking among U.S. high school students has gradually declined over the past decade, use of oral moist snuff and chewing tobacco has not. Including males and females, youth smokeless tobacco use in the U.S. declined from 1995 to 1999, but has since remained relatively unchanged, increasing slightly from 7.8% (1999) to 8.8% (2013) [36]. In 2013, smokeless tobacco use continues to be sharply higher among high school males (14.7%) than females (2.9%) [37], and use prevalence rises steadily with grade in school: current use among males increases from 11.2% in the 9th grade to 16.6% in the 12th grade [37].

Smokeless Tobacco Use by Athletes

Among all U.S. adult men, in 2012-2013, 4.8% reported regular use of smokeless tobacco “every day” or “some days” [2]. However, smokeless tobacco use is dramatically higher among young athletes participating in certain sports. In a 2009 National Collegiate Athletic Association (NCAA) survey of substance use by college student-athletes, for example, prevalence of using smokeless tobacco at least once in the past year among men’s sports participants was 54.2% for ice hockey, 52.3% for baseball, 47.6% for wrestling, 41.0% for lacrosse, and 27.9% for football [38]. Smokeless tobacco was the second-most commonly used substance among college baseball athletes, after alcohol, with more than twice as many players having used smokeless tobacco (52.3%) than had used cigarettes (19.2%) or marijuana (21.5%) [38].

In the early 1990s, the NCAA and Minor League Baseball both instituted measures to ban the use of smokeless tobacco during competition [39]. Following these regulations, from 1998 to 2003, there was a gradual decline in use prevalence among minor league players [40]. However, the NCAA and minor league bans have been criticized for lax enforcement, and smokeless tobacco use on playing fields remains widespread [41,42].

In contrast to the decline in smokeless tobacco use observed among minor league players, use of smokeless tobacco in Major League Baseball (MLB), which does not prohibit use by players and coaches during competition, remained unchanged at 36% during the same time period [40]. Recent evidence suggests that the high prevalence of smokeless tobacco use persists among major league players today. This year, a new study reported that 37% of 159 surveyed MLB players and coaches were smokeless tobacco users [43], nearly identical to the prevalence estimates recorded a decade prior [40].

While chewing tobacco has been present in MLB for many decades, oral snuff became increasingly commonplace in the major leagues during the 1970s and 1980s [8,40]. At the time, the health risks of cigarette smoking were achieving broad public attention, and smokeless tobacco companies launched aggressive marketing campaigns to target

professional baseball athletes, including sample distribution in major league clubhouses [8,40]. As a result, professional baseball athletes have a lengthy history of unpaid, nationally broadcast smokeless tobacco endorsements via on-camera product use during widely broadcast games, such as the World Series [44,45].

Sports announcers have drawn attention to players' smokeless tobacco use, once, for example, relaying a story that a pitcher was told to improve his delivery to home plate by positioning his body "to show the catcher his Skoal" in his back pocket [45]. Major League Baseball barred its players from carrying tobacco products in their uniforms beginning with the 2012 season [46], but the league stopped short of an outright ban. Public health advocates have expressed outrage at what has been described as deliberate infiltration into professional baseball on the part of the smokeless tobacco industry and the co-opting of smokeless tobacco into the values and traditions of the sport for the promotion of a dangerous product [8].

Smokeless Tobacco and Athletic Performance

Nicotine raises resting heart rate and blood pressure but does not cause an increase in maximal oxygen uptake or cardiac output and may decrease muscular strength [47]. A clinical study of oral and other health effects of smokeless tobacco use among 1109 professional baseball players and coaches was completed during Major League Spring Training in 1988 [25,26,48]. Oral leukoplakia, a form of pre-cancerous mouth lesion, was detected in nearly half (46%) of current weekly smokeless tobacco users [25]. Moreover, in areas of the mouth adjacent to where players held the smokeless tobacco, there was significantly greater loss of the supporting tissues of the teeth (gums and bone) than in similar sites in non-users [26]. However, there was no discernible difference in the in-season, on-field performance between players who did or did not report smokeless tobacco use [49].

The World Anti-Doping Agency is currently monitoring nicotine as a doping product [50]. Even without evidence of enhanced performance, nicotine can still be named a forbidden substance for its health risks and for failure to respect the spirit of the sport [47].

Smokeless Tobacco and Role Modeling

Modeling of smokeless tobacco use by family, friends, and others is strongly associated with initiation and use intensity among high school males [51-53]. Acceptance into male-oriented social networks and emulation of respected male figures has been repeatedly described as central to the process of smokeless tobacco initiation for young males [54,55]. Adult men who use smokeless tobacco commonly report use while attending or participating in sporting events [54,56], and sporting events can be settings for initial smokeless tobacco experimentation [54]. In a study of male ice hockey players in Sweden, socialization related to sports participation was a major factor in the decision to use oral snuff [57]. Smokeless tobacco use by admired elite players and coaches normalized smokeless tobacco within the sporting environment, which then fostered initiation among younger players [57].

Tobacco companies have exploited peer influence and role modeling to sell smokeless

tobacco products. Tobacco advertising may particularly influence youth, who look to messages delivered through marketing and other media for examples and cues related to socially endorsed behavior and appearance [58,59]. In a 1989 review of advertising and promotion of smokeless tobacco products, Ernster cited instances of famous athletes endorsing the products and encouraging consumers to use them [60]. Smokeless tobacco logos appeared as promotional devices on baseball caps and other athletic paraphernalia [60].

Smokeless tobacco products continue to be heavily promoted in male-centric and sports-oriented magazines with substantial youth readership [61]. In 2014, ads for the Skoal brand of smokeless tobacco products returned to mainstream magazines after a 5-year hiatus, with ads featuring young men engaged in outdoor activities and peer camaraderie, rejoining the persistent magazine campaigns from the Grizzly brand that stress masculinity [62,63].

Smokeless Tobacco and High School Athletes

Professional and college athletes provide a powerful model for boys and young men to use smokeless tobacco by legitimizing chewing and dipping as an integral part of being a successful athlete, and the high levels of smokeless tobacco use observed in the college and professional ranks are mirrored among adolescent athletes. Adolescents who participate in high school sports are at greater risk of using smokeless tobacco. Pooling the results of six studies [64-69], Diehl and colleagues [70] reported that high school athletes were at 60% greater odds of using smokeless tobacco than were non-athletes. This association was found in all of these six studies; yet, the opposite association held for cigarette smoking: in each study, high school athletes were less likely than non-athletes to smoke cigarettes, despite the increased risk for using smokeless tobacco [64-69]. Overall, high school females were much less likely than their male counterparts to use smokeless tobacco, but female athletes used smokeless tobacco at higher levels than female non-athletes [67,71]. Smokeless tobacco use was strongly associated with particular sports and athletic activities. Davis and colleagues [65] reported levels of use from 22% to 28% among high school males who participated in a set of “medium intensity” sports that included baseball, football, wrestling, track, and rodeo. In a survey of high school male baseball athletes in California, 46% had ever tried smokeless tobacco, and 15% were defined as current users [52].

Higher levels of smokeless tobacco use were significantly associated with perceived use by baseball coaches, by teammates, and by other baseball athletes of similar age [52]. Taken together, an environmental context that embraces smokeless tobacco use as normative behavior within sporting culture stimulates greater smokeless tobacco initiation and continued use on the part of young male athletes.

References

1. National Cancer Institute & Centers for Disease Control and Prevention. Smokeless tobacco fact sheets. Proceedings of the International Conference on Smokeless Tobacco; 2002 Sep 22-25; Stockholm, Sweden.
2. Agaku IT, King BA, Husten CG, Bunnell R, Ambrose BK, Hu SS, Holder-Hayes E, Day HR; Centers for Disease Control and Prevention (CDC). Tobacco product use among adults--United States, 2012-2013. *MMWR Morb Mortal Wkly Rep.* 2014;63(25):542-7.
3. Hoffmann D, Djordjevic MV. Chemical composition and carcinogenicity of smokeless tobacco. *Adv Dent Res.* 1997;11(3):322-9.
4. Tomar SL, Henningfield JE. Review of the evidence that pH is a determinant of nicotine dosage from oral use of smokeless tobacco. *Tob Control.* 1997;6(3):219-25.
5. Alpert HR, Koh H, Connolly GN. Free nicotine content and strategic marketing of moist snuff tobacco products in the united states: 2000-2006. *Tob Control.* 2008;17(5):332-8.
6. Dougherty PN. Moving smokers to snuff. *New York Times.* January 13, 1984:4.
7. Connolly GN, Orleans CT, Kogan M. Use of smokeless tobacco in major-league baseball. *N Engl J Med.* 1988;318(19):1281-5.
8. Connolly GN, Orleans CT, Blum A. Snuffing tobacco out of sport. *Am J Public Health.* 1992;82(3):351-3.
9. Tomar SL, Giovino GA, Eriksen MP. Smokeless tobacco brand preference and brand switching among US adolescents and young adults. *Tob Control.* 1995;4(1):67-72.
10. Haddock CK, Weg MV, DeBon M, Klesges RC, Talcott GW, Lando H, Peterson A. Evidence that smokeless tobacco use is a gateway for smoking initiation in young adult males. *Prev Med.* 2001;32(3):262-7.
11. Forrester KK, Biglan A, Severson HH, Smolkowski K. Predictors of smoking onset over two years. *Nicotine Tob Res.* 2007;9(12):1259-67.
12. Severson HH, Forrester KK, Biglan A. Use of smokeless tobacco is a risk factor for cigarette smoking. *Nicotine Tob Res.* 2007;9(12):1331-7.
13. Walsh MM, Langer TJ, Kavanagh N, Mansell C, MacDougal W, Kavanagh C, Gansky SA. Smokeless tobacco cessation cluster randomized trial with rural high school males: intervention interaction with baseline smoking. *Nicotine Tob Res.* 2010;12(6):543-50.
14. International Agency for Research on Cancer. Smokeless Tobacco and Some Tobacco-Specific N-Nitrosamines. Lyon, France: World Health Organization International Agency for Research on Cancer. 2007.
15. Zheng W, McLaughlin JK, Gridley G, Bjelke E, Schuman LM, Silverman DT, Wacholder S, Co-Chien HT, Blot WJ, Fraumeni, JF, Jr. A cohort study of smoking, alcohol consumption, and dietary factors for pancreatic cancer (United States). *Cancer Causes and Control.* 1993;4(5):477-82.
16. Alguacil J, Silverman DT. Smokeless and other noncigarette tobacco use and pancreatic cancer: a case-control study based on direct interviews. *Cancer Epidemiol Biomarkers Prev.* 2004;13(1):55-8.
17. Boffetta P, Aagnes B, Weiderpass E, Andersen A. Smokeless tobacco use and risk of cancer of the pancreas and other organs. *Int J Cancer.* 2005;114(6):992-5.
18. Luo J, Ye W, Zendeheh K, Adami J, Adami HO, Boffetta P, Nyren O. Oral use of Swedish moist snuff (snus) and risk for cancer of the mouth, lung, and pancreas in male construction workers: a retrospective cohort study. *Lancet.* 2007;369(9578):2015-20.
19. Ebbert JO, Carr AB, Dale LC. Smokeless tobacco: an emerging addiction. *Med Clin North Am.* 20004;88(6):1593-605.
20. Hatsukami D, Slade J, Benowitz N, Giovino G, Gritz ER, Leischow S, Warner KE. Reducing tobacco harm: research challenges and issues. *Nicotine Tob Res.* 2002;4(Suppl 2):S89-101.
21. Hatsukami D, Lemmonds C, Tomar S. Smokeless tobacco use: harm reduction or induction approach? *Prev Med.* 2004;38(3):309-17.
22. Greer RO Jr, Poulson TC. Oral tissue alterations associated with the use of smokeless tobacco by teenagers. *Oral Surg.* 1983;56(3):275-84.
23. Poulson TC. A comparison of the use of smokeless tobacco in rural and urban teenagers. *CA Cancer J Clin.* 1984;34(5):248-61.
24. Offenbacher S, Weathers DR. Effects of smokeless tobacco on the periodontal mucosal and caries status of adolescent males. *J Oral Pathol.* 1985;14(2):169-81.
25. Ernster V, Grady D, Greene JC, Walsh M, Robertson P, Daniels TE, Benowitz N, Siegel D, Gerbert B, Hauck WW. Smokeless tobacco: prevalence and health effects among professional baseball players. *JAMA.* 1990;

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- 264(2):218-24.
26. Robertson PB, Walsh M, Greene J, Ernster V, Grady D, Hauck W. Periodontal effects associated with the use of smokeless tobacco. *J Periodontol.* 1990;61(7):438-43.
 27. Little SJ, Stevens VJ, LaChance PA, Severson HH, Bartley MH, Lichtenstein E, Leben JR. Smokeless tobacco habits and oral musosal lesions in dental patients. *J Public Health Dent.* 1992;52(5):269-76.
 28. Tomar SL, Winn DM, Swango PA, Giovino GA, Kleinman DV. Oral mucosal smokeless tobacco lesions among adolescents in the United States. *J Dent Res.* 1997;76(6):1277-86.
 29. Mumford E, Levy D, Gitchell J, Blackman K. Smokeless tobacco use 1992-2002: Trends and measurement in the current population survey –tobacco use supplements. *Tob Control.* 2006;15(3):166-71.
 30. Bombard J, Rock V, Pederson L Asman K. Monitoring polytobacco use among adolescents: do cigarette smokers use other forms of tobacco? *Nicotine Tob Res.* 2008;10(11):1581-9.
 31. Tomar SL, Alpert HR, Connolly GN. Patterns of dual use of cigarettes and smokeless tobacco among US males: Findings from national surveys. *Tob Control.* 2010;19(2):104-9.
 32. Horn K, Hernandez A, Dino G, Massey C, Kalsekar I. Adolescent nicotine dependence and smoking cessation outcomes. *Addict Behav.* 2003;28(4):769-76.
 33. Storr C. Characteristics associated with rapid transition to tobacco dependence in youth. *Nicotine Tob Res.* 2008;10(6):1099-104.
 34. DiFranza JR, Sweet M, Savageau J, Ursprung W. The assessment of tobacco dependence in young users of smokeless tobacco. *Tob Control.* 2011; 21(5): 471-76.
 35. Soldz S, Huysen D, Dorsey E. Characteristics of users of cigars, bidis, and kreteks and the relationship to cigarette use. *Prev Med.* 2003;37(3):250-8.
 36. Kann L, Kinchen S, Shanklin SL, Flint KH, Kawkins J, Harris WA, Lowry R, Olsen EO, McManus T, Chyen D, Whittle L, Taylor E, Demissie Z, Brener N, Thornton J, Moore J, Zaza S; Centers for Disease Control and Prevention (CDC). Youth risk behavior surveillance--United States, 2013. *MMWR Surveill Summ.* 2014;63 Suppl 4:1-168.
 37. Centers for Disease Control and Prevention (CDC). 1991-2013 High School Youth Risk Behavior Survey Data. Available at <http://nccd.cdc.gov/youthonline/>. Accessed: March 30, 2015.
 38. National Collegiate Athletic Association. National Study of Substance Use Trends Among NCAA College Student-Athletes. 2012. Available at: <http://www.ncaapublications.com/productdownloads/SAHS09.pdf>. Accessed: March 29, 2015.
 39. National Collegiate Athletic Association. Legislative Services Database - LSDBi. <https://web1.ncaa.org/LSDBi/exec/bylawSearch>. Accessed: March 29, 2015.
 40. Severson HH, Klein K, Lichtensein E, Kaufman N, Orleans CT. Smokeless tobacco use among professional baseball players: Survey results, 1998 to 2003. *Tob Control.* 2005;14(1):31-6.
 41. Livingstone S. Will Major League Baseball toss tobacco? *USA Today.* September 27, 2011.
 42. Abraham P. Players find tobacco habit hard to shake. *Boston Globe.* March 7, 2014.
 43. Conrad AK, Hutton SB, Munnely M, Bay RC. Screening for smokeless tobacco use and presence of oral lesions in major league baseball athletes. *J Calif Dent Assoc.* 2015;43(1):14-20.
 44. Jones RB. Use of smokeless tobacco in the 1986 world series. *N Engl J Med.* 1987;316(15):952.
 45. Jones RB. Use of smokeless tobacco in the world series, 1986 through 1993. *Am J Public Health.* 1995;85(1):117-8.
 46. Carlson D. MLB season opens with curbs on smokeless tobacco use. *Ethics & Religious Liberty Commission.* Available at <https://erlc.com/article/mlb-season-opens-with-curbs-on-smokeless-tobacco-use>. Accessed: April 2, 2015.
 47. Chagué F, Guenancia C, Gudjoncik A, Moreau D, Cottin Y, Zeller M. Smokeless tobacco, sport and the heart. *Arch Cardiovasc Dis.* 2015;108(1):75-83.
 48. Siegel D, Benowitz N, Ernster VL, Grady DG, Hauck WW. Smokeless tobacco, cardiovascular risk factors, and nicotine and cotinine levels in professional baseball players. *Am J Public Health.* 1992;82(3):417-21.
 49. Robertson PB, DeRouen TA, Ernster V, et al. Smokeless tobacco use: How it affects the performance of major league baseball players. *J Am Dent Assoc.* 1995;126(8):1115-21; discussion 1121-4.
 50. World Anti-Doping Agency. Monitoring Program. 2014. Available at: <https://www.wada-ama.org/en/resources/science-medicine/monitoring-program>. Accessed: March 27, 2015.
 51. Riley WT, Barenie JT, Mabe PA, Myers DR. The role of race and ethnic status on the psychosocial correlates of smokeless tobacco use in adolescent males. *J Adolesc Health.* 1991;12(1):15-21.
 52. Walsh MM, Ellison J, Hilton JF, Chesney M, Ernster VL. Spit (smokeless) tobacco use by high school baseball athletes in California. *Tob Control.* 2000;9 Suppl 2:II32-9.

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53. Gansky SA, Ellison JA, Kavanagh C, Isong U, Walsh MM. Patterns and correlates of spit tobacco use among high school males in rural California. *J Public Health Dent.* 2009;69(2):116-24.
54. Helme DW, Cohen EL, Parrish AJ. Health, masculinity and smokeless tobacco use among college-aged men. *Health Commun.* 2012;27(5):467-77.
55. Nemeth JM, Liu ST, Klein EG, Ferketich AK, Kwan MP, Wewers ME. Factors influencing smokeless tobacco use in rural Ohio Appalachia. *J Community Health.* 2012;37(6):1208-17.
56. Cohen-Smith D, Severson HH. A comparison of male and female smokeless tobacco use. *Nicotine Tob Res.* 1999;1(3):211-8.
57. Rolandsson M, Hallberg LR, Hugoson A. Influence of the ice-hockey environment on taking up snuff: An interview study among young males. *Acta Odontol Scand.* 2006;64(1):47-54.
58. Krugman DM, Quinn WH, Sung Y, Morrison M. Understanding the role of cigarette promotion and youth smoking in a changing marketing environment. *J Health Commun.* 2005;10(3):261-78.
59. Solomon MR, Polegato R, Zaichkowsky JL. Consumer behavior: buying, having, and being. Vol. 6. Upper Saddle River, NJ: Pearson Prentice Hall, 2009.
60. Ernster VL. Advertising and promotion of smokeless tobacco products. *NCI Monogr.* 1989;8:87-94.
61. Morrison MA, Krugman DM, Park P. Under the radar: Smokeless tobacco advertising in magazines with substantial youth readership. *Am J Public Health.* 2008;98(3):543-8.
62. Trinkets & Trash. Surveillance Update. April 2014. Available at: <http://www.trinketsandtrash.org/documents/TrinketsSurveillanceUpdate-April2014.pdf>. Accessed: March 30, 2015.
63. Campaign for Tobacco-Free Kids. Tobacco Unfiltered (blog). May 28, 2014. Available at: http://www.tobaccofreekids.org/tobacco_unfiltered/post/2014_05_28_smokeless. Accessed: March 30, 2015.
64. Rainey CJ, McKeown RE, Sargent RG, Valois RF. Patterns of tobacco and alcohol use among sedentary, exercising, nonathletic, and athletic youth. *J Sch Health.* 1996;66(1):27-32.
65. Davis TC, Arnold C, Nandy I, Bocchini JA, Gottlieb A, George RB, Berkel H. Tobacco use among male high school athletes. *J Adolesc Health.* 1997;21(2):97-101.
66. Baumert PW J, Henderson JM, Thompson NJ. Health risk behaviors of adolescent participants in organized sports. *J Adolesc Health.* 1998;22(6):460-5.
67. Pate RR, Trost SG, Levin S, Dowda M. Sports participation and health-related behaviors among US youth. *Arch Pediatr Adolesc Med.* 2000;154(9):904-11.
68. Sabo D, Miller KE, Melnick MJ, Farrell MP, Barnes GM. Athletic participation and the health risks of adolescent males: a national study. *Int J Mens Health.* 2002;1:173-93.
69. Castrucci BC, Gerlach KK, Kaufman NJ, Orleans CT. Tobacco use and cessation behavior among adolescents participating in organized sports. *Am J Health Behav.* 2004;28(1):63-71.
70. Diehl K, Thiel A, Zipfel S, Mayer J, Litaker DG, Schneider S. How healthy is the behavior of young athletes? A systematic literature review and meta-analyses. *J Sports Sci Med.* 2012;11(2):201-20.
71. Melnick MJ, Miller KE, Sabo DF, Farrell MP, Barnes GM. Tobacco use among high school athletes and nonathletes: Results of the 1997 youth risk behavior survey. *Adolescence.* 2001;36(144):727-47.