

Characteristics of School Sanctioned Sports: Participation and Attrition in Wisconsin Public High Schools

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Abstract

Current models of obesity treatment and prevention are limited in both efficacy and effectiveness, and new public health approaches are needed. This research describes patterns of high school interscholastic sports participation, specifically participation prevalence in 9th grade and risk of attrition from 9th to 12th grade by sport, gender, and school size characteristics. Although much research focuses on the benefits of physical activity and sports involvement, little attention has been given to the trends of participation through high school. In recent years the public health benefits of reducing sedentary lifestyles and promoting physical activity has become increasingly apparent. Furthermore, research suggests interscholastic sports may convey other life benefits such as gains in academic achievement, motivation and life goals, psychosocial development, as well as a protective factor in health and risk taking behavior. Still, many young people do not reach their recommended daily level of physical activity, and physical activity declines with increasing age among adolescents and young adults. Increasing access to daily organized after-school programs is one way to engage youths in physical activity, and understanding of trends in participation is one promising approach to measure access to physical activities, and can be widely applied. The objective of this study is to examine participation in the interscholastic sports programs of Wisconsin public high schools. Schools (n=412) are matched by WIAA and DPI enrollment data, and cohorts are followed from 9th grade (2000-2001) to 12th grade (2003-2004). Results indicate a higher prevalence of participation is seen in small schools than large schools for both genders, and high risks of attrition are observed in many sports. Among shared gender sports, attrition from freshman to senior year is lower in small schools (18% in boys and 39% in girls) as compared to large schools (31% in boys and 49% in girls). The interaction between school size and participation from 9th to 12th grade indicates the greatest gender disparity is seen among small schools, where change in prevalence of female participation from 9th to 12th grade indicates females have twice the risk of attrition as male classmates, despite similar gender specific participation prevalence in the 9th grade. Examining rates of participation through high school may prove a useful surveillance mechanism for policymakers and advocates of Title IX, and may also serve as a proxy for larger patterns of physical activity among high school students. Further, the cost associated with interscholastic sports is an investment that deserves to be monitored.

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All data used in these analyses are publicly available data and the unit of measurement is the school. This data meets exemption criteria of the University of Wisconsin Institutional Review Board.

Introduction

Today adolescent obesity is a problem of epidemic proportions, and public health workers, legislators and local parent teacher organizations often hypothesize what changes need to occur to address this problem. This research addresses not only one potential contribution to adolescent obesity and quality of life; but also identifies a surveillance mechanism that can be widely applied to monitor physical activity throughout high school.

The objective of this research is to prospectively follow trends in participation among Wisconsin public high schools from the freshman class (2000-2001 academic school year) to the senior class three years later (2003-2004 academic school year). As evidenced in the review of existing literature, there is intense interest in the benefits that are associated with physical activity during adolescence. However, no research was located which takes a public health perspective regarding rates of participation in interscholastic sports.

With an awareness of the psychological and physical health benefits associated with sports involvement, there remains a need to identify how sports participation changes during high school. High schools who wish to fully encourage physical activity of the student body should consider the role of interscholastic sports as well as alternatives (such as intramural sports) as a starting point to better promote youth physical activity.

Examining interscholastic sports participation through high school may be useful for schools as a way to measure progress and success. Measuring participation prevalence and risk of attrition over time may further serve as a proxy for future patterns of physical activity, and is an investment that deserves to be monitored.

A REVIEW OF THE LITATUURE
REGARDING
INTERSCHOLASTIC SPORTS
PARTICIPATION IN HIGH SCHOOL

- I) Overview**
- II) Brief History of Interscholastic Sports in High School**
- III) Attributes of Sports Participation**
 - a. Academic Achievement**
 - b. Motivation and Life Goals**
 - c. Psychosocial Implications**
 - d. Contributions of Sport to Risk Taking and Health Factors**
- IV) Economic Considerations**
- V) Policy Considerations**
- VI) Conclusion**

I) Overview

This review of the literature serves two purposes: first to demonstrate that although there is intense interest in sports involvement, no studies on the trends of sports participation through high school have been identified. The second goal is to assess the relevant literature, which shows there is intense interest in the attributes of sports involvement, which include other benefits apart from encouraging lifelong physical activity.

In recent years the public health benefits of reducing sedentary lifestyles and promoting physical activity have become increasingly apparent (1). Still, many young people do not get the recommended levels of physical activity, and physical activity declines with increasing age among adolescents (2, 3). Increasing access to daily organized after-school programs is one way to engage youths in physical activity (3). Because school sanctioned sports teams fall into this category, it is feasible to better promote and extend opportunities to all students, as the benefits are apparent. Access to opportunities for physical activity is associated with increased physical activity (3). Schools offer the opportunity to reach a large number of young people during a significant part of their day, and throughout much of the year (3). Furthermore, schools present opportunities for concepts of energy balance to be taught and put into practice (3). In addition to providing educational messages about physical activity, evidence suggests schools can better reinforce and support these concepts throughout the school environment by increasing the options for participation in interscholastic sports.

Practices formed early in adolescent development can be carried on into adulthood. Physical activity, namely sports involvement, is no exception. In general, the earlier children are introduced to activities the more likely they are to maintain the activity later in life. As will be seen, the reviewed literature indicates that not only is youth sports involvement influential in promoting adult physical activity, but also that active engagement in physical activity during youth is beneficial to well being and success. At a cost of one to three percent of an overall school budget, high school sports programs are an exceptional bargain when matched against the overall school district's education budget (4). As a part of the educational experience, interscholastic sports have been shown to provide lasting benefits for the participants in addition to the known physical health benefit. Interscholastic sports teach time management, commitment, teamwork, and how to deal with success and failure. These are valuable life lessons that may prove indispensable later in life.

To fully appreciate the potential for developing extracurricular programs, it is important to understand the evolution of America's public school system. Just as physical education used to be discouraged, today physical education has become integral to many high school curriculums. Even still, its effectiveness remains in doubt. It has been suggested that although a majority of students are enrolled in physical education classes, the classes appear to have little effect on the current physical fitness levels of children, and furthermore, have little impact on the developing life long physical activity skills (5).

The face of the educational experience has undergone drastic changes since its debut in America as the one room schoolhouse. As the goal of education has become a cornerstone of our democratic society, educators, researchers, and policymakers must re-evaluate the role of education in promoting a healthy and happy society. The role of interscholastic sports will likely play a role for the current and future generations. Historically, sports have been measured by the overall number of teams and participants (by sport), the quality of athletic facilities, and the skills and talents of the individuals (6). Changing the way participation is monitored by examining how involvement in interscholastic high school sports changes from freshman to senior year, along with a current understanding of relevant research, may provide a novel assessment option to monitor the success high school athletics programs may have in influencing healthy lifestyles. Hallmarks of future research will explore the relationships among participant needs and interests, the impact of participation with individual attributes, and establish standards for facilities and programs.

II) The Rise of Education and Interscholastic Sports in High School

The public school system in America is continually evolving and is one of our democracy's most dynamic institutions (7). From the inception of the first public school, the universal education offered by in our nation's public schools has been a cornerstone of our democracy, and offers a glimpse into the future of our national identity (7).

The first public schools emphasized the "three R's" at the rudimentary level: reading, writing, and arithmetics in one-room schoolhouses. At this time the school year was

short and only lasted a few months. Many children were laborers for their farming parents, and the duties of the farm came first. This was reflected in the simplicity of early school design, expressing the frugality of a largely rural, agricultural economy (7). Rural communities had few resources to direct toward education, and there was a lack of commercially available products for schools. Even so, the community at large realized the benefits of education. In addition to the duties of the farm, families and communities valued the school so much that they often went to great lengths to supply school teachers by providing them free housing, donating firewood in the winter, and maintaining the general upkeep of the schoolhouse.

Since the days of the one room schoolhouse, the American school has changed drastically. Today large systems of education govern schools. Teachers must have a college degree and specialized training. The student body is much larger and diverse. The curriculum is also more diverse. Today's curriculums are sophisticated, and course selections range from automotive repair to anthropology, from statistics to sociology, and from graphic design to geology.

As schools have become more diverse in their curriculum offerings, so have the extracurricular offerings that a student can choose. The foundations of extracurricular offerings began in the early part of the 20th century when many schools had difficulty retaining students, and incorporating leisure activities enabled educators to retain more students (8). By the 1920s, many schools began merging outside clubs into regular programs, and students were encouraged to participate in a wide variety of student

activities (9). Athletics and interscholastic sports in particular became established in schools throughout the nation, despite periodic dissent among educators, community leaders, and policymakers who believe the sole duty of the school should be to educate.

The expansion of sports continues today. Title IX, which mandates schools provide equal access to men's and women's sports, has opened the door for women's sports. In Wisconsin, the state high school athletic association, WIAA, governs the play of 24 high school sports offered to male and female students throughout the state. The high visibility of interscholastic sports has been considered a valuable bridge between the school and the community whose taxes finance the athletic department and the overall educational environment (10). For this reason, a myriad of benefits of interscholastic sports and consequences of excessive competition have been studied since the 1960s.

III) Attributes of Sports Participation

Today interscholastic sports are largely regarded as a part of a high school's total educational experience. During the 2003-2004 academic year, over 6.9 million high school students participated in interscholastic sports (11). Compared to people not engaging in high school sports, people who have such acquired experience are more likely to continue the activity through life (12). This basic orientation toward experience is established early in life (13). The relationship between interscholastic high school sports participation and involvement in sports later in life is arguably a strong predictor of adult sport involvement (14). This research controlled for social background factors and concludes that the effects of high school involvement persist long after high school for

both genders (14). Benefits of high school sports extended to respondents aged 40 to 59, approximately 22 to 42 years beyond their high school years (14). This suggests children who adopt rewarding activity patterns as part of their lifestyle will tend to retain that orientation through adolescence and adulthood. However, the failure to establish positive patterns of active interest in childhood and youth may result in significant gaps, which persist throughout life. This research indicates that childhood participation, if carried through high school, can be a significant predictor of adult active physical participation in similar activities.

Further, the role of high school student athletes has generally been viewed as one of value to the students in terms of their academic, social, and physical growth (15). Developing skills in one or several sports began through involvement in community recreational sports at a young age. The focus was about participation, learning, and enjoying the game. In its simplest form, sports are activities that make everyday life more meaningful (16). However, enjoyment of an activity seems to depend on whether its structure allows a person to match one's skills with the demands of participation. Many studies have examined the aspects of physical activity in the educational setting in an attempt to identify benefits and drawbacks of including such programs in the educational experience. In addition to the conferred health benefits of physical activity and playing sports, many studies focus on the roles and attributes of interscholastic sports in relation to:

- *academic achievement*
- *motivation and goal orientation*

- *psychosocial implications*
- *sports' contribution to risk taking and health factors*
- *policy considerations*
- *economic considerations*

Many of these studies compare athletes to non athletes, but no studies were identified which followed a cohort of school grades through four years. The following review of the literature not only reflects the intense interest in the role of physical activity in the educational environment, it seems to point to a variety of intrinsic and extrinsic benefits that are derived from sports competition.

a) Academic Achievement

The relationship between physical activity and academic achievement has been the subject of research and speculation for years. Those who examine the influence of participation on school performance reach a wide range of conclusions. Those opposed to interscholastic sports assert that sports are an “energy drain,” such that sports activity detracts from the academic pursuits (17). Some even argue it is poor economics; a study in England following a cohort of 232 boys and girls from 8th to 11th grade found no significant correlation between minutes of sports involvement and exercise (18). Nevertheless, the opponents are severely outnumbered by the majority of related research. One area of interest among researchers is the benefit of sports on academic achievement.

Grades, grade point averages, and graduation rates of athletes have been compared with non athletes. Findings suggest high school athletes perform as well or better than non participating peers (19). However, a study on New York school children (n=838) indicated no association between grade point, general academic performance and sports participation (20). Other findings report female athletes fare better academically than female non athletes on average, though findings also indicate that Caucasian and Hispanic female athletes also had similar, elevated educational gains compared to African American female athletes (21). Athletes and non athletes in the Canadian school system showed that golf, tennis, and hockey participation are associated with higher English grades but not Mathematics (22). This remained significant for all high school sports when controlling for sex, father's education, mother's education, and community size. Other high school sports such as basketball, volleyball and soccer did not show this relationship. Among Hong Kong youths (n=4690) who completed a sports participation questionnaire and rated their own academic performance, students with high self ratings indicated a significantly higher frequency and extent of participation than students with less satisfactory self reported performance (23). However, the researchers note the ANOVA analyses, emphasizing that sports participation cannot be considered a determinant of academic success among males, since the highest levels of male participation self reported low academic performance. In Japan, the 'sport test' has been annually conducted in Japanese schools for over 35 years. The association between school physical education and the outcome of the trends over time in the mean score for athletic ability and physical fitness has been consistent (24). In summary, the published literature indicates that sports do not generally adversely affect the ability of students to

participate in sports, and that other countries have made whole population gains over time through promoting physical activity.

Through the years, a number of survey instruments have been used to assess American student involvement in physical activity and academic performance indicators. Surveys of educators and students indicate that perceived benefits are consistent with measured benefits regarding sports participation through physical education, intramurals, and interscholastic competition. Specifically focusing on interscholastic competition, there are a number of survey instruments that indicate a positive influence of structured sports participation on academic performance (4):

- In a survey of 4,800 high school students in March 1995, the Minnesota State High School League found that 91 percent who participate in school activities tend to be school leaders and role models; 92 percent said that participation in school activities provides an opportunity not found in a regular classroom setting to develop self-discipline (4).
- A 1991 Hardiness Institute study showed by a 2 to 1 ratio, boys who participate in sports do better in school, do not drop out and have a better chance to graduate from college (25). The ratio for girls who participate in sports who meet at least one measure of success is three to one. The research further showed that sports participants take more honors or advanced learning classes.
- In 1985 a survey of high school principals in all 50 states showed that 95 percent of principals agree that participation in activities teaches valuable lessons to students which cannot be learned in a regular class routine; 99 percent agree that

- participation in activities promotes citizenship; 95 percent agree that activity programs contribute to the development of "school spirit" among the student body; 76 percent believe the demand made on students' time by activities is not excessive; and 72 percent said there is strong support for school activity programs from parents and the community at large (4).
- Information obtained from a 1997 study revealed student participants in Jefferson County, Missouri high schools had an overall grade point average of 3.093 on a 4.0 scale, while the grade point average for non participants was 2.444.
 - A 1992 study by the Colorado Department of Education revealed that Colorado high school students who participate in some form of interscholastic activity have higher grade point averages and better attendance than students who do not participate (26).
 - o Of the students surveyed, the average participant's grade point average was 2.96 (on a 4.0 scale), compared to 2.35 for the non participant.
 - o A participant missed school an average of 3.59 days a year, while a non participant missed 5.92 days.
 - A statewide study by the North Carolina High School Athletic Association found large differences among 12th grade students regarding interscholastic sports and academic performance for the 1994-95 academic year (4). Student records were assessed for five indicators, and athletes were defined as students who participate in any high school sport over the course of high school. The indicators include grade point average, attendance rate, discipline referrals and dropout rate. No confidence intervals are reported.

<u>Success Measure</u>	<u>Athletes</u>	<u>Non-athletes</u>
Grade point average	2.86	1.96
Average number of absences (per 180-day school year)	6.52 days	12.57 days
Discipline referrals	30.51%	40.29%

- Findings from the National Center for Education Statistics, *Extracurricular Participation and Student Engagement*, June 1995, revealed that during the first semester of their senior year, participants reported better attendance than their non-participating classmates (4). Athletes reported higher rates of zero unexcused absences (50% among athletes; 33% among non athletes) and fewer athletes had skipped a class. Students who participate in sports were three times as likely to perform in the top quartile on a composite math and reading assessment compared with non participants. Athletes were also more likely than non participating peers to aspire to higher education; two-thirds of athletes expected to complete at least a bachelor's degree while about half of non athletes expected to do so.
- High school students who compete in sports programs in New Mexico had a 2.80 grade-point average, compared to 2.00 for non-participants, according to a 1992 survey by the New Mexico Activities Association (4). The survey also indicated that more than 60 percent of the state's principals believe that GPAs of at-risk students improved by being active in interscholastic activities.

Despite the convictions of many in opposition to school sanctioned sports activities, a body of literature of research in America and abroad, as well as a number of surveys and

assessments done by state and local agencies, education advocates and physical activity associations seem to indicate sports involvement will not be a detriment to academic success. Although there is no determination of whether sports involvement is a causal factor, or if students who are involved in sports are different from their non participating classmates, intense support for sports among educators and evidence presented by state education and sports associations is reason to believe that sports involvement adds a motivating factor for many students to achieve in school.

b) Motivation and Life Goals

Like academic achievement, examination of the literature relating sports involvement to motivation and life goals has produced the spectrum of conclusions. Sports have become associated with youth social structure, personal identity, and achievement. Both the good and bad aspects of society are reflected in youth sports culture (27). Yet in general, athletes seem to have clearer and higher achieving expectations of education and success than non athletes. However, it is unclear to what extent this fluctuates by socioeconomic, demographic, and racial status. But, regardless of individual status, goal setting has been shown to be most successful if realistic goals are sought.

Post high school expectations and interscholastic sports participation (or lack thereof) was studied among 785 male seniors from 6 urban Pennsylvania high schools (28). Social status, academic performance and parental educational encouragement were three confounding variables this study controlled for. A strong positive relationship was observed between educational expectations and athletic participation. Interestingly, an

interactive relationship was seen, specifically that the positive association is strongest for those respondents least disposed toward a college education and weak for respondents most positively disposed toward a college education. However, the study fails to account for other career goals that may be preferred by urban students.

The American College Testing Service tested the relative predictive power of four factors of success (4). Success was defined as self satisfaction and participation in a variety of activities two years after college. Of the four predictors (achievement in high school [sports] activities, high grades in high school, high grades in college, high ACT scores), achievement school activities, including interscholastic sports, proved to be the best predictor of success. Although the benefit of high school sports might not be immediate, stressing inclusion and realistic expectations may help maintain participation through high school and later in life.

Goal setting is one of the most powerful motivational techniques for enhancing performance (29). A goal is defined as the object, aim, endpoint of an action, or what an individual describes as an accomplishment being sought. In this study involving high school students from 15 schools, 346 students were randomly assigned to goal setting groups. Study groups ranged from those having no goals to those with unattainable goals. The middle group with realistic yet challenging expectations showed the greatest likelihood to achieve the set goal. This study has important implications for sports, namely that participating involves collective goal setting and working towards achieving the end. Although the goal may not always be met, this demonstrates that learning an

“untaught” skill may be useful throughout the lifetime. The researchers emphasized that motivation and goal attainment be focused on realistic expectations.

In summary, this subset of literature demands more study on topics such as how competition level affects goals as well as affinity toward sports participation. Available research does suggest some benefit in goal attainment might be gained through sports participation, but the research does not account for duration of play, level of knowledge, or type of sport. An explanation for any difference among athletes and non athletes, especially perceived benefits, may not come from sports itself, but from eligibility standards. Many schools impose academic achievement standards. If the minimum standards are not met, the student may not be able to participate in athletics. Time management may also be a result of just having something to plan around. Practices, games, and other responsibilities mean high school athletes must manage their time effectively. However, it is reasonable to believe that success cannot occur passively. Research suggests that extending opportunities to more participants should consider the ways participant expectations vary based upon skill and experience. One potential consequence of not considering a participant’s ability may be that students who are forced to participate in highly competitive sports are at higher risk for depression and anxiety. Although some studies examine the psychosocial effect of sport participation, it is unclear how athletes and non athletes differ.

c) Psychosocial Implications

The caveat to this body of literature is that psychosocial implications are difficult to assess, making causal inferences difficult. The primary reason is that the types of personalities seeking sports involvement are likely different from personalities that do not actively seek such involvement. People who enjoy socialization, an active process of learning and social development that occurs through interactions with others, are more likely to be involved in team sports (17). The process of becoming an athlete involves introduction, involvement, and developing commitment (17). These multiple components make the decision to play sports dependant on individual ideas about sports' connection to other interests and goals; desires to develop and display competence; social and material support; memories of past experiences in sports; general cultural images and messages about sports (17).

The CDC Youth Risk Behavior Survey was used to examine the subjective perspective between perceived life satisfaction and physical activity behaviors in a statewide sample of 4,758 adolescents in South Carolina (30). Significant relationships were established between dissatisfaction with life and self reported not playing on school sports teams in white females (Odds Ratio 1.61; $p < .0001$), white males (Odds Ratio 1.36; $p < .05$), and black males (Odds Ratio 1.40; $p < .005$). It appears that playing on a sport team may be protective for improved quality of life, and researchers report perhaps playing on sports teams enhances school connectedness, social support and bonding among friends and teammates.

Longitudinal data from a nationally representative sample of 10th grades from the Educational Longitudinal Study (1988) were used to assess the effect of athletic participation on student outcomes after controlling for student background and 8th grade measures of the dependant variables (31). Analysis shows positive effects of participation on self concept, locus of control, educational aspirations and a negative effect on discipline problems. However, analysis also points to uneven distribution across gender and socioeconomic groups: males, students from higher socioeconomic levels, students attending private and smaller schools, and those with previous experience in school sport teams were more engaged in high school competitive sports.

Cognitive affective sources of sport enjoyment were examined among 215 male high school freshmen (32). A survey was completed on several sport specific measures, and found that sources of sport enjoyment included task orientation, perceived competence, learned helpless affect, and years of participation in organized sports, and ego orientation. Stepwise regression found that development of sport competence accounts for the greatest amount of variance in enjoyment. The results suggest that task orientation, with regard to self referenced standards of performance, is instrumental in promoting enjoyment among adolescent sports participants. The researchers conclude that although directional causality is limited, the results suggest that competence is central to the manifestation of sport enjoyment, and competence through task achievement orientation toward the self lends itself to enjoyment in sport participation.

A random survey to evaluate the relationship between athletic participation and leadership skills among public high school students (n=60) found significantly higher leadership abilities among athletes as compared to non athletes, with no gender interaction (33). Leadership is defined as the capacity to guide others in the achievement of a common goal. Assessed leadership qualities include decisiveness, determination, interpersonal and organizational aptitude, loyalty, self efficacy, and self discipline. This research shows leadership development is important for society, and students involved in interscholastic sports are exposed to leadership role models (e.g. coaches) and are also required to exercise some degree of leadership with peers (e.g. team captains). Therefore interscholastic sports can play a positive role in the socialization process.

A study on the relationship between physical activity, self image and problem behavior found that physical exercise was significantly related to scores for physical and psychological well being (34). This study was conducted in a large representative sample of over 1000 German high school students through a comprehensive questionnaire. Adolescents who engaged regularly in physical activity were characterized by lower anxiety and depression scores as well as displayed higher ambition and social aptitude. There was also a strong association reported between participation in sports and the personality types that tend to be resistant to drug and alcohol addiction.

Although this has yet to be demonstrated in adolescents, physical activity has been shown to be an effective treatment for adult depression. An efficacy and dose response study of 80 adults (of 1664 prescreened individuals) by the Cooper Institute found that increased

total expenditure improved depression (35). Study findings indicate that increased energy expenditure improved the depressive state. The highest dose (17.5 kcal/kg/week; defined by American College of Sports Medicine as a “Public Health Dose”) yielded the greatest response in minimizing depression over the 12 week intervention. This was statistically significant compared to low dose energy expenditure (7.0 kcal/kg/week) and the placebo group (flexibility exercises only). Furthermore, the response and remission rates of depression in the highest energy expenditure group are comparable to other depression treatments such as medication or cognitive behavioral therapy. Such findings support the idea that sports, as a source of physical activity, has potential benefits for adults. By fostering and maintaining an interest in sports involvement during adolescence, as individuals grow they may be able prevent later co morbid conditions such as depression.

Even so, it seems that the ways in which adolescents are exposed to sports plays an important role in later attitudes of sports involvement. Another study focuses on social anxiety and sports involvement (36). Undergraduate students (n=180) completed a questionnaire on athletics and physical activity. The performance demands of sport and potential social evaluative nature of competition make it likely that social anxiety would generalize to this situation. Preliminary results indicate that fear of negative evaluation and social anxiety is related to social evaluative fears in sporting for women. Findings further indicate that familial pressure to compete during high school is associated with higher fear of negative evaluation among men. Finally, findings indicate social anxiety does not differ by competition level, but that anxiety is more related with individual

rather than team sports. Avoidance of physical activity would thereby create a negative cycle wherein the socially anxious person avoids athletic situations, leading to diminished physical capacities and decreased skills that would, in turn, diminish future performances and amplify fears of negative evaluation by others. Such avoidance behavior may deter individuals from gaining the psychological benefits of lowered distress and depression that has been shown to occur through sports involvement.

It has been suggested that underlying societal factors also contribute to negative reasons why individuals may seek out sports participation. Important implications with regard to the behavior of young athletes have been revealed (37). Young athletes may engage in excessive competition and unsportsmanlike conduct because: young athletes observe their professional sport role models engaged in increasingly unsportsmanlike behavior; a greater number of young athletes are participating for extrinsic reasons such as social status and high status career; a philosophy of “survival of the fittest” has been largely adopted by sports organizers, coaches, and parents; and the current rates of athlete deselection are considerable at the competitive youth level.

Among highly competitive sports, one common negative socialization effect that many athletes must confront is violence. Violence in sports is an important factor in student motivation to participate (38). Although many players do not feel comfortable with the amount of violence in their sports, they have generally come to accept it. A voluntary questionnaire was mailed to 325 high school athletic directors in North Carolina, and a response rate was 46% (n = 148). Among basketball, football and soccer the frequency

of very serious and somewhat serious responses of verbal intimidation, physical intimidation, and physical violence were reported. Among a 10 item questionnaire, coaching was the only consistent significant response. The analyses of responses show that opponent coaches who encourage verbal and physical intimidation were consistently and significantly related to verbal intimidation, physical intimidation, and physical violence using forward stepwise regression. This was seen individually for basketball, football and soccer ($p < 0.01$).

A case study of high school student athletes indicated that excessive competition in sports can negatively impact self concept, self esteem, physical acceptance, and self efficacy, thereby contributing to an overall feeling of inadequacy, helplessness, hopelessness, and ultimately leading to depression and chronic fatigue (39). Success in sports without a great deal of effort early on can be a fundamental aspect in developing identity as long as it is reinforced by significant others, notably parents, coaches, and later, peers. If this success diminishes over time, diminished positive reinforcement can follow. A disenfranchised feeling may be compounded through pressure to excel from multiple sources, and once happy participants may begin to discontinue sports involvement.

Furthermore, the pressure of competing has been shown to contribute to 'burnout' among elite adolescent athletes. Burnout was most likely when high performance sports were organized so that athletes had little control over their lives and when involvement was perceived to interfere with accomplishing important developmental tasks (17). Excessive competition may likely drive students away from competition, depriving high school

students of accessing instrumental outlets for their skills (16). In summary, if playing a sport constricts or limits a person's life, expect negative socialization effects; if playing sports expands or diversifies a person's life, expect positive socialization effects (17).

d) Contributions of Sport to Risk Taking and Health Factors

Risk taking has been studied as it contributes to sports involvement. One study examined whether participation in school team sports, exclusively or in combination with other extracurricular activities, is associated with higher levels of psychological functioning and healthy behavior (40). A voluntary survey performed by 9th grade public school students (n=50,168) found that students involved in sports alone or in combination with other activities, had significantly higher odds than the other non participating group for exercise, milk consumption, and healthy self-image as well as significantly lower odds for emotional distress, suicidal behavior, family substance abuse, and physical and sexual abuse victimization. Participating students also had significantly higher odds for doing homework, and lower odds for alcohol and marijuana use, and vandalism.

However, performance enhancing drug use among elite high school athletes is on the rise. A survey by the National Institute on Drug abuse reported in a 2003 survey that 3.5% of high school seniors reported to using steroids at least once (41). The use of performance enhancing drugs is growing at an alarming rate: this is a 67% increase from the 1991 survey and a 17% increase from a 1999 survey. Surprisingly, some schools that test for other illicit drugs do not test for steroids.

A cross sectional study using the 1999 Youth Risk Behavior Survey found that nationwide, 41.9% of students were both physically active and a participant on a sports team; 22.1% were physical active but not on a sports team; 12.6% were physically non active sports team members, and 22.3% were physically non active and not sports team members (42). Furthermore, assessment of health risk behaviors found a number of significant relationships that indicate a benefit of being a physically active female. Active team female students had a lower prevalence for ever had sexual intercourse, had 4 or more sexual partners during lifetime, and had 4 or more sex partners in the last 3 months, a lower prevalence of ever having been pregnant (although this was not statistically significant from non active team female students). The active team females did not differ in terms of cigarette use and current marijuana use. Further, contrary to other studies, active team male students were not more likely than their active non team and non active peers to have used alcohol, to have ever had sex, or to have initiated sexual intercourse at an early age. They were also no less likely to have used cigarettes or marijuana. However, categorizing by both physical activity and sports participation gives fewer students to each category, which may have led to fewer statistically significant findings. Nevertheless, this study demonstrates that sports involvement does not necessarily mean being physically active, and sports involvement itself does not mean high amounts of physical activity. Further, only the active females derive some benefit beyond the known biological health benefits of physical activity.

Another study supports the finding that encouraging female sports involvement can have lasting effects on their psychological well being, personal health as well as economic

benefits. Last year one million teenage girls experienced unintended pregnancies in the United States, at a taxpayer cost of \$7 to \$15 billion annually (43). Also, nearly 4 million new cases of adolescent STDs occur annually, costing billions more (43, 44). A study on gender and racial/ethnic differences in predicting sexual risk among sports participants and exercisers found both forms of physical activity are a buffer for sexual risk in girls (43). In contrast, strenuous exercise is associated with increased odds of sexual risk for boys, but sexual risk taking was higher among black male adolescents and lower among white male adolescents.

Eating disorders are another common issue among adolescent males and females, and involvement in sports has shown unclear benefits. Competitive sports participation in high school was associated with fewer mental health problems, eating and dietary problems, and total risks as compared to recreational athletes (45). Further, participating in athletics at an elite level serves as a protective factor most notably for eating disordered eating among females. Male athletes and non athletes do not show such an association. Another study addresses the female athlete triad: a syndrome of three interrelated components: disordered eating, amenorrhea, and osteoporosis (46). Relating athletic participation to the female athlete triad found that a higher percentage of non athletes were at higher risk for the triad (69.2%) than athletes (60.4%; $p < 0.05$). However, a higher percentage of athletes reported fractures as compared to non athletes ($p < 0.05$).

Another study on eating disorders and personality characteristics among high school athletes and non athletes found no difference between disordered eating and attitudes than non participating peers (47). However, perfectionist tendencies were higher among athletes and may put them at increased risk. Even so, athletes were found to have a more positive outlook on life as compared to non athletes.

Despite the harmful tendencies that could be present among athletes, sports teams are effective natural vehicles for gender specific peer led curricula to promote healthy lifestyles (48). A prospective controlled trial found that among female athletes (n = 928) receiving a 8 week educational intervention, use of diet pills, less riding with and alcohol consuming driver, more seat belt use, and less new sexual activity was significantly lowered ($p < 0.05$) after controlling for mood, refusal skills, belief in the media, and perceptions of closest friends' body shaping drug use.

Finally, sports can be used as a means to promote community ideals; an example of this is the success of the "Sport for Peace" curriculum. This program was instituted by 10 physical education teachers in six urban schools (49). According to testimonials of students, teachers and parents, the curriculum was successful at creating a place where high and low skilled males and females would actively participate in physical activity, partly by offering safe places in which students can affiliate with others. Tenants of the curriculum are that individual emotions will be protected and that a discourse of affiliation will be encouraged to promote inclusion. These qualities are noted in

supporting literature as essential to forming a community voice, and allowing the voices of less dominant and aggressive students to be heard.

Although the contributions of sport to risk taking and associated health factors shows variability, it is clear that the ways in which sports are presented, promoted, and maintained for youth involvement are important factors in addressing team spirit, inclusion, and excessive competition. It was not apparent that female athletes are generally at higher risk for disordered eating. Furthermore, it has been shown that elite athletes, especially females, are more resistant to peer pressure, and in general sports involvement helps protect individuals from risk taking behavior. Although there may be some protective benefit against tobacco, alcohol and marijuana use, this is not the case for steroid use, which continues to rise in popularity among elite high school athletes.

IV) Economic Considerations

When participation is part of the whole educational experience, schools with no cut policies may provide more adolescents with greater freedom to grow and mature. Steve Schultz, athletic director at a Minnesota High School, uses no cut policies in 23 of the 29 interscholastic sports (50). Schultz says “it’s pretty tough to justify an education system if you’re just building championship teams. Our coaches really work hard to make sure that every kid plays in games ... we are a success driven sports program, and it’s important to keep in mind that success is not the same as winning.” Incidentally, the high school has captured the Minnesota Class 5A championship in three of five years. This is

evidence that although winning is important, playing to win does not mean playing to win at all costs.

The benefits of inclusion come with economic costs, but with benefits as well. Potential limitations of no cut policies include that they stretch facility usage fees and maintenance costs, as well as higher budgetary appropriations for coaching, equipment, uniform, and travel costs. Another argument against no cut policies is that the program will present safety concerns across different skill levels. If no cut policies are to be widely adopted, the ability factor is an important consideration in determining how no cut policies are instituted. Despite these barriers, schools are increasingly adept at finding ways to increase funding of sports programs in a time of tight budgets.

For example, in Colorado the Denver Public Schools have teamed up with the Nuggets and Avalanche, the Denver based NBA and NHL teams. They developed a program to rename the local sports divisions the “Denver Nuggets/Colorado Avalanche Prep League” (51). The symbiotic nature of the program has proven successful: the annual payment for naming rights has funded uniforms, equipment, and coaching salaries. In return, the Nuggets and Avalanche have become every local student’s favorite team. Although this adds another form of school sanctioned advertising, unlike allowing a preponderance of vending machines on school grounds and fast food in the cafeteria, this advertising promotes inclusion and participation. One athletic director, when asked about the success of the program replied, “Let’s say my student athlete population goes up 10

percent a year. Do I have 10 percent more uniforms? Do I have 10 percent more coaches? The answer is No (51).”

The need for budgetary safeguarding has even promoted high schools to hire marketing firms to sell naming rights of athletic fields (52). For example an Illinois High School sold naming rights of the athletic field to Rust-Oleum Corporation for \$100,000 and a 20 year supply of paint and maintenance products. The most extreme example is seen at a Dallas High School, who worked out a 10 year multimillion dollar deal with Dr. Pepper to paint the soft drink logo on the school’s field house roof, where it can be seen by air travelers.

The economic costs and associated safety concerns to implementing a broad reaching sports program are apparent, but schools committed to inclusive sports programs are finding increasingly creative ways to fund such endeavors. Obviously outfitting a well run sports program is not cheap, but at a cost of one to three percent of the total educational budget, but when the budget is tight sports programs seem to be the first to go. Although not every school would chose to hire a marketing firm to promote the opportunities for advertising partnerships, one expects there are other creative ways to achieve a similar end.

V) Policy Considerations

In March 2005 the Bush administration suggested the Education Department clarify Title IX regulations (53). The regulations would allow colleges to remain in compliance with

Title IX through using an online student survey, and discontinue female sports where interest is shown to be low. Potential implications are that high schools in turn discontinue sports programs, and stymie the growth in women's sports that has occurred over the last 33 years.

Although the advantage of sports participation to females is apparent, especially in risk taking behaviors, reports of gender inequities are rampant. According to the Georgia High School Association, 64% of boys play competitive sports compared to 36% of girls; 86% of legislative grants aimed at supporting high school sports during a five year period was directed toward projects in which the primary beneficiaries were boys; and less than half of Georgia's public schools offer girl's volleyball, the country's third most popular high school sport for girls (54).

Furthermore, many believe the woman's sports market is both vast and lucrative, but has not challenged market forces by developing large appeal. One exception is the recent eruption of interest in girl's hockey. From 1990 to 2000 the number of community girls hockey teams increased from 149 to 1,530 and the number of players grew from 6,300 to just under 40,000 (55). In 2000 372 high schools offer girl's hockey. According to NCAA, this is among the most popular woman's sports, due in part to expanding availability, improved access and more actionable interest.

VI) Conclusion

This review of the literature serves two purposes: first to demonstrate that although there is intense interest in sports involvement, no studies on the trends of sports participation through high school have been identified. The second goal is to assess the relevant literature, which shows there is intense interest in the attributes of sports involvement, which include other benefits apart from encouraging lifelong physical activity. Even so, the cost of interscholastic sports in American society must be weighed against the benefits. There are many economic and policy barriers as well as safety considerations that must be addressed in expanding any sports program. Furthermore, there are facility maintenance and equipment supply costs that would be incurred through expanding interscholastic sports. Potential benefits of interscholastic sports that may not always be considered by policymakers and educators include gains in academic achievement, motivation and life goals, psychosocial development, as well as may be a protective factor in health and risk taking behavior. It is also important to consider the importance of the target student population and start to develop and implement a body of research tested interventions and best practices. A conceptual framework of the determinants of sports participation should also be developed. Future research may further consider how preferences of sport participation and risk taking behavior vary by gender, ethnicity, socioeconomic status, parental and coaching support, by community size and by region of interest.

Instead of achieving the “highest” level of competition, the evidence suggests more students may benefit by implementing strategies that encourage good sportsmanship, fairness of play, improve physical fitness such as cardio respiratory conditioning,

neuromuscular coordination, and athletic skills while achieving a sense of accomplishment, improvement, and success both individually and collectively (56). Participation in sports may accomplish many goals other than physical health, but obesity researchers are often perplexed as to what policy issues are important determinants to promoting and maintaining lifelong physical activity. Current strategies for obesity prevention are limited in efficacy and effectiveness, and new public health approaches are needed.

Perhaps a fresh look should be given to the benefits and risks of participating in sports as a means of engaging youths in regular physical activity. Among health young people, physical activity and physical fitness may favorably affect risk factors for cardiovascular disease. Regular physical activity among children and adolescents with chronic disease risk factors is important: it decreases blood pressure in adolescents with borderline hypertension, increases physical fitness in obese children, and decreases the degree of overweight among obese children (57). Physical activity among adolescents is related to higher levels of self-esteem, self-concept and lower levels of anxiety and stress (57). The evidence base suggests that if physical activity can be maintained and properly reinforced during youth, there are better chances that established patterns of physical activity extend into adulthood. Among adults, regular physical activity increases a person's ability to perform daily activities with greater vigor and may reduce the risk for specific health problems, including coronary heart disease, hypertension, non insulin dependent diabetes mellitus, colon cancer, and depression, as well as lower all cause death rates (58).

Extracurricular activities like interscholastic sports provide an opportunity to ensure that a minimal amount of regular physical activity is maintained.

METHODS

- I) Overview**
- II) Building the dataset**
- III) Descriptive statistics and exclusion of outliers**
- IV) Calculation of participation prevalence**
- V) Stratifying by school size**
- VI) Cost calculation**

I) Overview

The objective of this research is to monitor trends in sports participation through high school. This involves looking at how the number of participants changes relative to the number of enrolled students. To accomplish this grade specific enrollment for a given school must be combined with the sports offerings reported to the Wisconsin Athletic Association. Public schools who offer at least one sport are matched with public school enrollment data. For a given school, reported number of participants in a grade of interest is combined with the enrollment of that grade for the corresponding academic school year. This enables examination of trends over time as freshman progress through high school to become seniors. The following process yields a dataset that answers the current research question and can be used to address future research questions, such as exploring the extent to which sports participation is a causal factor in academic success.

II) Building the dataset

First, numerators were gathered. Original data were obtained from the Wisconsin Interscholastic Athletic Association (WIAA); a board that ensures Wisconsin schools adhere to a standard set of rules and regulations. I contacted WIAA (Joan Gralla and David Anderson) to obtain four years of data. The data WIAA provided include the 2000-2001, 2001-2002, 2002-2003, and 2003-2004 academic school years. Data are self reported to WIAA by high school coaches or high school athletic directors for each school. For each academic school year, Joan Gralla compiles the information into seasons by gender specific sport. Information gathered by gender specific sport includes the number of freshmen, sophomores, juniors, and seniors who play in a given high

school sport at the beginning of the season, and at the end of the season. It is important to note that this study focuses ONLY on participants at the END of the sports season. This means only students who COMPLETED a freshman, sophomore, junior, or senior year sport are included. The following steps were followed to combine all sports by gender, year and school. This results in a dataset with all potential numerators.

- a. Convert .dat files to SPSS files for each sport for each year of interest; 2000-2001, 2001-2002, 2002-2003, and 2003-2004 academic school years.
- b. Assign unique identifiers for each reported sport.
- c. Sort each sport by ascending school order. This allows all sports to be combined by school name. Large variation in school spellings meant this had to be done separately for each year.
- d. Clean up each year by combining misspellings of schools. There were some school names that could not be matched for all the years of interest. For example, there were 9 schools in 2000-2001 and 7 schools in 2003-2004 that did not match with each other nor had names that could not be linked to another school. Reasons include that a school could be a newly opened school, the school changed names, or a school can be referred to by multiple names that the researcher cannot link.
- e. Merge files for each year on school name. Coordinate school names so one school appears only once. If WIAA school names did not match up over the 4 years of interest, they were excluded.

- f. Result: **483** school observations (this includes both public and private schools), for up to 24 sports per year (with the exception of 2000-2001 when girl's hockey is not reported, only 23 sports are available).

Next, denominator figures are gathered for each corresponding year of interest. These are publicly available data and were downloaded directly from the Wisconsin Department of Public Instruction (DPI) website as Excel spreadsheet files

(<http://www.dpi.state.wi.us/dpi/dltcl/lbstat/pubdata2.html>). The *Public Enrollment Master* is the complete enrollment file, which includes grade level data by gender and ethnicity/race within individual schools. Enrollment is a one-time count on the third Friday in September. The file includes district name, district number, district type (00=County Children with Disabilities Education Board, 03=public school district, 05=State Education Agencies, and 49=Milwaukee "non-instrumentality" Charter schools), county code, county name, CESA, WTCS (formerly VTAE) district initial, school code, and school name. The following steps were followed to merge enrollment data for public schools.

- a. Download public school enrollment data for each corresponding year of interest; the 2000-2001, 2001-2002, 2002-2003, and 2003-2004 academic school years.
- b. Sort by grade for each corresponding year, expunge kindergarten through 8th grade. The remaining high school data are sorted by district, and then by high school name, to acquire a listing of public high school by grade. Next I isolated 9th grade for 2000-2001, 10th grade for 2001-2002, 11th

grade for 2002-2003, and 12th grade for the 2003-2004 academic school year.

- c. Assign a Unique Identifier for each year by combining district code and school code. This was done by multiplying the district code by for through 12th grade. For example, the first school in my dataset is Abbotsford High School, district code 0007 and school code 0040. The district code was multiplied by 10,000 and the school code was added, giving this school a unique identifier of 70040.
- d. Merge 9th through 12th grade (years 2000-2001, 2001-2002, 2002-2003, and 2003-2004) on the unique identifier. Result: in the 2000-2001 school year there were 520 public schools reporting 9th grade data to the State Department of Public Instruction, this number grew to 590 public schools reporting 12th grade data in 2003-2004. Therefore, **520** public schools are used to match with WIAA data.

Finally, the DPI and WIAA data were merged. WIAA school names were manually assigned a unique identifier to merge by. This allowed for a merger of numerator and denominator information by school, for all public schools that reporting at least one interscholastic sports program. However, not all these schools matched with WIAA data. After building the dataset, a sample of 412 Wisconsin Public High Schools reporting at least one sport to the Wisconsin Athletic Association (APPENDIX A), and could be matched with Wisconsin Department of Public Instruction Enrollment data, are used to assess participation across 24 interscholastic sports. The sample of schools is followed

for four academic school years, by successive grade for each of the corresponding four years. This allows one to examine participation through the high school experience by sport.

A number of schools are excluded from the analysis, and there are a number of reasons why this occurred. The major reason is that WIAA reports public and private school sports information, but this study focuses on public enrollment only. This explains why public DPI enrollment will cause WIAA reporting schools to be excluded, or not receive a unique identifier. Another reason is that the school name in WIAA does not provide adequate information to match on. School names without adequate identifying information are excluded (for example, just reporting “North” instead of “Appleton North” will mean that sport/school name is excluded from analysis). Along those same lines, duplicate school names (two different “North” listings of football participants) were also excluded. Another reason for the large number of DPI names that did not match with WIAA data is that DPI data also includes adult high schools (such as Phoenix and Milwaukee Area Technical College GED programs), charter schools, alternative schools, and Department of Corrections schools. Such types of schools tended not to match with WIAA school data. Result: 412 public schools are included in analysis.

III) Descriptive statistics and exclusion of outliers

SPSS software package and Microsoft EXCEL were used for analysis. Descriptive statistics were first run on each individual sport for each year, for 412 matched schools. Two outliers were identified and upon examination were deemed to be incorrectly

entered by WIAA. These single entries were excluded from analysis. The first glaring exclusion was where one school showed 169 female volleyball participants in 9th grade, which is much more than the grade size. The other excluded data point was for one school that showed 1857 female soccer participants in 11th grade. This also did not make sense considering the size of other sports and the class size.

The final study population includes 53084 participants in the 412 school sample 9th grade (2000-2001 academic school year). In 12th grade (2003-2004 academic school year) there were 29,353 participants.

IV) Calculation of participation prevalence

As opposed to raw numbers of participants, participation prevalence is a better way to examine participation in sports, as it takes into account the available pool of potential participants. Of the 520 public high schools in the state (2000-2001), 412 Public High Schools reported at least one of 24 sports to the Wisconsin Athletic Association and could be matched with Wisconsin Department of Public Instruction enrollment information. Potential participants are defined as the number of enrolled students each year. Although this excludes potential freshman participants who drop out, are expelled, or transfer in a subsequent year; taking into account this declining enrollment helps ensure that only the available pool of participants are considered. Instead of using the number of freshman participants as the denominator for all years, a grade and year specific denominator is used, which represents a conservative estimate of the pool of participants. Dividing the number of participants by the number of enrolled students

enables the prevalence of interscholastic sports participation to be calculated by gender specific sport using the gender specific class size denominator for each year (APPENDIX C).

The arcsine transformation of participation prevalence was employed to enable the application of paired t tests, to determine if participation changes significantly from freshman to senior year. The arcsine transformation must be used because a proportion is constrained by 0 and 1, making the variance of the proportion dependant on the proportion itself. The arcsine transformation is a mathematical function that allows a proportion to vary freely and without constraint, and is variance stabilizing. The transformation also had a tendency (although not perfect) to normalize the distribution of these proportions. The following calculation was used to accomplish this transformation (<http://darkwing.uoregon.edu/~robinh/arcsin.txt>).

**Calculation of Arcsine
Transformation using participation
rate p:**

IF $1 \leq y \leq n-1$ THEN $p = y/n$
 $\text{angle} = t(p) = (360/(2*3.14159)) * (\text{arcsin}(\sqrt{p}))$;
where $\text{angle} = t(p) = \text{arcsin}$
transformation of p

This enables the computation of t-tests or ANOVAs on the transformed data using the means of $t(p)$ to check for group differences.

For each sport, the participation prevalence was compared in 9th grade and 12th grade for a true cohort of schools (APPENDIX D). Tests of significance were carried out on these true cohorts to determine if the 9th grade participation prevalence is different from the 12th grade participation prevalence (three years later).

V) Stratifying by school size

The prevalence of participation is further examined by school size, to see if school size has any effect on participation in 9th grade as well as in the risk of attrition from freshman to senior year. To accomplish this, first the average total enrollment over four years was examined, and the tertiles were calculated (APPENDIX B). Schools were assigned as a small school (bottom tertile), medium school (middle tertile), and large school (top tertile). Next, participation by school size was calculated for each gender specific sport for each year. Stratification presented issues with small numbers (as indicated by ** and alternative calculations are provided as needed) for most sports, and using a true cohort would not enable comparison across school size. Therefore, these analyses utilize the sample of public high schools reporting to WIAA for a given gender specific sport in the year of interest, a representative sample of the “typical” Wisconsin public high school. Furthermore, by using the untransformed participation prevalence the results are of interest to policymakers, and easily understood by educators, school districts, and school boards. Means and standard error of the mean are calculated for individual sports as well as for shared gender sports (APPENDIX E). Shared gender sports are calculated by summing the numbers of participants for all shared sports by gender, and dividing by the total enrollment*3, to account for possible overlap across fall, winter, and spring seasons

(APPENDIX E). These findings are presented using graphic displays of the mean gender specific sport by grade and by school size, noting an interaction effect of school size with participation prevalence in 9th grade as well as risk of attrition is seen in shared gender sports for males, females and also many individual sports (APPENDIX F). The means are used to calculate the rate ratios of grade specific percent participants for small versus large schools by gender specific sport, and means are used to calculate rate ratios of percent of 9th grade participants in small versus large schools, as well as 9th to 12th grade risk of attrition by gender specific sport for small versus large schools (APPENDIX F).

VI) Cost calculation

The final step in the analysis is to calculate a ballpark estimate of the cost of expanding interscholastic sports. Literature has reported that the annual budgetary appropriation for interscholastic sports ranges from one to three percent (4). The annual budget for Wisconsin Public Schools is reported by the Wisconsin Department of Public Instruction as a revenue limit per member. The revenue limit per member is found by dividing the revenue limit (defined as a district-specific limit on the revenue a school district is entitled to receive from general state aid such as equalization, special adjustment, and integration aids; and local levies) divided by the revenue limit membership (defined as the number of resident full-time equivalency pupils enrolled on the third Friday of September plus a portion of summer school FTE equivalent). This was gathered for the year of interest for three years, and the 2003-2004 academic year, the 12th grade class, is not available (http://www2.dpi.state.wi.us/sfsdw/Financial_profile_results.asp).

To calculate an average cost per school, the average cost per member was multiplied by 3%, or the maximum estimated budgetary appropriation to interscholastic sports involvement (4). This allowed an estimate of average cost per student to be calculated by grade. Five cost estimates are presented. First, the average cost per student was multiplied by the total number of participants (by grade), to estimate the current cost of interscholastic sports among the 412 schools. Second, the average cost per participant was multiplied by total enrollment to estimate the cost if all students participated in interscholastic sports. Third, the difference was taken to estimate the excess cost that would be incurred if the non participants became participants. Fourth, the difference in the number of freshman and sophomore, and freshman and junior students is calculated to estimate the cost if all freshman remain participants. Lastly, these costs are divided by the number of schools (412), to estimate the average extra cost per school if all non participants became participants, and if all freshman participants remain participants. Although this is a crude estimate, this method gives some indication of what the economic cost would be, on average, if all students wished to participate.

RESULTS

I) Two approaches of analysis

II) Prevalence of 9th grade participation

III) Attrition from 9th to 12th grade

IV) Economic consideration

I) Two approaches of analysis

Examining the trends of sports participation through high school provides an opportunity to understand how interscholastic sports contribute to physical activity of high school students. There are two major ways this is reported, taking into account student enrollment: the first focuses on prevalence of 9th grade participation in 2000-2001; the second focuses on attrition among this group, by the time the students are 12th graders in 2003-2004. These trends in participation prevalence and risk of attrition can be examined by individual sport, by shared gender sports (shared gender sports include basketball, volleyball, softball/spring baseball, track and field, soccer, golf, tennis, cross country, and swimming) and by all sports.

II) Prevalence of 9th grade participation

A large percent of the freshman class participates in sports. Among the 72,118 students enrolled, there are 53,084 participants in a fall, winter, or spring sport. Examining by season (as there may be some overlap of students who play a sport in more than one season), it can be seen that the number of schools offering a sport, as well as the number of participants, varies based on the sport (TABLE 1). Among freshman females, approximately 26% of enrolled females participate in a fall sport, 14% participate in a winter sport, and 25% participate in a spring sport. Additionally, roughly 48% of the female freshmen participate in a shared gender sport. Among freshman males, approximately 35% of enrolled males participate in a fall sport, about 21% participate in a winter sport, and 25% participate in spring/summer sport. Approximately 46% of males participate in a shared gender sport.

The prevalence of freshman participants varies by gender and by sport. Among a cohort of 9th grade schools, it can be seen that among females, volleyball with 16.3% participation has the highest participation prevalence (TABLE 1). This is followed by girl's basketball (13.2%) and girl's softball (10.4%). Among the school cohort of 10 female sports, golf has the lowest participation prevalence (0.8%), followed by gymnastics (1.2%), and cross country (2.6%). Among the same cohort of schools, football is the most popular sport among male freshman (25.4%), followed by basketball (13.4%) and track and field (7.8%). The male sports with the lowest prevalence of freshman participation are volleyball (0.7%), ice hockey (0.8%), and swimming and diving (1.4%).

Comparing small (or medium) and large schools, it can be seen that among 9th grade participants, for the most part freshman in small schools have higher prevalence of participation than is seen in large schools (TABLE 2). For some sports the sample of schools is less than 20 after stratifying by school size, and therefore medium size schools may be reported in addition to small schools for an individual sport. Interestingly, some of the most popular female sports show the largest differences in prevalence across school size. Female volleyball has a high percent of freshman participants in small and large schools (44% and 12%); therefore rate of female volleyball participation prevalence in small schools is 3.6 times higher than is seen in large schools. Among female sports with low participation, it can be seen that female golf in medium schools has 4% participation versus 1% participation in large schools (rate ratio=3.0). Across school

size, the prevalence of female participants is approximately twice as high in small/medium schools as is seen in large schools for cross country and gymnastics (rate ratio= 2.0 and 2.1, respectively). Male sports show similar results across school size. Approximately 43% of males participate in freshman football at small schools, compared to 22% in large schools (rate ratio=2.0). The participation prevalence among male basketball players is about 3 times as high in small versus large schools, and a similar level is seen with male soccer (25% in small vs. 9% in large). In terms of individual sports, the most popular freshman sports have the highest participation in both small and large schools, yet participation in these sports are higher among students who attend small schools than those attending large schools.

Among shared gender sports, freshman participation is approximately 36% for females in small schools and 19% for females in large schools (rate ratio=1.9). Among male shared gender sports small schools have a larger participation prevalence than large schools (23% versus 15%; rate ratio=1.6), although the ratio is not as great as seen in females. Therefore, among shared gender sports, the prevalence of females who participate in a 9th grade sport is nearly twice as high in small schools as compared to large schools (rate ratio=1.9), and a higher proportion of the small school male class completes a sport as freshman (rate ratio=1.6). Upon considering all sports, the only additional female sport is gymnastics, and participation in small and large schools does not differ from what is reported among shared gender sports (rate ratio = 1.8 all sports, 1.9 shared gender sports). Among male sports, the addition of four sports, including football, increases the percent of male participants to 38% in small schools and 25% in large schools; although the rate

of participation does not change drastically (shared gender rate ratio=1.6; all sports rate ratio=1.5).

III) Attrition from 9th to 12th grade

Attrition is evident across all sports seasons by gender from 9th to 12th grade. Among girl's sports seasons, fall sports (which include golf, swimming, cross country, tennis, and volleyball) show a 38% rate of attrition; winter sports (gymnastics, basketball, and hockey though not reported) show a 59% rate of attrition; and spring sports (soccer, track and field, and softball), show a 45% rate of attrition. Among male's sports seasons, fall sports (volleyball, cross country, soccer, football) shows a 28% rate of attrition; winter sports (hockey, swimming, wrestling, basketball) show attrition of 35%; and spring/summer sports (tennis, golf, baseball, track) show 23% attrition. Comparing attrition in common gender sports, female attrition is 40% and male attrition is 24%.

A cohort of schools reporting in both 9th and 12th grade are examined by sport and by gender using paired t-tests again show evidence of attrition in participation from freshman to senior year (TABLE 1, 3). Among shared gender sports (n=18), 13 sports show a decline, 12 of which show significant declines (11 at significance $p < 0.05$ and 1 at significance $p < 0.1$). The largest decline in shared gender sports is seen in boy's basketball, which falls from 13.1% of freshman male participation to 5.1% of male senior participation (61% decline, $p < 0.05$). Girl's volleyball has the highest participation prevalence of all 9th grade sports at 16.3%, which falls to 6.6% by 12th grade – a 60%

decline ($p < 0.05$). The lowest class participation prevalence for girl's and boy's sports is golf (0.8%) and volleyball (0.7%), respectively. By 12th grade, the prevalence of female golf participants increases, although not significantly, while male volleyball declines by 13% ($p < 0.1$). Girl's hockey is not reported in the 2000-2001 academic year, and as a result not included in these analyses.

Also among shared gender sports, significant increases are seen for boy's ($p < 0.05$) and girl's ($p < 0.1$) cross country, although these sports have low participation prevalence (TABLE 1). No significant changes in prevalence of freshman and senior participation are observed in four shared gender sports: girl's golf, girl's tennis, boy's tennis, and boy's swimming.

Among gender specific sports, football has the highest prevalence of 9th grade boy's participants at 25.4%, but falls by 37% to 16% of 12th grade males participating in football ($p < 0.05$). The only reported girl's sport is gymnastics, which shows a 34% decline from freshman to senior year ($p < 0.05$). Among boy's gender specific sports, boy's wrestling and summer baseball also show significant declines of 23% and 50%, respectively ($p < 0.05$). The largest increase is seen in boy's hockey, where prevalence increases from 0.8% to 1.4% of enrolled pupils ($p < 0.05$). This represents a 76% increase.

Dividing all schools into tertiles by school size reveals that attrition is seen across school size for many sports. For most sports, this general interaction can be observed between school size and participation prevalence (APPENDIX C). Risk ratios are calculated for

small and large schools to identify how school size affects participation among different sports (TABLE 3; APPENDIX F). Among common gender sports, school size appears to influence both the prevalence of 9th grade participation as well as attrition in small versus large schools. Focusing on shared gender sports, participation prevalence amongst small and large schools reveals that both female (36% small, 19% large; rate ratio=1.9) and male sports (23% small, 15% large; rate ratio=1.6) have higher prevalence of freshman participation in small versus large schools. The prevalence of freshman participation corresponds to a lower risk of female attrition (risk ratio=0.8) and male attrition (risk ratio=0.6) in small schools as compared to large schools (TABLE 3). Looking at all sports, similar patterns of attrition are seen across school size, and similar risk ratios are seen among females (risk ratio=0.8) and males (risk ratio=0.5). This is also evidenced in raw percent decline in freshman participants who are not senior participants. These findings indicate that in small schools compared to large schools, less male attrition is observed while more female attrition is observed.

These findings point to evidence of gender disparity in attrition, which is seen in both small and large schools (TABLE 3). Considering shared gender sports, females are at higher risk of attrition than males in both small (risk ratio=0.5) and large (risk ratio=0.6) schools. Upon considering all sports, the disparity increases in small schools and decreases in large schools. The disparity among small school female and male attrition becomes more apparent (risk ratio=0.4), while the gender disparity of attrition risk in large schools becomes less evident (risk ratio=0.7).

IV) Economic consideration

The National Federation of High School Associations indicates that extracurricular activities account for up to 3% of a school's budget (4). Wisconsin Department of Public Instruction reports average revenue allotment per enrolled pupil across the state, which is used to estimate the annual cost of education for a student. This is done for the corresponding years for each school year. Across the sample of schools, freshman participation costs approximately \$11.8 million annually, which falls to \$8.2 million in 11th grade (FY 2003-2004, 12th grade is not currently available). For the average school it may cost an additional \$10,200 to \$16,900 per class each year if all students were to participate from freshman to junior year. This means schools could expect to additionally spend up to \$40,000 per academic year. As the number of participants decline through high school, the approximate cost of participation among the schools also declines. Assuming that facilities would not need to be expanded, across the sample of schools, the average cost per school if all non participants became participants is about \$10,200 in 9th grade, nearly \$12,700 in 10th grade and about \$17,000 in 11th grade. Alternatively, if all 9th graders remained participants, this would cost \$4,800 per school to keep them participating in 10th grade and roughly \$10,700 to keep freshman participating in 11th grade.

DISCUSSION
OF MAJOR FINDINGS

This research has produced three major findings of interest to public health practitioners. First, the research demonstrates that the majority of high school sanctioned interscholastic sports see significant declines, including those sports with the highest prevalence of 9th grade participation. Second, in both small and large schools, the risk of attrition among shared gender sports is markedly higher in females than in males. Third, this gender disparity becomes more apparent in small schools upon examining all sports, and less apparent in large schools.

Although an extensive review of the literature indicates there is intense interest in high school interscholastic sports, this is the first study we are aware of that examines participation prevalence and risk of attrition. It should be noted that perhaps this has not been studied in depth because there remains an inability to point to reasons why participation prevalence differs across sports and risk of attrition may vary by sport, gender, and school attributes. Even so, this research has a number of implications that add a valuable piece to the related body of literature,

There are several reasons that may account for variation in participation prevalence across sports. Three main reasons include cultural influences, sport specific influences, facility accesses issues, and costs. First of all cultural influences may contribute to participation prevalence. Football, basketball, and baseball are the major professional sports industries, and much more visible in the media than swimming or cross country. This drives popularity of sports in high school, and children are encouraged to identify

with professional athletes from an early age, which may influence choice of high school sports.

Secondly, sports specific influences may also contribute to changes in participation prevalence. For example, one implication of Title IX is that girl's volleyball has been popularized as a girl's sport, and participation is much higher than in boy's volleyball. Furthermore, girl's and boy's hockey is gaining popularity as schools react to increased interest by building ice hockey programs in the high school.

This leads to the third major reason for why sports participation differs, which is facility access issues. Many schools may not have a track or a swimming pool, or have access to a golf course. It is obvious that if there is not the infrastructure in place to allow for the sport to be played, it is unlikely to gain popularity or may not be feasible to offer such a program. Furthermore, facility usage must address maintenance costs, which may get very expensive (like in the case of a swimming pool).

Lastly, costs for the participant may also be a barrier to participation. Golf clubs or hockey equipment is expensive compared to running shoes or a baseball glove, which may contribute to the reason golf and hockey have such low numbers of participants.

There are also several considerations that may help to explain why attrition may or may not occur from freshman to senior year. One major reason is that students simply lose interest. High school interscholastic sports for the most part follow the competitive

model, in which the major incentive is to win. As the level of competition increases, students may grow uninterested in meeting the increased demands. Furthermore, this situation may be exacerbated through competing interests that increase as students pass through high school. Getting a job, saving up for a car, and increased independence may discourage many students from continuing involvement in sports.

Another major factor that may address attrition and also stems from the competitive model is the idea of cut policies and no cut policies. Some sports may cut students who do not satisfy a certain criteria of competition, while other sports may always be in need of participants, and encourage participation at all skill levels.

Attrition may also be a factor of existing policies. For example, Title IX may have more of an impact in large schools, where resources and facilities may be more available to the student population. Small schools may not have the financial ability to provide facilities for a diverse set of boy's and girl's sports.

Despite the reasons for why there is variation in participation and attrition, this study has several implications for public health practice and the way physical activity performance is measured. Historically high school sports have been measured in terms of raw number of participants and winning records. Nationally, high school sports participation was at record highs in 1977-1978, when over 6.4 million high school students participated in high school sanctioned sports (59). After falling in the 1980s, the number of students playing interscholastic sports broke the previous record in 1998-1999 and continues to

rise. However, this is misleading upon realizing that students' risk of attrition increases as they progress through high school.

Participation prevalence and risk of attrition provides another way to measure not only participation but success (apart from winning records). This research has potentially far reaching implications in the way high schools approach interscholastic sports and monitor the extent to which involvement in high school sports promotes equal opportunity and inclusion.

A second implication of this research is that monitoring the prevalence of participation and risk of attrition through high school enhances the ability to monitor the success of Title IX in encouraging the advancement of women's sports, and promoting equal opportunity across gender. Measuring participation and attrition in high schools can improve the ability to identify gender gaps in shared gender sports, or monitor trends in sports involvement alongside other factors. This approach can be applied from the local level to the national level: from an individual school to the National Federation of High School Associations.

A third implication of this monitoring approach is its ability to assess how effectively high schools promote interscholastic sports compared to other alternatives when considering the economic cost associated with interscholastic sports. Budgetary considerations are an obvious barrier to increased access for all interested pupils, especially those who complete a sport in 9th grade. For the average school it may cost an

additional \$15,000 per school per year if all freshman participants remain on a team until the end of their junior year. This may be a substantial cost for many school districts. In weighing the option of extracurricular sports or education, it is understandable that many schools choose the business of educating the students rather than providing unfettered access to the student's sport of choice.

Nevertheless, the cost involved also can be looked at as an investment in encouraging students to adopt healthy lifestyles, and subsequently, lifelong physical activity. The reviewed literature indicates that increasing access and opportunities to engage in physical activity while effectively reinforcing youth physical activity may be an investment which promotes lifelong benefits that may enable society to avoid investing more dollars in the future health care needs.

STRENGTHS AND LIMITATIONS

I) Strengths

Large sample size of schools enables examination of a true cohort of schools as participation prevalence changes from 9th to 12th grade. On the other hand, examining for changes in participation by school size must use all reporting schools. Even so, the confidence intervals remain small for most sports across the years. This strengthens the ability to use the actual percent of participants instead of the arcsine transformed data. This display of actual percent of participation is of direct relevance to policymakers and easily understood by educators, parents, and a general audience. This is especially true for helping policymakers understand how school size affects participation (FIGURE A, B).

End of the season estimate may vary if a coach reports students as non participants. For example, this may occur if they are injured and unable to play during the end of the season. Still using students who completed the freshman year demonstrate sustained interest and a level of commitment that students who do not finish the sport arguably do not demonstrate. Another reason that start of the season estimates have more variation, and why end of season estimates are favorable, is because some coaches may report starting numbers as before cuts were made (if any), and not all students are assured of completing the season. Participation is limited only to those who complete the season.

The number of schools reporting year to year does not vary widely for most sports, and not every school reports data every year. However, using all reported data circumvents these issues. The standard error remains small across most observations (APPENDIX C).

For this reason, means are displayed in tables as well as visually by creating three dimensional graphic representations to examine patterns of participation by school size (FIGURE A, B).

II) Limitations

Although reporting is mandated by WIAA, it is not enforced and the participating schools may not report every sport every year. There may also be variation in the number of participants in the end of the season estimate, although it likely to have less variation in reporting method than beginning of the season estimates. A standard protocol should be developed to help coaches and athletic instructors to complete the form.

In terms of the Wisconsin Department of Public Instruction enrollment data, it must be assumed that a given school's pool of participants is similar/identical as a freshman and senior class (accounting for yearly enrollment). As enrollment is defined as the attendance on the third Friday in September, we must assume this one time estimate accurately estimates true enrollment.

It should be noted that not all sports are "equal" in terms of the activity level they provide, and how other benefits (e.g. academic and social) are incurred across sports. Furthermore, it is unknown to what extent other, non WIAA sanctioned opportunities for after school physical fitness are provided to pupils. Moreover, there is no way to account for specialization, when an athlete that plays multiple sports in the freshman year only

plays one sport senior year. There is also no way to account for students that may leave high school sports to play club sports, or simply become recreational players of sport. The reasons for attrition are unknown, and reviewed literature does not point to any study of attrition. However a survey instrument could provide insight regarding these limitations.

This sample represents a convenience sample of Wisconsin Public Schools that could be matched with WIAA and DPI data. Although it comes close, this sample cannot be considered representative of all high schools that participate in WIAA. For example, many private high schools also participate in WIAA sanctioned sports. Even still, of the 520 high schools reported in 2000-2001, 412 are included in this analysis (79%).

FUTURE RESEARCH

The construction of this database enables a wide variety of future research, as this dataset has been meticulously built to easily incorporate State Department of Public Instruction data. The data can be updated by following the methodology to replicate the experiment across school cohorts as students progress through high school. Future research includes vast opportunities to further explore the dataset, and also to incorporate a diverse variety of data, enabling researchers to ask questions about how participation may vary based on school performance indicators, financial data, geographic and community attributes, as well as pupil attributes such as drop out rate, disciplinary issues, and race and ethnicity components. This database holds the potential to explore questions of causation, namely how strong a predictor high school sports involvement is of academic performance taking these other factors into account. Further research could incorporate a follow up survey instrument that would enable the study of how strong a predictor high school sports involvement is in determining physical activity later in life.

As we begin to better understand the role of high school sports involvement as it contributes to lifelong physical activity and the ability of interscholastic involvement to impede the advent of co-morbid conditions later in life, a compelling cost effectiveness study on long term benefits of high school sports involvement may show this is a worthwhile investment. Furthermore, such an analysis may point to other options that are even more cost effective, such as opportunities that encourage students in intramural sports or community recreation leagues. An alternative to expanding interscholastic sports may be for schools wishing to encourage a more physically active student body to consider such alternatives as intramural sports, partnering with community recreation, or

a similar approach. Offering such alternatives would allow students access to both competitive and non competitive options, which can encourage new ways to think about the role of high school athletics in encouraging physical activity during high school and into the future.

CONCLUSIONS

In conclusion, the primary aim of this study was to understand how participation in interscholastic high school sports changes from freshman to senior year by sport, gender, and school size. This was accomplished through monitoring participation prevalence in the 9th grade academic year and also risk of attrition from 9th to 12th grade. Schools (n=412) are matched by WIAA and DPI enrollment data, and followed from 9th grade (2000-2001) to 12th grade (2003-2004).

Overall, findings indicate that significant declines in participation are observed in many sports, by gender. During the freshman year from 14% to 35% of male or female students participate in a fall, winter, spring, or summer sports season. However, of 23 high school sanctioned sports, from freshman to senior year significant declines are seen in 16 sports. This includes sports with the highest prevalence of participation, such as boy's football (37% attrition; $p<0.05$), boy's basketball (50% attrition; $p<0.05$), girl's basketball (61% attrition; $p<0.05$), girl's volleyball (60% attrition; $p<0.05$), and girl's softball (49% attrition; $p<0.05$). Among shared gender sports (n=18), 11 sports show a significant decline of participation prevalence from 9th to 12th grade.

Additionally, analysis by school size characteristics indicates variation in participation prevalence as well as risk of attrition. Small schools have higher participation prevalence than do large schools, which is observed for both genders. Among shared gender sports, attrition from freshman to senior year is lower in small schools (18% in boys and 39% in

girls; risk ratio=0.5) as compared to large schools (31% in boys and 49% in girls; risk ratio=0.6).

Moreover, the variation in participation prevalence is assessed by risk of attrition, which shows evidence of gender disparity. Considering shared gender sports, more female attrition is seen than male attrition in both small (risk ratio=0.5) and large (risk ratio=0.6) schools. Upon considering all sports, the disparity increases in small schools and decreases in large schools. The disparity among small school female and male attrition becomes more apparent (risk ratio=0.4), while the gender disparity of attrition in large schools closes (risk ratio=0.7).

Finally, this disparity is more apparent in small schools than in large schools. Although the ability to participate may be greater in small schools, small schools do not address retention issues in girl's athletics as effectively as large schools do, relative to male retention, despite similar gender specific participation rates in the 9th grade.

Although this research compels one to recommend that interscholastic sports participation be promoted, more research is needed to consider both the short and long term health benefits of interscholastic sports competition, as well as other forms of school sanctioned activity. The reviewed literature demonstrates a variety of benefits that accompany organized sports, from immediate benefits of improved school performance to long term benefits such as better leadership skills and higher rates of physical activity later in life. However, much of this research comes as the result of student surveys,

administrator interviews, and parties whose main interest is promoting high school sanctioned athletics. Other reviewed literature indicates high school is an integral period in the socialization process, and does instill long term benefits on the participating individuals. Even still, the extent to which social pressures, athletic policies, and competition level influences participation prevalence and risk of attrition in sports is not adequately addressed in the literature.

This research provides an initial assessment of the ability for a public health perspective to be applied to high school interscholastic sports, specifically how sports participation changes across sports, genders, and high schools from 9th to 12th grade. Although more research is needed to understand the long term health effects of participation prevalence and risk of attrition among high school interscholastic sports, there are a number of policy assessment options that can be achieved through measuring participation prevalence and risk of attrition. Some of these policy assessment options and future research priorities are outlined:

- Consider the role of sports participation in promoting physical activity throughout high school, taking into account school performance indicators, financial data, geographic and community attributes, as well as pupil attributes such as drop out rate, disciplinary issues, and race and ethnicity components.
- Assess the success of Title IX in promoting equal access for females
- Provide a surveillance mechanism that can monitor different types of sports programs for how effectively they promote physical activity throughout high school relative to the monetary investment.

- Serve as a proxy for larger patterns of physical activity among high school students, and predict future levels of physical activity among the student body.
- Provide a novel public health approach for battling the obesity epidemic, which can identify physical activity programs that have high efficacy and are effective.

Therefore, measuring participation prevalence and risk of attrition is a promising approach that can be widely applied, and holds the potential to monitor the success high school athletics programs in another way besides wins and losses. This method of assessment can also be used to extend the amount of time students are physically active by offering an enhanced ability to identify and promote programs that most effectively encourage physical activity.

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TABLES and FIGURES

TABLE 1: Participation prevalence in 9th and 12th grade with attrition (relative percent change) and associated significance, among a panel of schools in 9th and 12th grade

SPORT	Gender	Schools (N)	Grade 9 2000-2001	Grade 12 2003-2004	Change = (12-9)/9	p value
SHARED GENDER						
Basketball	Female	396	20.5%	8.1%	-60%	<0.001
	Male	403	20.4%	10.7%	-48%	<0.001
Volleyball	Female	390	27.6%	11.3%	-59%	<0.001
	Male	28	3.6%	2.8%	-22%	0.051
Softball	Female	353	14.8%	8.0%	-46%	<0.001
Spring Baseball	Male	280	14.4%	11.2%	-22%	<0.001
Track and Field	Female	337	11.2%	6.8%	-39%	<0.001
	Male	337	9.9%	8.9%	-10%	0.032
Soccer	Female	160	11.2%	5.5%	-51%	<0.001
	Male	170	9.3%	7.2%	-23%	<0.001
Golf	Female	109	1.8%	2.0%	11%	0.48
	Male	273	7.9%	5.2%	-34%	<0.001
Tennis	Female	143	5.1%	4.7%	-8%	0.28
	Male	131	3.4%	4.0%	18%	0.038
Cross Country	Female	295	2.9%	3.3%	14%	0.077
	Male	295	3.0%	4.1%	37%	<0.001
Swimming and Diving	Female	122	4.7%	3.8%	-19%	<0.001
	Male	95	2.4%	2.7%	13%	0.18
GENDER SPECIFIC						
Football	Male	383	36.1%	23.5%	-35%	<0.001
Wrestling	Male	296	7.7%	5.7%	-26%	<0.001
Summer Baseball	Male	74	12.3%	7.5%	-39%	<0.001
Gymnastics	Female	84	3.4%	2.0%	-41%	<0.001
Hockey	Male	75	2.0%	3.7%	85%	<0.001

TABLE 2: Participation prevalence and associated prevalence ratios in high school sports among 9th grade students in Wisconsin, 2000-2001

	School Size		Prevalence Ratio (Small vs. Large schools)
	Small	Large	
ALL SPORTS			
Female	36%	20%	1.8
Male	38%	25%	1.5
Prevalence Ratio (male vs. female)	1.1	1.3	
SHARED GENDER SPORTS			
Female	36%	19%	1.9
Male	23%	15%	1.6
Prevalence Ratio (male vs. female)	0.6	0.8	

TABLE 3: Attrition from 9th to 12th grade among small and large schools for both gender specific sport and all sport with associated risks of attrition

	School Size		
ALL SPORTS	Small	Large	Risk Ratio (Small vs. Large schools)
Female	-39%	-49%	0.8
Male	-17%	-35%	0.5
Risk Ratio (Male vs. Female)	0.4	0.7	
SHARED GENDER SPORTS	Small	Large	Risk Ratio (Small vs. Large schools)
Female	-39%	-49%	0.8
Male	-18%	-31%	0.6
Risk Ratio (Male vs. Female)	0.5	0.6	

Figure A: Female participation prevalence of shared gender sports by grade and school size from 9th to 12th grade among Wisconsin public high schools: 2000-2001 to 2003-2004

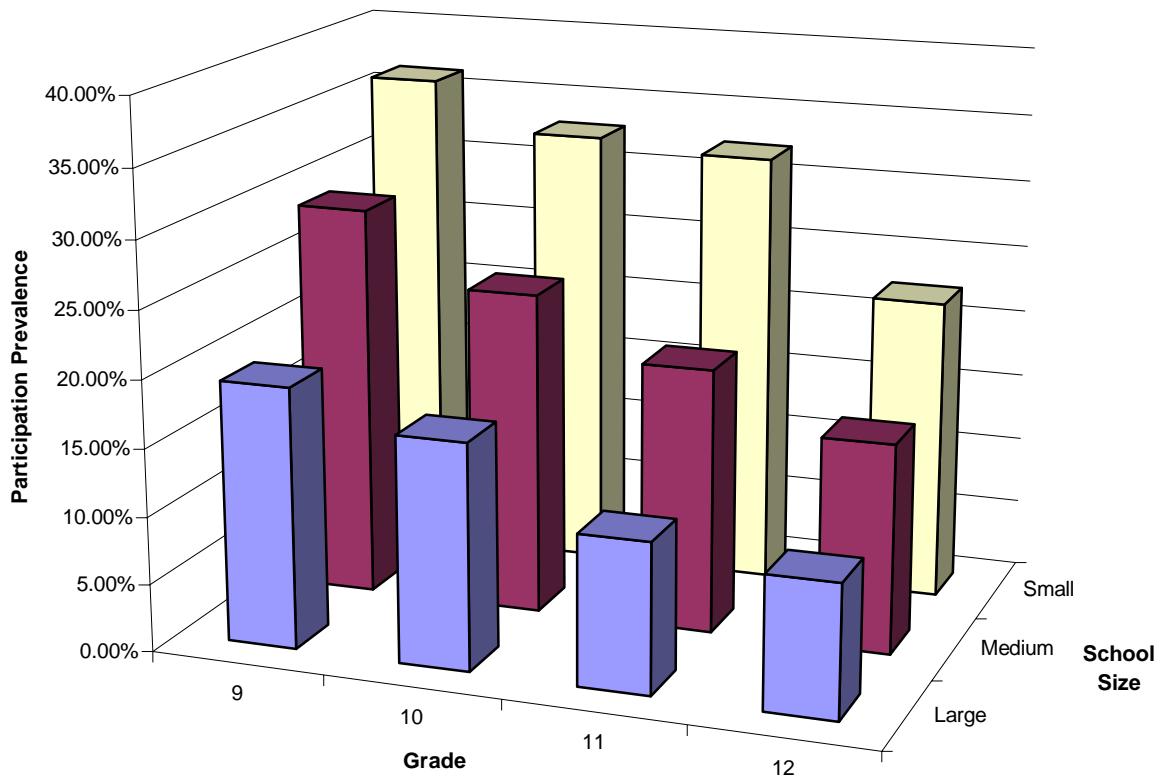
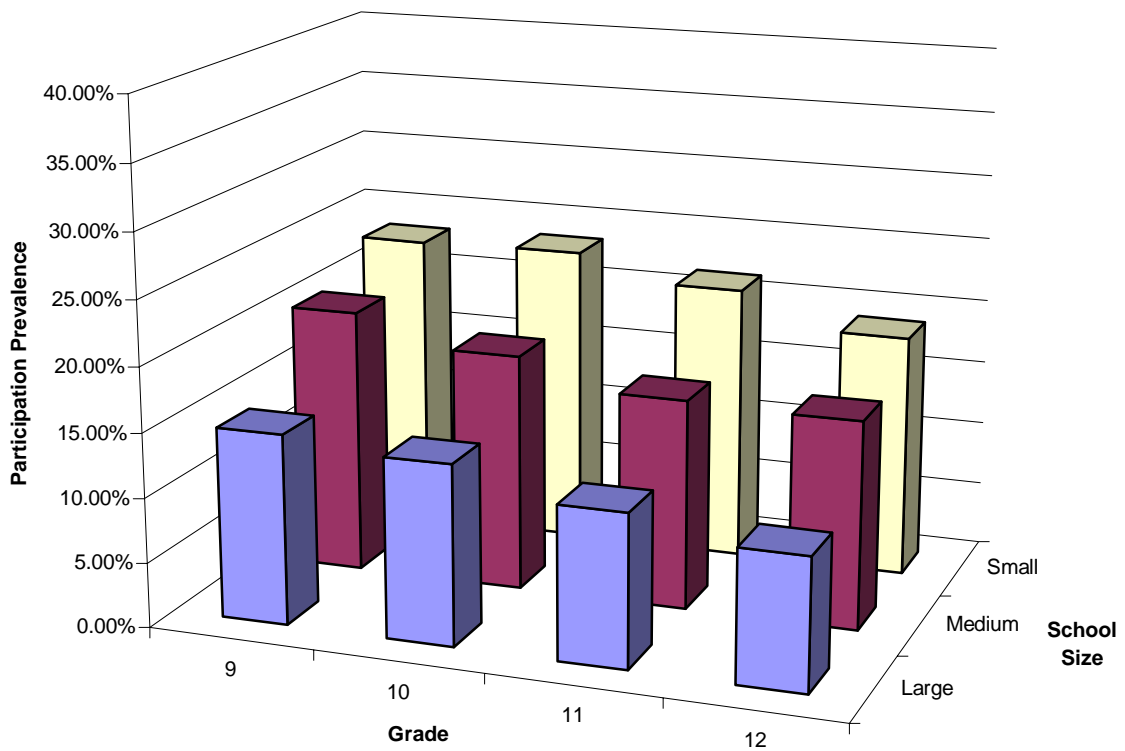


Figure B: Male participation prevalence of shared gender sports by grade and school size from 9th to 12th grade among Wisconsin public high schools: 2000-2001 to 2003-2004



APPENDICES

APPENDIX A: Participation Prevalence Statistics for 412 schools by grade: 2000-2001 through 2003-2004 academic year

Girl's Basketball

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	403	397	399	403
	Missing	9	15	13	9
Mean Participation Prevalence		21.0%	17.4%	12.2%	9.6%
Std. Error of Mean		0.7%	0.9%	0.6%	0.5%
Median Participation Prevalence		18%	13%	8%	6%
Percentiles of Participation Prevalence	25	11%	9%	4%	3%
	50	18%	13%	8%	6%
	75	28%	23%	16%	12%

Girl's Cross Country

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	315	311	310	325
	Missing	97	101	102	87
Mean Participation Prevalence		3.8%	4.7%	4.7%	4.3%
Std. Error of Mean		0.2%	0.3%	0.3%	0.2%
Median Participation Prevalence		3%	4%	4%	3%
Percentiles of Participation Prevalence	25	1%	1%	2%	1%
	50	3%	4%	4%	3%
	75	5%	6%	6%	6%

Girl's Golf

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	114	121	124	129
	Missing	298	291	288	283
Mean Participation Prevalence		2.4%	2.9%	3.4%	2.8%
Std. Error of Mean		0.2%	0.3%	0.4%	0.3%
Median Participation Prevalence		2%	2%	2%	2%
Percentiles of Participation Prevalence	25	1%	1%	1%	1%
	50	2%	2%	2%	2%
	75	3%	4%	4%	4%

Girl's Gymnastics

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	100	92	91	93
	Missing	312	320	321	319
Mean Participation Prevalence		3.7%	3.5%	2.9%	2.6%
Std. Error of Mean		0.4%	0.3%	0.3%	0.3%
Median Participation Prevalence		3%	3%	2%	2%
Percentiles of Participation Prevalence	25	1%	1%	1%	1%
	50	3%	3%	2%	2%
	75	5%	5%	4%	3%

Girl's Hockey (not reported in 2000-2001)

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	Not Reported	5	8	9
	Missing	Not Reported	407	404	403
Mean Participation Prevalence		Not Reported	3.7%	4.0%	2.8%
Std. Error of Mean		Not Reported	0.7%	1.1%	0.7%
Median Participation Prevalence		Not Reported	3%	3%	3%
Percentiles of Participation Prevalence	25	Not Reported	2%	2%	1%
	50	Not Reported	3%	3%	3%
	75	Not Reported	5%	7%	4%

Girl's Soccer

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	170	175	145	187
	Missing	242	237	267	225
Mean Participation Prevalence		11.7%	10.7%	24.0%	6.4%
Std. Error of Mean		0.5%	0.5%	2.2%	0.4%
Median Participation Prevalence		10%	9%	17%	5%
Percentiles of Participation Prevalence	25	7%	6%	7%	3%
	50	10%	9%	17%	5%
	75	14%	13%	30%	8%

Girl's Softball

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	379	374	379	363
	Missing	33	38	33	49
Mean Participation Prevalence		15.6%	14.1%	11.8%	9.2%
Std. Error of Mean		0.5%	0.5%	0.5%	0.4%
Median Participation Prevalence		14%	12%	9%	7%
Percentiles of Participation Prevalence	25	9%	7%	5%	4%
	50	14%	12%	9%	7%
	75	21%	18%	16%	13%

Girl's Swimming

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	129	125	121	135
	Missing	283	287	291	277
Mean Participation Prevalence		5.3%	5.4%	4.6%	4.5%
Std. Error of Mean		0.3%	0.3%	0.3%	0.5%
Median Participation Prevalence		5%	5%	4%	3%
Percentiles of Participation Prevalence	25	3%	3%	3%	2%
	50	5%	5%	4%	3%
	75	7%	7%	6%	5%

Girl's Tennis

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	153	155	157	159
	Missing	259	257	255	253
Mean Participation Prevalence		5.6%	6.5%	6.2%	5.1%
Std. Error of Mean		0.3%	0.3%	0.3%	0.3%
Median Participation Prevalence		5%	6%	5%	4%
Percentiles of Participation Prevalence	25	2%	4%	4%	3%
	50	5%	6%	5%	4%
	75	8%	8%	8%	6%

Girl's Track

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	362	360	368	358
	Missing	50	52	44	54
Mean Participation Prevalence		12.2%	11.8%	9.5%	7.7%
Std. Error of Mean		0.5%	0.5%	0.4%	0.3%
Median Participation Prevalence		10%	9%	7%	6%
Percentiles of Participation Prevalence	25	6%	5%	4%	4%
	50	10%	9%	7%	6%
	75	16%	14%	13%	10%

Girl's Volleyball

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	398	390	390	400
	Missing	14	22	22	12
Mean Participation Prevalence		27.6%	21.0%	15.2%	12.9%
Std. Error of Mean		0.9%	0.7%	0.7%	0.6%
Median Participation Prevalence		24%	18%	11%	9%
Percentiles of Participation Prevalence	25	14%	10%	5%	4%
	50	24%	18%	11%	9%
	75	37%	29%	22%	18%

Boy's Basketball

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	409	399	401	407
	Missing	3	13	11	5
Mean Participation Prevalence		21.1%	17.0%	13.6%	12.2%
Std. Error of Mean		0.8%	0.6%	0.6%	0.6%
Median Participation Prevalence		18%	14%	10%	9%
Percentiles of Participation Prevalence	25	11%	8%	5%	4%
	50	18%	14%	10%	9%
	75	26%	22%	19%	16%

Boy's Baseball (Spring)

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	301	310	316	306
	Missing	111	102	96	106
Mean Participation Prevalence		14.8%	14.2%	12.7%	12.4%
Std. Error of Mean		0.6%	0.6%	0.5%	0.7%
Median Participation Prevalence		13%	11%	10%	10%
Percentiles of Participation Prevalence	25	8%	7%	6%	5%
	50	13%	11%	10%	10%
	75	20%	19%	17%	16%

Boy's Baseball (Summer)

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	86	78	77	75
	Missing	326	334	335	337
Mean Participation Prevalence		12.7%	11.8%	9.8%	8.0%
Std. Error of Mean		0.9%	0.7%	0.8%	0.7%
Median Participation Prevalence		11%	10%	8%	6%
Percentiles of Participation Prevalence	25	8%	7%	5%	4%
	50	11%	10%	8%	6%
	75	16%	14%	12%	10%

Boy's Cross Country

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	310	321	319	326
	Missing	102	91	93	86
Mean Participation Prevalence		4.1%	4.8%	5.0%	5.0%
Std. Error of Mean		0.3%	0.2%	0.3%	0.3%
Median Participation Prevalence		3%	4%	4%	4%
Percentiles of Participation Prevalence	25	1%	2%	2%	2%
	50	3%	4%	4%	4%
	75	5%	6%	7%	7%

Boy's Football

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	392	384	389	391
	Missing	20	28	23	21
Mean Participation Prevalence		34.4%	28.9%	24.4%	23.6%
Std. Error of Mean		1.2%	1.4%	0.8%	0.8%
Median Participation Prevalence		32%	25%	21%	19%
Percentiles of Participation Prevalence	25	22%	17%	14%	13%
	50	32%	25%	21%	19%
	75	43%	33%	31%	31%

Boy's Golf

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	301	305	306	297
	Missing	111	107	106	115
Mean Participation Prevalence		9.0%	8.8%	7.9%	6.3%
Std. Error of Mean		0.4%	0.4%	0.5%	0.4%
Median Participation Prevalence		7%	7%	5%	5%
Percentiles of Participation Prevalence	25	4%	3%	3%	2%
	50	7%	7%	5%	5%
	75	12%	12%	10%	8%

Boy's Hockey

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	81	81	79	92
	Missing	331	331	333	320
Mean Participation Prevalence		2.9%	5.0%	4.7%	3.9%
Std. Error of Mean		0.4%	0.5%	0.4%	0.3%
Median Participation Prevalence		2%	4%	4%	4%
Percentiles of Participation Prevalence	25	1%	2%	2%	1%
	50	2%	4%	4%	4%
	75	4%	6%	7%	5%

Boy's Soccer

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	182	182	185	189
	Missing	230	230	227	223
Mean Participation Prevalence		10.4%	10.4%	8.7%	8.1%
Std. Error of Mean		0.7%	0.7%	0.5%	0.5%
Median Participation Prevalence		8%	8%	7%	6%
Percentiles of Participation Prevalence	25	5%	6%	5%	4%
	50	8%	8%	7%	6%
	75	13%	12%	10%	9%

Boy's Swimming

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	109	103	103	105
	Missing	303	309	309	307
Mean Participation Prevalence		2.8%	2.9%	3.3%	3.1%
Std. Error of Mean		0.3%	0.2%	0.2%	0.2%
Median Participation Prevalence		2%	3%	3%	3%
Percentiles of Participation Prevalence	25	1%	1%	1%	1%
	50	2%	3%	3%	3%
	75	4%	4%	4%	4%

Boy's Tennis

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	150	143	149	145
	Missing	262	269	263	267
Mean Participation Prevalence		4.2%	5.1%	4.8%	4.8%
Std. Error of Mean		0.3%	0.5%	0.3%	0.4%
Median Participation Prevalence		4%	4%	4%	4%
Percentiles of Participation Prevalence	25	2%	2%	2%	2%
	50	4%	4%	4%	4%
	75	5%	6%	6%	6%

Boy's Track

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	362	358	363	352
	Missing	50	54	49	60
Mean Participation Prevalence		11.2%	11.7%	11.2%	9.8%
Std. Error of Mean		0.4%	0.4%	0.4%	0.4%
Median Participation Prevalence		10%	10%	9%	8%
Percentiles of Participation Prevalence	25	6%	6%	6%	5%
	50	10%	10%	9%	8%
	75	15%	14%	14%	13%

Boy's Volleyball

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	33	39	39	37
	Missing	379	373	373	375
Mean Participation Prevalence		5.1%	4.8%	3.6%	3.0%
Std. Error of Mean		1.0%	0.7%	0.3%	0.3%
Median Participation Prevalence		4%	3%	3%	3%
Percentiles of Participation Prevalence	25	2%	2%	2%	2%
	50	4%	3%	3%	3%
	75	5%	6%	5%	4%

Boy's Wrestling

		Grade 9	Grade 10	Grade 11	Grade 12
Number of Schools	Valid	315	318	308	320
	Missing	97	94	104	92
Mean Participation Prevalence		8.5%	7.9%	7.1%	6.8%
Std. Error of Mean		0.3%	0.3%	0.3%	0.3%
Median Participation Prevalence		7%	6%	6%	5%
Percentiles of Participation Prevalence	25	4%	3%	3%	3%
	50	7%	6%	6%	5%
	75	11%	11%	10%	9%

APPENDIX B: Calculation of School Size Tertiles

Total Enrollment for Each Grade of Interest

		TotoalCOUNT S9	TotoalCOUNT S10	TotoalCOUNT S11	TotoalCOUNT S12
N	Valid	412	412	412	412
	Missing	0	0	0	0
Mean		175.04	163.28	155.12	150.46
Std. Deviation		156.799	137.743	126.814	124.225
Percentiles	33.33	71.65	70.00	69.00	68.00
	66.66	193.53	187.31	182.31	165.31

Calculation of Average Enrollment

AvgEnrollment4years =
 MEAN(TotoalCOUNTS9, TotoalCOUNTS10, TotoalCOUNTS11, TotoalCOUNTS12)

Output of Average Enrollment, Showing Tertiles as A Percent of Total Class Enrollment

AvgEnrollment4years

N	Valid	412
	Missing	0
Mean		160.9782
Std. Deviation		134.49638
Percentiles	33.33	70.8264
	66.66	182.2293

Therefore, schools with less than 71 students in the average class are defined as “small” schools, schools with an average class size from 71 to 182 are defined as “medium” schools, and schools with 182 or more students in the average class are defined as “large” schools.

APPENDIX C: Participation by Sport Stratified by School Size

Girl's Basketball

	Grade	9	10	11	12
Small	Mean Participation Prevalence	32.3%	29.2%	22.2%	18.0%
	Standard Error of Mean	1.4%	2.3%	1.3%	1.2%
	Count	137	137	137	137
	Valid N	N=133	N=130	N=132	N=134
Medium	Mean Participation Prevalence	20.7%	15.9%	10.2%	7.6%
	Standard Error of Mean	0.6%	0.5%	0.5%	0.4%
	Count	138	138	138	138
	Valid N	N=135	N=131	N=133	N=135
Large	Mean Participation Prevalence	10.1%	7.6%	4.4%	3.3%
	Standard Error of Mean	0.4%	0.3%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=135	N=136	N=134	N=134

Girl's Cross Country

	Grade	9	10	11	12
Small	Mean Participation Prevalence	5.4%	7.7%	7.3%	6.2%
	Standard Error of Mean	0.8%	1.1%	1.0%	0.9%
	Count	137	137	137	137
	Valid N	N=71	N=67	N=62	N=70
Medium	Mean Participation Prevalence	4.1%	4.5%	4.9%	4.6%
	Standard Error of Mean	0.3%	0.4%	0.4%	0.3%
	Count	138	138	138	138
	Valid N	N=120	N=118	N=121	N=126
Large	Mean Participation Prevalence	2.7%	3.2%	3.3%	3.0%
	Standard Error of Mean	0.2%	0.2%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=124	N=126	N=127	N=129

Girl's Golf##

	Grade	9	10	11	12
Small	Mean Participation Prevalence	5.3%	4.7%	10.8%	1.8%
	Standard Error of Mean	1.4%	0.9%	4.4%	1.8%
	Count	137	137	137	137
	Valid N	N=2	N=3	N=6	N=2
Medium	Mean Participation Prevalence	4.3%	5.7%	5.5%	5.1%
	Standard Error of Mean	0.6%	0.6%	0.7%	0.7%
	Count	138	138	138	138
	Valid N	N=35	N=36	N=37	N=41
Large	Mean Participation Prevalence	1.5%	1.6%	1.9%	1.6%
	Standard Error of Mean	0.1%	0.1%	0.2%	0.1%
	Count	137	137	137	137
	Valid N	N=77	N=82	N=81	N=86

Girl's Gymnastics##

	Grade	9	10	11	12
Small	Mean Participation Prevalence	2.2%	2.8%	8.4%	3.9%
	Standard Error of Mean	1.5%	1.8%	4.1%	0.7%
	Count	137	137	137	137
	Valid N	N=5	N=4	N=2	N=2
Medium	Mean Participation Prevalence	6.3%	5.5%	4.9%	4.7%
	Standard Error of Mean	0.8%	0.7%	1.0%	0.8%
	Count	138	138	138	138
	Valid N	N=24	N=21	N=22	N=24
Large	Mean Participation Prevalence	3.0%	2.8%	2.1%	1.8%
	Standard Error of Mean	0.4%	0.2%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=71	N=67	N=67	N=67

Girl's Hockey (not reported in 2000-2001, zero programs among small schools)##

	Grade	9	10	11	12
Medium	Mean Participation Prevalence	Not Reported	5.3%	4.6%	1.6%
	Standard Error of Mean	Not Reported	.	4.6%	1.6%
	Count	Not Reported	138	138	138
	Valid N	Not Reported	N=1	N=2	N=3
Large	Mean Participation Prevalence	Not Reported	3.3%	3.7%	3.3%
	Standard Error of Mean	Not Reported	0.8%	0.9%	0.6%
	Count	Not Reported	137	137	137
	Valid N	Not Reported	N=4	N=6	N=6

Girl's Soccer##

	Grade	9	10	11	12
Small	Mean Participation Prevalence	19.9%	22.9%	42.8%	12.2%
	Standard Error of Mean	3.8%	4.5%	4.4%	2.1%
	Count	137	137	137	137
	Valid N	N=9	N=10	N=57	N=15
Medium	Mean Participation Prevalence	15.2%	13.1%	16.6%	10.0%
	Standard Error of Mean	1.3%	1.0%	1.1%	0.9%
	Count	138	138	138	138
	Valid N	N=40	N=45	N=51	N=51
Large	Mean Participation Prevalence	9.9%	8.7%	5.4%	4.2%
	Standard Error of Mean	0.5%	0.4%	0.5%	0.2%
	Count	137	137	137	137
	Valid N	N=121	N=120	N=37	N=121

Girl's Softball

	Grade	9	10	11	12
Small	Mean Participation Prevalence	21.6%	20.8%	19.2%	15.7%
	Standard Error of Mean	1.1%	1.1%	1.1%	1.0%
	Count	137	137	137	137
	Valid N	N=119	N=120	N=121	N=109
Medium	Mean Participation Prevalence	16.8%	14.5%	11.5%	9.1%
	Standard Error of Mean	0.7%	0.7%	0.6%	0.4%
	Count	138	138	138	138
	Valid N	N=127	N=123	N=128	N=123
Large	Mean Participation Prevalence	9.1%	7.5%	5.4%	4.0%
	Standard Error of Mean	0.4%	0.3%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=133	N=131	N=130	N=131

Girl's Swimming##

	Grade	9	10	11	12
Small	Mean Participation Prevalence	1.0%	6.7%	0.0%	11.2%
	Standard Error of Mean	1.0%	3.6%	0.0%	9.8%
	Count	137	137	137	137
	Valid N	N=3	N=2	N=2	N=6
Medium	Mean Participation Prevalence	6.4%	5.8%	6.0%	4.8%
	Standard Error of Mean	1.2%	1.4%	1.1%	0.9%
	Count	138	138	138	138
	Valid N	N=21	N=18	N=18	N=23
Large	Mean Participation Prevalence	5.2%	5.3%	4.5%	4.1%
	Standard Error of Mean	0.3%	0.3%	0.2%	0.4%
	Count	137	137	137	137
	Valid N	N=105	N=105	N=101	N=106

Girl's Tennis##

	Grade	9	10	11	12
Small	Mean Participation Prevalence	8.2%	7.8%	9.7%	5.6%
	Standard Error of Mean	1.8%	1.3%	5.4%	2.2%
	Count	137	137	137	137
	Valid N	N=2	N=2	N=2	N=4
Medium	Mean Participation Prevalence	8.3%	9.9%	9.8%	8.6%
	Standard Error of Mean	0.8%	0.9%	0.8%	0.9%
	Count	138	138	138	138
	Valid N	N=28	N=31	N=32	N=32
Large	Mean Participation Prevalence	5.0%	5.6%	5.2%	4.2%
	Standard Error of Mean	0.3%	0.3%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=123	N=122	N=123	N=123

Girl's Track

	Grade	9	10	11	12
Small	Mean Participation Prevalence	17.8%	19.4%	13.9%	12.0%
	Standard Error of Mean	1.2%	1.5%	1.0%	0.9%
	Count	137	137	137	137
	Valid N	N=99	N=101	N=102	N=96
Medium	Mean Participation Prevalence	13.1%	10.8%	9.7%	8.0%
	Standard Error of Mean	0.7%	0.6%	0.6%	0.5%
	Count	138	138	138	138
	Valid N	N=131	N=131	N=134	N=130
Large	Mean Participation Prevalence	7.1%	6.7%	5.8%	4.4%
	Standard Error of Mean	0.4%	0.3%	0.3%	0.2%
	Count	137	137	137	137
	Valid N	N=132	N=128	N=132	N=132

Girl's Volleyball

	Grade	9	10	11	12
Small	Mean Participation Prevalence	43.5%	35.0%	27.4%	24.3%
	Standard Error of Mean	1.8%	1.4%	1.3%	1.2%
	Count	137	137	137	137
	Valid N	N=132	N=126	N=127	N=132
Medium	Mean Participation Prevalence	27.4%	20.3%	13.8%	11.1%
	Standard Error of Mean	0.8%	0.6%	0.6%	0.5%
	Count	138	138	138	138
	Valid N	N=132	N=131	N=131	N=133
Large	Mean Participation Prevalence	12.2%	8.3%	4.8%	3.7%
	Standard Error of Mean	0.6%	0.3%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=134	N=133	N=132	N=135

Boy's Basketball

	Grade	9	10	11	12
Small	Mean Participation Prevalence	30.6%	27.8%	24.5%	21.4%
	Standard Error of Mean	1.2%	1.2%	1.4%	1.0%
	Count	137	137	137	137
	Valid N	N=134	N=131	N=130	N=136
Medium	Mean Participation Prevalence	22.6%	15.7%	11.6%	10.6%
	Standard Error of Mean	1.8%	0.5%	0.5%	0.8%
	Count	138	138	138	138
	Valid N	N=138	N=133	N=137	N=136
Large	Mean Participation Prevalence	10.2%	7.9%	5.1%	4.5%
	Standard Error of Mean	0.3%	0.2%	0.2%	0.3%
	Count	137	137	137	137
	Valid N	N=137	N=135	N=134	N=135

Boy's Baseball (Spring)

	Grade	9	10	11	12
Small	Mean Participation Prevalence	19.9%	21.1%	20.2%	20.7%
	Standard Error of Mean	1.2%	1.2%	1.1%	1.1%
	Count	137	137	137	137
	Valid N	N=106	N=108	N=108	N=101
Medium	Mean Participation Prevalence	15.0%	13.9%	12.3%	12.1%
	Standard Error of Mean	0.7%	0.6%	0.6%	1.5%
	Count	138	138	138	138
	Valid N	N=100	N=101	N=107	N=105
Large	Mean Participation Prevalence	8.8%	7.2%	5.1%	4.4%
	Standard Error of Mean	0.4%	0.3%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=95	N=101	N=101	N=100

Boy's Baseball (Summer)##

	Grade	9	10	11	12
Small	Mean Participation Prevalence	18.8%	16.0%	16.3%	15.7%
	Standard Error of Mean	2.6%	2.1%	1.5%	1.8%
	Count	137	137	137	137
	Valid N	N=16	N=15	N=15	N=14
Medium	Mean Participation Prevalence	14.0%	13.1%	11.6%	8.7%
	Standard Error of Mean	1.4%	1.2%	1.4%	0.9%
	Count	138	138	138	138
	Valid N	N=31	N=30	N=28	N=27
Large	Mean Participation Prevalence	9.2%	8.6%	5.5%	4.3%
	Standard Error of Mean	0.8%	0.5%	0.4%	0.3%
	Count	137	137	137	137
	Valid N	N=39	N=33	N=34	N=34

Boy's Cross Country

	Grade	9	10	11	12
Small	Mean Participation Prevalence	6.9%	7.2%	6.6%	6.7%
	Standard Error of Mean	0.9%	0.8%	0.9%	0.9%
	Count	137	137	137	137
	Valid N	N=70	N=69	N=70	N=70
Medium	Mean Participation Prevalence	4.1%	5.3%	5.7%	5.8%
	Standard Error of Mean	0.3%	0.3%	0.3%	0.4%
	Count	138	138	138	138
	Valid N	N=114	N=122	N=122	N=128
Large	Mean Participation Prevalence	2.4%	3.1%	3.5%	3.4%
	Standard Error of Mean	0.2%	0.2%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=126	N=130	N=127	N=128

Boy's Football

	Grade	9	10	11	12
Small	Mean Participation Prevalence	43.0%	39.7%	37.5%	36.0%
	Standard Error of Mean	1.7%	1.7%	1.6%	1.5%
	Count	137	137	137	137
	Valid N	N=119	N=116	N=120	N=119
Medium	Mean Participation Prevalence	39.4%	31.8%	23.5%	23.8%
	Standard Error of Mean	2.9%	3.6%	0.8%	1.1%
	Count	138	138	138	138
	Valid N	N=136	N=132	N=134	N=136
Large	Mean Participation Prevalence	22.0%	17.0%	13.6%	12.5%
	Standard Error of Mean	0.7%	0.6%	0.4%	0.4%
	Count	137	137	137	137
	Valid N	N=137	N=136	N=135	N=136

Boy's Golf

	Grade	9	10	11	12
Small	Mean Participation Prevalence	17.2%	16.6%	16.9%	13.2%
	Standard Error of Mean	1.5%	1.4%	1.7%	1.6%
	Count	137	137	137	137
	Valid N	N=57	N=61	N=60	N=54
Medium	Mean Participation Prevalence	9.1%	9.0%	8.1%	6.8%
	Standard Error of Mean	0.5%	0.5%	0.5%	0.4%
	Count	138	138	138	138
	Valid N	N=113	N=114	N=117	N=116
Large	Mean Participation Prevalence	5.3%	4.9%	3.5%	3.0%
	Standard Error of Mean	0.3%	0.4%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=131	N=130	N=129	N=127

Boy's Hockey##

	Grade	9	10	11	12
Small	Mean Participation Prevalence	1.6%	1.1%	2.7%	1.0%
	Standard Error of Mean	1.6%	1.1%	2.1%	1.0%
	Count	137	137	137	137
	Valid N	N=2	N=4	N=7	N=4
Medium	Mean Participation Prevalence	5.0%	8.1%	7.4%	5.5%
	Standard Error of Mean	1.3%	1.7%	1.2%	0.9%
	Count	138	138	138	138
	Valid N	N=19	N=16	N=16	N=24
Large	Mean Participation Prevalence	2.3%	4.4%	4.2%	3.5%
	Standard Error of Mean	0.3%	0.4%	0.3%	0.3%
	Count	137	137	137	137
	Valid N	N=60	N=61	N=56	N=64

Boy's Soccer

	Grade	9	10	11	12
Small	Mean Participation Prevalence	25.1%	32.6%	21.6%	22.5%
	Standard Error of Mean	6.5%	7.2%	4.6%	5.5%
	Count	137	137	137	137
	Valid N	N=12	N=13	N=13	N=13
Medium	Mean Participation Prevalence	11.5%	10.5%	10.2%	9.8%
	Standard Error of Mean	1.2%	0.8%	0.8%	0.7%
	Count	138	138	138	138
	Valid N	N=47	N=46	N=49	N=50
Large	Mean Participation Prevalence	8.5%	8.0%	6.8%	6.0%
	Standard Error of Mean	0.4%	0.3%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=123	N=123	N=123	N=126

Boy's Swimming###

	Grade	9	10	11	12
Small	Mean Participation Prevalence	.	.	0.0%	7.1%
	Standard Error of Mean	.	.	.	7.1%
	Count	137	137	137	137
	Valid N	N=0	N=0	N=1	N=2
Medium	Mean Participation Prevalence	3.3%	3.6%	5.3%	4.5%
	Standard Error of Mean	0.8%	1.0%	1.0%	0.9%
	Count	138	138	138	138
	Valid N	N=14	N=14	N=12	N=14
Large	Mean Participation Prevalence	2.7%	2.8%	3.0%	2.8%
	Standard Error of Mean	0.3%	0.2%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=95	N=89	N=90	N=89

Boy's Tennis###

	Grade	9	10	11	12
Small	Mean Participation Prevalence	14.8%	31.4%	15.0%	14.1%
	Standard Error of Mean	4.3%	10.0%	15.0%	10.0%
	Count	137	137	137	137
	Valid N	N=2	N=3	N=2	N=3
Medium	Mean Participation Prevalence	5.4%	6.3%	7.2%	7.7%
	Standard Error of Mean	0.9%	1.0%	0.8%	1.1%
	Count	138	138	138	138
	Valid N	N=28	N=26	N=25	N=29
Large	Mean Participation Prevalence	3.7%	4.1%	4.1%	3.8%
	Standard Error of Mean	0.2%	0.3%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=120	N=114	N=122	N=113

Boy's Track

	Grade	9	10	11	12
Small	Mean Participation Prevalence	14.4%	16.3%	16.3%	13.2%
	Standard Error of Mean	1.0%	1.2%	1.2%	1.0%
	Count	137	137	137	137
	Valid N	N=102	N=98	N=100	N=94
Medium	Mean Participation Prevalence	12.6%	12.3%	11.3%	11.3%
	Standard Error of Mean	0.6%	0.5%	0.5%	0.7%
	Count	138	138	138	138
	Valid N	N=129	N=131	N=130	N=127
Large	Mean Participation Prevalence	7.2%	7.6%	7.4%	6.0%
	Standard Error of Mean	0.3%	0.3%	0.3%	0.2%
	Count	137	137	137	137
	Valid N	N=131	N=129	N=133	N=131

Boy's Volleyball (zero programs among small schools)##

	Grade	9	10	11	12
Medium	Mean Participation Prevalence	25.0%	17.2%	1.2%	1.3%
	Standard Error of Mean	2.3%	4.0%	.	.
	Count	138	138	138	138
	Valid N	N=2	N=3	N=1	N=1
Large	Mean Participation Prevalence	3.8%	3.7%	3.6%	3.1%
	Standard Error of Mean	0.4%	0.3%	0.3%	0.3%
	Count	137	137	137	137
	Valid N	N=31	N=36	N=38	N=36

Boy's Wrestling

	Grade	9	10	11	12
Small	Mean Participation Prevalence	11.6%	11.8%	11.2%	10.9%
	Standard Error of Mean	0.9%	1.0%	1.0%	0.9%
	Count	137	137	137	137
	Valid N	N=76	N=73	N=67	N=77
Medium	Mean Participation Prevalence	9.8%	8.7%	8.2%	7.7%
	Standard Error of Mean	0.5%	0.4%	0.5%	0.5%
	Count	138	138	138	138
	Valid N	N=114	N=120	N=116	N=115
Large	Mean Participation Prevalence	5.4%	4.8%	4.0%	3.5%
	Standard Error of Mean	0.2%	0.2%	0.2%	0.2%
	Count	137	137	137	137
	Valid N	N=125	N=125	N=125	N=128

NOTE:

signifies small number (n<20) in one or more years

APPENDIX D: Participation by Sport by School Size for Shared Gender and All Sports

Example Calculation

Shared Gender Sport for 9th Grade Males =

$$\frac{\text{SUM}(\text{Basketball, Baseball-Spring, Golf, Soccer, Swimming, Tennis, Track, Volleyball, Cross Country})}{\text{Shared Gender Sport for 9}^{\text{th}} \text{ Grade Males} / (3 \text{ seasons} * \text{TOTALM9})}$$

Shared Gender Sports for Females

	Grade	9	10	11	12
Small	Mean Participation Prevalence	36.4%	32.9%	32.2%	22.4%
	Standard Error of Mean	1.1%	1.2%	1.4%	0.9%
	Count	137	137	137	137
	Valid N	N=137	N=136	N=136	N=137
Medium	Mean Participation Prevalence	29.1%	23.9%	19.6%	15.5%
	Standard Error of Mean	0.7%	0.6%	0.7%	0.4%
	Count	138	138	138	138
	Valid N	N=136	N=135	N=136	N=136
Large	Mean Participation Prevalence	19.3%	16.7%	11.1%	9.8%
	Standard Error of Mean	0.6%	0.5%	0.3%	0.3%
	Count	137	137	137	137
	Valid N	N=137	N=136	N=137	N=137

Shared Gender Sports for Males

	Grade	9	10	11	12
Small	Mean Participation Prevalence	23.2%	23.4%	21.5%	18.9%
	Standard Error of Mean	0.9%	0.8%	0.8%	0.7%
	Count	137	137	137	137
	Valid N	N=136	N=136	N=136	N=137
Medium	Mean Participation Prevalence	20.6%	18.4%	16.3%	16.1%
	Standard Error of Mean	0.8%	0.5%	0.5%	1.1%
	Count	138	138	138	138
	Valid N	N=138	N=136	N=138	N=138
Large	Mean Participation Prevalence	14.7%	13.9%	11.8%	10.2%
	Standard Error of Mean	0.5%	0.4%	0.3%	0.3%
	Count	137	137	137	137
	Valid N	N=137	N=136	N=136	N=137

All Sports for Females (Except Hockey)

	Grade	9	10	11	12
Small	Mean Participation Prevalence	36.4%	33.0%	32.2%	22.4%
	Standard Error of Mean	1.1%	1.2%	1.4%	0.9%
	Count	137	137	137	137
	Valid N	N=137	N=136	N=136	N=137
Medium	Mean Participation Prevalence	29.5%	24.0%	19.9%	15.8%
	Standard Error of Mean	0.7%	0.6%	0.7%	0.5%
	Count	138	138	138	138
	Valid N	N=136	N=136	N=136	N=136
Large	Mean Participation Prevalence	19.8%	17.1%	11.4%	10.1%
	Standard Error of Mean	0.7%	0.5%	0.3%	0.3%
	Count	137	137	137	137
	Valid N	N=137	N=136	N=137	N=137

All Sports for Males

	Grade	9	10	11	12
Small	Mean Participation Prevalence	38.4%	37.4%	35.1%	31.9%
	Standard Error of Mean	1.1%	1.1%	1.0%	1.0%
	Count	137	137	137	137
	Valid N	N=137	N=136	N=136	N=137
Medium	Mean Participation Prevalence	37.6%	32.3%	27.3%	26.9%
	Standard Error of Mean	1.4%	1.4%	0.7%	1.4%
	Count	138	138	138	138
	Valid N	N=138	N=137	N=138	N=138
Large	Mean Participation Prevalence	24.9%	22.4%	18.6%	16.3%
	Standard Error of Mean	0.8%	0.6%	0.5%	0.4%
	Count	137	137	137	137
	Valid N	N=137	N=136	N=136	N=137

**APPENDIX E: Results of Paired Sample 2 Tail T-Tests Among
a Cohort of Schools Reporting the Sport in Both 9th
(2000-2001) and 12th (2003-2004) Grade**

Season and Sport	Number of Schools	Mean	SE Mean	95% Confidence Interval		t	df	Significance (2-tailed)
				Lower	Upper			
FALL								
Volleyball Boy's	28	1.29	0.63	-0.01	2.60	2.04	27	5.1E-02
Golf Girl's	109	-0.35	0.50	-1.34	0.64	-0.70	108	4.8E-01
Swimming and Diving Girl's	122	1.31	0.36	0.60	2.02	3.63	121	4.2E-04 ***
Cross Country Girl's	295	-0.66	0.37	-1.39	0.07	-1.78	294	7.7E-02
Cross Country Boy's	295	-1.69	0.39	-2.47	-0.92	-4.30	294	2.3E-05 ***
Tennis Girl's	143	0.43	0.39	-0.35	1.20	1.09	142	2.8E-01
Soccer Boy's	170	2.07	0.42	1.25	2.90	4.95	169	1.8E-06 ***
Volleyball Girl's	28	11.02	0.48	10.09	11.96	23.16	389	3.2E-75 ***
Football Boy's	383	6.91	0.42	6.07	7.74	16.27	382	1.4E-45 ***
WINTER								
Gymnastics Girl's	84	2.55	0.55	1.44	3.65	4.59	83	1.6E-05 ***
Hockey Boy's	75	-2.91	0.63	-4.17	-1.65	-4.60	74	1.7E-05 ***
Swimming and Diving Boy's	95	-0.58	0.43	-1.45	0.28	-1.34	94	1.8E-01
Wrestling Boy's	296	2.22	0.28	1.66	2.77	7.89	295	6.1E-14 ***
Basketball Girl's	396	9.69	0.36	8.99	10.39	27.17	395	2.0E-92 ***
Basketball Boy's	403	7.15	0.40	6.36	7.93	17.89	402	4.6E-53 ***
Hockey Girl's-----	-----	-----not reported	1999-	2000-----				
SPRING								
Tennis Boy's	131	-0.92	0.44	-1.79	-0.05	-2.10	130	3.8E-02
Golf Boy's	273	3.09	0.37	2.37	3.81	8.43	272	2.1E-15 ***
Soccer Girl's	160	5.82	0.39	5.04	6.59	14.84	159	8.2E-32 ***
Baseball Boy's	280	2.59	0.43	1.73	3.44	5.97	279	7.1E-09 ***
Track and Field Girl's	337	4.18	0.41	3.37	5.00	10.10	344	3.6E-21 ***
Softball Girl's	353	5.85	0.35	5.15	6.55	16.52	352	8.7E-46 ***
Track and Field Boy's	337	0.86	0.40	0.07	1.64	2.15	336	3.2E-02
SUMMER								
Baseball Boy's	74	4.49	0.70	3.09	5.89	6.38	73	1.4E-08 ***

*** p≤0.001

**APPENDIX F: Risk Ratios and Attrition from 9th (2000-2001)
to 12th grade (2003-2004)**

Girl's Shared Gender Sports

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	19.3%	16.7%	11.1%	9.8%	-49.5%
medium	29.1%	23.9%	19.6%	15.5%	-46.7%
small	36.4%	32.9%	32.2%	22.4%	-38.5%
Risk Ratio small vs. large	1.9	2.0	2.9	2.3	

Boy's Shared Gender Sports

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	14.7%	13.9%	11.8%	10.2%	-30.8%
medium	20.6%	18.4%	16.3%	16.1%	-22.2%
small	23.2%	23.4%	21.5%	18.9%	-18.5%
Risk Ratio small vs. large	1.6	1.7	1.8	1.9	

All Girl's Sports (Except Hockey)

	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	19.8%	17.1%	11.4%	10.1%	-49.3%
medium	29.5%	24.0%	19.9%	15.8%	-46.4%
small	36.4%	33.0%	32.2%	22.4%	-38.5%
Risk Ratio small vs. large	1.8	1.9	2.8	2.2	

All Boy's Sports

	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	24.9%	22.4%	18.6%	16.3%	-34.5%
medium	37.6%	32.3%	27.3%	26.9%	-28.4%
small	38.4%	37.4%	35.1%	31.9%	-16.9%
Risk Ratio small vs. large	1.5	1.7	1.9	2.0	

Girl's Basketball

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	10.1%	7.6%	4.4%	3.3%	-67.6%
medium	20.7%	15.9%	10.2%	7.6%	-63.3%
small	32.3%	29.2%	22.2%	18.0%	-44.1%
Risk Ratio small vs. large	3.2	3.9	5.0	5.5	

Girl's Cross Country

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	2.7%	3.2%	3.3%	3.0%	11.8%
medium	4.1%	4.5%	4.9%	4.6%	10.5%
small	5.4%	7.7%	7.3%	6.2%	13.8%
Risk Ratio small vs. large	2.0	2.4	2.2	2.1	

Girl's Golf###

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	1.5%	1.6%	1.9%	1.6%	12.8%
medium	4.3%	5.7%	5.5%	5.1%	18.9%
small	5.3%	4.7%	10.8%	1.8%	-66.0%
Risk Ratio small vs. large##	3.6	2.9	5.6	1.1	
Risk Ratio medium vs. large	3.0	3.5	2.8	3.1	

Girl's Gymnastics##

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	3.0%	2.8%	2.1%	1.8%	-38.6%
medium	6.3%	5.5%	4.9%	4.7%	-25.5%
small	2.2%	2.8%	8.4%	3.9%	74.4%
Risk Ratio small vs. large##	0.8	1.0	4.1	2.1	
Risk Ratio medium vs. large	2.1	1.9	2.4	2.6	

Girl's Hockey (not reported)

Girl's Soccer##

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	9.9%	8.7%	5.4%	4.2%	-57.5%
medium	15.2%	13.1%	16.6%	10.0%	-34.4%
small	19.9%	22.9%	42.8%	12.2%	-38.9%
Risk Ratio small vs. large##	2.0	2.6	7.9	2.9	
Risk Ratio medium vs. large	1.5	1.5	3.1	2.4	

Girl's Softball

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	9.1%	7.5%	5.4%	4.0%	-56.3%
medium	16.8%	14.5%	11.5%	9.1%	-46.1%
small	21.6%	20.8%	19.2%	15.7%	-27.1%
Risk Ratio small vs. large	2.4	2.8	3.6	3.9	

Girl's Swimming##

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	5.2%	5.3%	4.5%	4.1%	-20.8%
medium	6.4%	5.8%	6.0%	4.8%	-24.9%
small	1.0%	6.7%	0.0%	11.2%	1005.8%
Risk Ratio small vs. large##	0.2	1.3	0.0	2.7	
Risk Ratio medium vs. large##	1.2	1.1	1.3	1.2	

Girl's Tennis##

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	5.0%	5.6%	5.2%	4.2%	-16.1%
medium	8.3%	9.9%	9.8%	8.6%	3.0%
small	8.2%	7.8%	9.7%	5.6%	-32.0%
Risk Ratio small vs. large##	1.7	1.4	1.9	1.3	
Risk Ratio medium vs. large	1.7	1.8	1.9	2.1	

Girl's Track

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
large	7.1%	6.7%	5.8%	4.4%	-38.2%
medium	13.1%	10.8%	9.7%	8.0%	-38.9%
small	17.8%	19.4%	13.9%	12.0%	-32.3%
Rate Ratio small vs. large	2.5	2.9	2.4	2.8	

Girl's Volleyball

Grade					Attrition in Prevalence of Participation by School Size, 9th to 12th grade
	9	10	11	12	
large	12.2%	8.3%	4.8%	3.7%	-70.0%
medium	27.4%	20.3%	13.8%	11.1%	-59.5%
small	43.5%	35.0%	27.4%	24.3%	-44.3%
Risk Ratio small vs. large	3.6	4.2	5.7	6.6	

Boy's Basketball

Grade					Attrition in Prevalence of Participation by School Size, 9th to 12th grade
	9	10	11	12	
large	10.2%	7.9%	5.1%	4.5%	-56.5%
medium	22.6%	15.7%	11.6%	10.6%	-53.0%
small	30.6%	27.8%	24.5%	21.4%	-30.0%
Risk Ratio small vs. large	3.0	3.5	4.8	4.8	

Boy's Baseball (Spring)

Grade					Attrition in Prevalence of Participation by School Size, 9th to 12th grade
	9	10	11	12	
large	8.8%	7.2%	5.1%	4.4%	-49.6%
medium	15.0%	13.9%	12.3%	12.1%	-19.8%
small	19.9%	21.1%	20.2%	20.7%	3.9%
Risk Ratio small vs. large	2.3	2.9	3.9	4.7	

Boy's Baseball (Summer)##

Grade					Attrition in Prevalence of Participation by School Size, 9th to 12th grade
	9	10	11	12	
large	9.2%	8.6%	5.5%	4.3%	-53.0%
medium	14.0%	13.1%	11.6%	8.7%	-37.7%
small	18.8%	16.0%	16.3%	15.7%	-16.6%
Risk Ratio small vs. large##	2.0	1.9	3.0	3.6	
Risk Ratio medium vs. large	1.5	1.5	2.1	2.0	

Boy's Cross Country

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
medium	4.1%	5.3%	5.7%	5.8%	39.5%
small	6.9%	7.2%	6.6%	6.7%	-1.7%
Risk Ratio small vs. large	2.8	2.3	1.9	2.0	

Boy's Football

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
medium	39.4%	31.8%	23.5%	23.8%	-39.7%
small	43.0%	39.7%	37.5%	36.0%	-16.5%
Risk Ratio small vs. large	2.0	2.3	2.8	2.9	

Boy's Golf

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
medium	9.1%	9.0%	8.1%	6.8%	-25.4%
small	17.2%	16.6%	16.9%	13.2%	-23.3%
Risk Ratio small vs. large	3.2	3.4	4.8	4.4	

Boy's Hockey##

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
medium	5.0%	8.1%	7.4%	5.5%	11.2%
small	1.6%	1.1%	2.7%	1.0%	-38.5%
Risk Ratio small vs. large##	0.7	0.2	0.6	0.3	
Risk Ratio medium vs. large##	2.2	1.8	1.7	1.6	

Boy's Soccer

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
medium	11.5%	10.5%	10.2%	9.8%	-14.6%
small	25.1%	32.6%	21.6%	22.5%	-10.5%
Risk Ratio small vs. large	2.9	4.1	3.2	3.8	

Boy's Swimming##

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
medium	3.3%	3.6%	5.3%	4.5%	35.8%
small	.	.	0.0%	7.1%	#VALUE!
Risk Ratio small vs. large##	#VALUE!	#VALUE!	0.0	2.5	
Risk Ratio medium vs. large##	1.2	1.3	1.8	1.6	

Boy's Tennis##

Grade	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
medium	5.4%	6.3%	7.2%	7.7%	41.0%
small	14.8%	31.4%	15.0%	14.1%	-5.0%
Risk Ratio small vs. large##	4.0	7.7	3.6	3.7	
Risk Ratio medium vs. large	1.5	1.6	1.7	2.0	

Boy's Track

	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
Grade					
large	7.2%	7.6%	7.4%	6.0%	-17.1%
medium	12.6%	12.3%	11.3%	11.3%	-10.6%
small	14.4%	16.3%	16.3%	13.2%	-8.2%
Risk Ratio small vs. large	2.0	2.2	2.2	2.2	

Boy's Volleyball##

	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
Grade					
large	3.8%	3.7%	3.6%	3.1%	-19.8%
medium	25.0%	17.2%	1.2%	1.3%	-94.9%
small	No Data	No Data	No Data	No Data	NA
Risk Ratio small vs. large##	NA	NA	NA	NA	
Risk Ratio medium vs. large##	6.6	4.6	0.3	0.4	

Boy's Wrestling

	9	10	11	12	Attrition in Prevalence of Participation by School Size, 9th to 12th grade
Grade					
large	5.4%	4.8%	4.0%	3.5%	-35.0%
medium	9.8%	8.7%	8.2%	7.7%	-21.4%
small	11.6%	11.8%	11.2%	10.9%	-6.0%
Risk Ratio small vs. large	2.2	2.5	2.8	3.1	

NOTE:

Signifies small number (n<20) for one of the four years

**Characteristics of School Sanctioned Sports:
Participation and Attrition in Wisconsin Public High Schools**

by
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A thesis, in journal article format, submitted in partial fulfillment
of the requirements for the degree of

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ABSTRACT

Background:

High school interscholastic sports participation has been associated with favorable health, social and academic outcomes in students. Despite the potential immediate and long-term benefits of high school participation, few studies have examined the epidemiology of sports participation through the course of high school.

Methods:

This research used a panel study design to prospectively follow students in 412 Wisconsin Public High Schools from 9th grade (2000-2001) to 12th grade (2003-2004). Participation prevalence in 9th grade and risk of attrition (defined as a reduction in prevalence) from 9th to 12th grade were determined by sport, gender and school size characteristics.

Results:

Participation in 9th grade was highest for boy's football (34.4%) and girl's volleyball (27.6%). Overall sports participation was greatest in smaller schools versus larger schools for both females (36% versus 20%) and males (38% versus 25%). Most high school sports exhibit declines in participation from 9th to 12th grade, including those sports with the highest prevalence of 9th grade participation. Small schools had a lower risk of attrition than large schools, but relative to their male classmates, this risk is much higher among females attending small schools compared to females attending large schools.

Conclusion:

This research indicates that school size is associated with both initial involvement and maintenance of sports involvement throughout high school. Better measurement of high

school sport participation and rates of attrition will permit policy makers to develop programs that promote physical activity among youth now, and in the future.

INTRODUCTION AND BACKGROUND

High school interscholastic sports participation has been associated with favorable health, social and academic outcomes in students (1-11). Furthermore, regular physical activity among children and adolescents with chronic disease risk factors has been associated with decreased blood pressure among those with borderline hypertension, increased physical fitness in obese children, and decreased degree of overweight among obese children (12-16).

In addition, high school sports participation may lead to higher rates of lifelong physical activity. Evidence suggests that children who adopt rewarding activity patterns as part of their lifestyle will tend to retain that orientation through adolescence and adulthood. Compared to non-participating peers, interscholastic athletes partake in an acquired experience, and this orientation toward experience is a strong predictor of adult physical activity (17-21). Given that regular physical activity is beneficial to health and well being throughout life, it is important to know what strategies work best to maintain lifelong physical activity.

Despite potential immediate and long-term benefits of high school participation, there is limited research that prospectively examines epidemiologic patterns of sports participation through high school (17, 22). The purpose of this report is to describe trends of interscholastic sports participation in Wisconsin public high schools, specifically participation prevalence in 9th grade and attrition from 9th to 12th grade by sport, gender and school characteristics. Measuring participation rates in high school sports can inform

policymakers on ways to promote physical activity among adolescents now, and in the future.

METHODS

This panel study of 412 Wisconsin Public High Schools prospectively examined participation prevalence in high school sports among 9th grade students in 2000-2001, and risk of attrition for these students when they reach 12th grade, in 2003-2004.

Study Population and Data

Publicly available data from two sources were linked for analysis: the Wisconsin Athletic Association (WIAA) sport participation data, and Wisconsin Department of Public Instruction (DPI) enrollment data.

The number of sport participants was defined as the number of athletes who completed a WIAA sanctioned interscholastic sports season in a given academic year (from 2000-2001 through 2003-2004). These data were reported by high school coaches or high school athletic directors directly to WIAA, a board that oversees the rules and regulations of interscholastic sports in Wisconsin schools. Enrollment figures for individual schools were obtained by gender for the grade and year of interest, through the Wisconsin Department of Public Instruction Enrollment database. The number of enrolled students was defined as a one-time count on the third Friday in September. Sport-specific participation prevalence was calculated as the fraction of a class' enrolled males or females who participate in the given sport for each year in each school.

Of the 520 public high schools in 2000-2001, we successfully matched 412 public high schools that report at least one of 24 sports to the WIAA with DPI enrollment

information. Schools that did not match include Department of Corrections schools, adult high schools and other schools that do not offer sports programs, as well as schools that simply did not report to WIAA. In order to examine attrition from 9th to 12th grade, we focus our analysis on those schools and sports that were reported to the WIAA in both 2000-2001 and 2003-2004.

Data Analysis

The panel of schools was examined prospectively for all sports using school size characteristics for the entire sample of reporting schools. Currently, Wisconsin public schools offer certain sports specifically to males (football, summer baseball, wrestling, and hockey) and females (gymnastics). Therefore, we repeated analyses for only those “shared gender” sports, defined as those sports where both males and females participate, including basketball, volleyball, softball/spring baseball, track and field, soccer, golf, tennis, cross country, and swimming.

We also examined participation prevalence by school size (n=137), to determine if size is associated with participation in 9th grade as well as attrition from freshman to senior year. To accomplish this, tertiles of small, medium and large schools were calculated using the average class enrollment over the four year study period. If there were 71 or fewer students in the class of interest the school was considered small; a medium school had between 71 and 182 students; and large schools had greater than 182 students.

Participation prevalence was examined by individual sport, all sports, and shared gender sports. Participation prevalence for all sports and shared gender sports with associated

prevalence ratios, as well as risk of attrition for shared gender sports and all sports with associated risk ratios, are presented.

School-specific proportions—participation prevalences and risks of attrition (the difference in prevalence from 9th to 12th grade)—were the units of observation.

Comparisons of these proportions among schools were made by school size, sport and gender. Because proportions were the unit of observation, tests for significant differences among the schools reporting in both 2000-2001 and 2003-2004 used transformed proportions where $t(p) = [\arcsine(\sqrt{p})]$. This “variance stabilizing” transformation has been recommended to increase the validity of significance testing with methods that assume asymptotic normality (such as ANOVA and linear regression), although it is used here as an approximation since the proportions often represent varying sample sizes (23,24).

RESULTS

Participation prevalence of schools reporting a 9th grade sport

Participation prevalences are reported for the panel of schools reporting in the freshman (2000-2001) and senior (2003-2004) academic year in Table 1. Across individual sports, participation prevalence varies widely based upon sport. Football has the highest percent of 9th grade boy's participants (36.1%), and volleyball has the highest participation prevalence of 9th grade girl's sports (27.6%).

For sports offered to both female and male students, participation prevalence in 9th grade is similar for basketball (20.5% among females and 20.4% among males), softball and baseball (14.8% and 14.4%), and cross country (2.9% and 3.0%). Females were more likely to participate than males in volleyball (27.6% versus 3.6%) and swimming (4.7% versus 2.4%), whereas they were less likely to participate in golf (1.8% versus 7.9%).

The participation prevalence for freshman attending small and large schools is reported for all sports and gender specific sports in Table 2. Among the panel of schools, participation is higher among freshmen females and males attending small schools compared with large schools. Among females, 36% of freshman attending small schools participate in sports, compared to only 20% of female freshman attending large schools. A similar pattern is seen among freshman males, with greater participation in small schools (38%) compared to large schools (25%).

Attrition from 9th to 12th Grade

Participation prevalence in 12th grade and the percent change from 9th to 12th grade are also reported in Table 1. Among five gender specific sports, four sports show declines while boy's hockey shows an increase in participation prevalence. Football has the highest percent of 9th grade boy's participants, which has a relative decrease of 35%, from 36.1% to 23.5% of 12th grade boys participating. Wrestling and summer baseball show attrition in participation of 26% and 39%, respectively. On the other hand, boy's hockey grows from 2.0% to 3.7% of enrolled pupils. The only reported girl's sport is gymnastics, which shows a 41% decline from freshman to senior year. Girl's hockey is not reported in the 2000-2001 academic year and is not included in these analyses.

Among the 18 sports with both male and female participants, 13 sports exhibit attrition while five sports increase in participation prevalence (Table 1). Attrition is greater among females than males for almost all sports, including basketball (60% female attrition versus 48% male attrition), volleyball (59% versus 22%), softball/baseball (46% versus 22%), track and field (39% versus 10%) and soccer (51% versus 23%). Furthermore, while attrition is demonstrated among females participating in tennis and swimming, males demonstrate growth from freshman to senior year. On the other hand, the only shared gender sport showing female growth and male attrition is golf. Participation gains are seen in girl's and boy's cross country, which have respective 12th grade participation prevalences of 3.3% (14% increase) and 4.1% (37% increase).

Tests of significance using arcsine transformed proportions among a cohort of schools reporting the sport of interest in both 9th (2000-2001) and 12th grade (2003-2004) are reported in Table 1. Among 18 shared gender sports, significant ($p < 0.05$) attrition is seen among ten sports, including those sports with the highest prevalence of 9th grade participation. Significant gains are seen for boy's cross country. Among five gender specific sports, significant attrition is observed among four sports, while boy's hockey shows significant gains in participation prevalence.

Dividing all schools into tertiles by school size demonstrates a strong effect on participation prevalence as well as risk of attrition. Graphs of participation prevalence by school size are shown for girl's (Figure A) and boy's (Figure B) shared gender sports through high school. Among girl's shared gender sports, freshman and senior participation prevalence among small schools falls from 36.4% to 22.4%. In large schools, 19.3% of freshman girl's participate in a shared gender sport, but this falls to 9.8% by senior year. Among boy's shared gender sports a similar pattern of declining participation prevalence is seen. Among small schools, 23.2% of freshman boys participate, and by senior year participation prevalence drops to 18.9%. On the other hand, large schools show a decline in boy's participation prevalence from 14.7% of freshman males to 10.2% of senior male participants.

Risk ratios in Table 3 are determined using attrition in small versus large schools, to determine how school size influences the risk of attrition. Results indicate a lower risk of

female attrition (risk ratio=0.8) and male attrition (risk ratio=0.5) in small schools as compared to large schools.

There were substantial gender disparities in the rate in attrition in both small and large schools. All schools show a higher decline among females than males, but the gender disparity is more apparent in small schools (risk ratio=0.4) than in large schools (risk ratio=0.7). This seems to suggest that policies promoting equal participation among genders may have different impacts in small and large schools.

DISCUSSION

Our study showed significant attrition from freshman to senior year in most (17 of 23) high school sports, including the sports with the highest participation among freshman.

Sports such as football, wrestling, softball, baseball, basketball, volleyball, soccer, boy's golf and gymnastics all show highly significant declines.

On the other hand, significant gains are reported for boy's cross country and boy's hockey, with slight increases in girl's cross country and golf, boy's tennis and boy's swimming. Further analysis by school size characteristics indicates that attrition is greater for females than for males, regardless of school size.

In Wisconsin public schools, female students who wish to participate in a sport can choose among 10 sports, while males can choose among 13 sports. Assuming that policies such as Title IX are equally applied across different school size characteristics, one might expect both genders to have comparable access to sports regardless of the school they attend.

However, this does not appear to be the case. In Wisconsin, our study indicates students attending small schools are more likely to participate in sports than students attending large schools, with less attrition over time. Yet, despite higher attrition in large schools than small schools, the gender disparity in risk of attrition is more apparent among small schools than large schools. This study suggests that policies aimed at maintaining equal participation in sports across genders have different impacts in small and large schools.

Many factors may contribute to different participation prevalences across sports, including cultural and media influences, sports specific influences, facility access issues, and cost. First, cultural and media influences may contribute to participation prevalence. For example, this research shows that basketball, which is also a professional sports

industry, has relatively high male and female participation prevalence in the 9th grade. It has been suggested that affinity toward certain high school sports stems from cultural and media influences which encourage youths to identify with professional athletes (25).

Secondly, policy considerations specific to certain sports may also contribute to the differing participation prevalence across shared gender sports. For instance, one implication of Title IX is that girl's volleyball has been promoted more actively than other girl's sports (26). The effects are evident among Wisconsin public high schools, as this is the most popular girl's sport. Another example is seen in girl's hockey, which is gaining popularity as schools react to increased interest by starting girl's high school ice hockey programs (27). However, at present it appears that while Title IX has been relatively successful in promoting equal access to sports, the ability to balance male/female attrition in small schools may be more limited relative to large schools.

Facility access issues and equipment costs are a third possible contributor to differing patterns of sports participation. This research indicates that among the studied schools, comparatively few schools offer gymnastics or hockey as opposed to basketball, track and field or cross-country. Not all schools have the capital for facility construction, maintenance, or insurance costs. Many of these sports require specific infrastructure, and it is not reasonable to offer a certain sport if the related costs compete with other aspects of education. In weighing the options of promoting sports or education, it is understandable that many schools under budgetary constraints choose the business of

classroom education rather than providing unfettered access to a student's sport of choice.

Several considerations may explain why attrition occurs from freshman to senior year. High school interscholastic sports largely follow the competitive model, in which the major incentive is to win. Literature has suggested that if goal attainment is not realistic, a high school student is less likely to reach the goal (28). As the level of competition increases, the demands of elite participation can discourage students to participate, and forced participation may have adverse effects (6,29,30).

Attrition may also be a factor of existing policies. It has been suggested that some schools enforce "cut" policies because they do not have the financial ability to provide sustained access to all interested students for the most popular boy's and girl's sports (31). At the same time schools must provide choices, and while students are cut from the most popular sports, less popular sports may be in need of participants. Low participation levels may contribute to encouraging participation at all skill levels. This may account for why low participation prevalence sports tend to have comparatively less attrition (and even show gains in some cases).

Current measures of sports participation are derived by dividing the statewide number of participants by the statewide number of enrolled students (32). Instead of using this conventional approach, our research measures participation prevalence on the school

level, not the aggregate level. This represents a more sophisticated approach of data collection that allows individual school attributes, such as size, to be taken into account.

Employing a surveillance mechanism to measure time trends of participation among class cohorts can be used to evaluate policy approaches for how well school-sanctioned programs like interscholastic sports promote physical activity. Developing a related reporting protocol can be widely applied from the local to the national level, and is an approach that measures the success high school athletics programs in another way besides wins and losses. This method of assessment can identify effective ways to extend the amount of time students are physically active, as this research indicates aspects of the school environment contribute to opportunities for interscholastic sports involvement.

For example, these findings suggest that attrition is greater among girl's sports than boy's sports. This may be of interest to policymakers as they consider how to direct funding aimed at improving physical activity programs. Such an approach may open inquiry into the potential for high school athletics to encourage physical activity throughout high school and into the future. Increasing access and opportunities to engage in physical activity, while effectively reinforcing youth physical activity, may be an investment which enables society to avoid investing more dollars in future health care needs by promoting healthy lifestyles today.

There are also limitations to this study. In terms of the Department of Public Instruction enrollment data, we assumed that a given school's pool of participants is similar for

freshman and senior classes (accounting for yearly enrollment) and that the one time estimate was accurate. Another limitation is that specialization, or when an athlete plays multiple sports freshman year and only plays one sport senior year, cannot be accounted for in the measure of attrition by sport. Furthermore, it is unknown to what extent other opportunities such as club sports or recreational leagues for after school physical activity are provided to pupils. Lastly, this cannot be generalized to private high schools, as other research has suggested there are differences between public and private students' activity behaviors (33).

CONCLUSION

This research has produced three major findings of interest to public and school health practitioners. First, the research demonstrates that the majority of high school sanctioned interscholastic sports show evidence of attrition, including those sports with the highest prevalence of 9th grade participation. Second, small schools have greater participation rates for students to engage in interscholastic sports. And although the risk of attrition is greater among females than males in all school sizes, this is most apparent in small schools. Finally, measuring participation prevalence allows sports to be measured using individual school characteristics, and has the potential for broad application.

The obstacles to obtaining similar relevant public health data rely on moving beyond the conventional collection and reporting method. This research demonstrates the necessary components are available. Improving methods of collection and reporting could provide rich datasets to explore program efficacy among individual schools and objectively answer questions on how to best promote physical activity through the course of high school.

Public and school health practitioners have identified interscholastic sports participation as one avenue to extend the amount of time students spend being physically active (34). Increasing physical activity through providing more opportunities to access physical activity in high school is one component of a multi pronged strategy. Focusing on interscholastic sports as a means to increase physical activity seems logical, as participation has been associated with favorable health, social and academic outcomes in

students. As we begin to refine our understanding of the contribution of interscholastic sports to lifelong physical activity, understanding how participation varies across sports, genders and school characteristics is fundamental to developing program interventions and evaluating policy approaches.

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TABLE 1: Participation prevalence in 9th and 12th grade with attrition (relative percent change) and associated significance, among a panel of schools in 9th and 12th grade

SPORT	Gender	Schools (N)	Grade 9 2000-2001	Grade 12 2003-2004	Change = (12-9)/9	p value*
SHARED GENDER						
Basketball	Female	396	20.5%	8.1%	-60%	<0.001
	Male	403	20.4%	10.7%	-48%	<0.001
Volleyball	Female	390	27.6%	11.3%	-59%	<0.001
	Male	28	3.6%	2.8%	-22%	0.051
Softball	Female	353	14.8%	8.0%	-46%	<0.001
Spring Baseball	Male	280	14.4%	11.2%	-22%	<0.001
Track and Field	Female	337	11.2%	6.8%	-39%	<0.001
	Male	337	9.9%	8.9%	-10%	0.032
Soccer	Female	160	11.2%	5.5%	-51%	<0.001
	Male	170	9.3%	7.2%	-23%	<0.001
Golf	Female	109	1.8%	2.0%	11%	0.48
	Male	273	7.9%	5.2%	-34%	<0.001
Tennis	Female	143	5.1%	4.7%	-8%	0.28
	Male	131	3.4%	4.0%	18%	0.038
Cross Country	Female	295	2.9%	3.3%	14%	0.077
	Male	295	3.0%	4.1%	37%	<0.001
Swimming and Diving	Female	122	4.7%	3.8%	-19%	<0.001
	Male	95	2.4%	2.7%	13%	0.18
GENDER SPECIFIC						
Football	Male	383	36.1%	23.5%	-35%	<0.001
Wrestling	Male	296	7.7%	5.7%	-26%	<0.001
Summer Baseball	Male	74	12.3%	7.5%	-39%	<0.001
Gymnastics	Female	84	3.4%	2.0%	-41%	<0.001
Hockey	Male	75	2.0%	3.7%	85%	<0.001

* test of difference between 9th and 12th grade proportions

TABLE 2: Participation prevalence and associated prevalence ratios in high school sports among 9th grade students in Wisconsin, 2000-2001

	School Size		Prevalence Ratio (Small vs. Large schools)
	Small	Large	
ALL SPORTS			
Female	36%	20%	1.8
Male	38%	25%	1.5
Prevalence Ratio (male vs. female)	1.1	1.3	
SHARED GENDER SPORTS			
Female	36%	19%	1.9
Male	23%	15%	1.6
Prevalence Ratio (male vs. female)	0.6	0.8	

TABLE 3: Attrition from 9th to 12th grade among small and large schools for both gender specific sport and all sport with associated risks of attrition

	School Size		
ALL SPORTS			Risk Ratio (Small vs. Large schools)
Female	-39%	-49%	0.8
Male	-17%	-35%	0.5
Risk Ratio (Male vs. Female)	0.4	0.7	
SHARED GENDER SPORTS			Risk Ratio (Small vs. Large schools)
Female	-39%	-49%	0.8
Male	-18%	-31%	0.6
Risk Ratio (Male vs. Female)	0.5	0.6	

Figure A: Female participation prevalence of shared gender sports by grade and school size from 9th to 12th grade among Wisconsin public high schools: 2000-2001 to 2003-2004

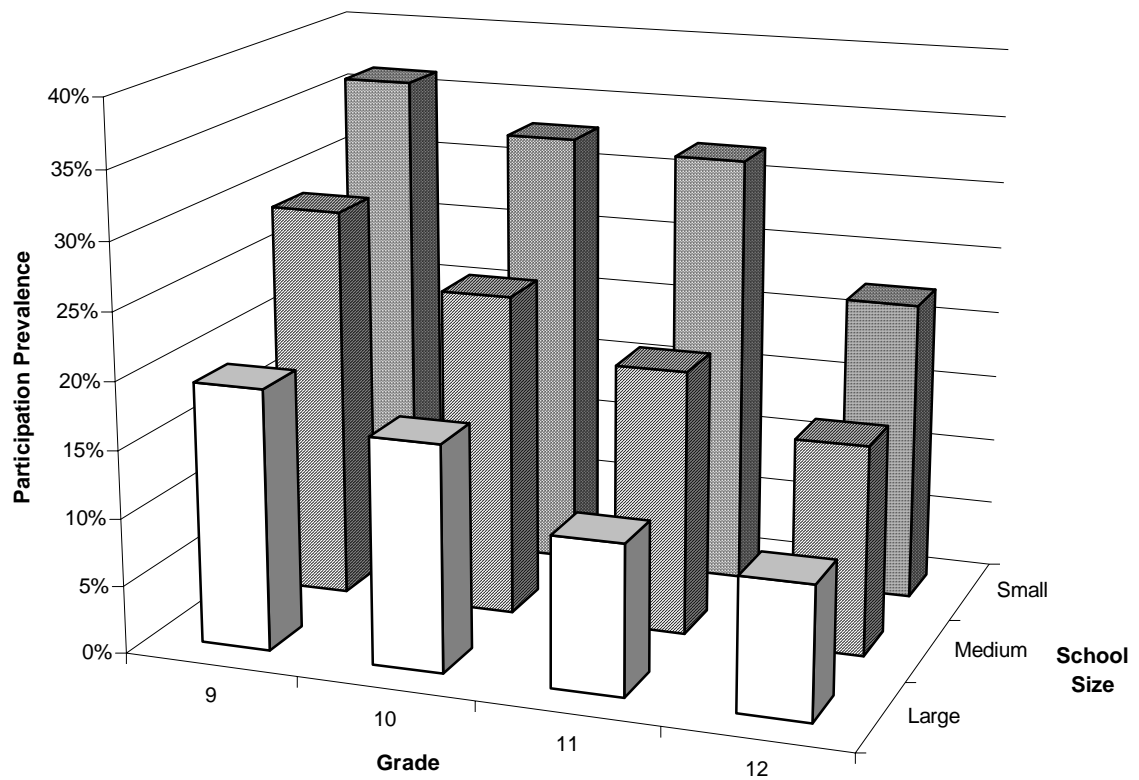


Figure B: Male participation prevalence of shared gender sports by grade and school size from 9th to 12th grade among Wisconsin public high schools: 2000-2001 to 2003-2004

