

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

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ABSTRACT

Introduction: Successful approaches are needed to decrease the burden of obesity on America's youth. Researchers often look to the high school interscholastic sports experience as a promising area for intervention. The purpose of this paper is to examine trends in participation over the course of a 4-year educational period.

Methods: Two research questions are posed in this study: (1) how does participation in interscholastic sports change over the high school interscholastic sports experience, and (2) how do gender and school size influence these patterns? To answer these questions, a panel study is used to prospectively follow 412 Wisconsin public high schools from freshman year (2000-2001) to senior year (2003-2004). Participation prevalence (percent participation) in freshman year and risk of attrition (defined as a reduction in prevalence) from freshman to senior year are reported for sport, gender, and school size characteristics.

Results: Overall sports participation is 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, including those sports with the highest prevalence of freshman participation. Compared to sports participants attending large schools, participants attending small schools have a lower risk of attrition from freshman to senior year. However, female attrition is much higher than male attrition in small schools, whereas this difference is not as apparent in large schools.

Conclusion: The results of this research suggest school size and gender play important roles in initial and sus-

tained involvement during high school. Despite the potential immediate and long-term benefits of high school interscholastic sports participation, there is limited research that prospectively examines patterns of participation through high school. Expanding the use of this measurement approach may effectively promote physical activity as youth grow into adults.

INTRODUCTION

High school interscholastic sports participation has been associated with favorable health, social, and academic outcomes in students.¹⁻¹¹ Furthermore, regular physical activity among youth 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 Evidence suggests that the earlier children can incorporate rewarding activity patterns into their lifestyle, the better the chance of maintaining those activity patterns as adults.¹⁷⁻¹⁸ Interscholastic sports participants partake in an acquired experience, and compared to non-participating peers, such 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 determine how physical activity patterns change through adolescence.

Despite the potential immediate and long-term benefits of high school sports participation, there is limited research that prospectively examines these patterns.^{17,22} The purpose of this study is to describe trends in interscholastic sports participation in Wisconsin public high schools, specifically participation prevalence in freshman year and attrition from freshman to senior year by sport, gender, and school characteristics. Two research questions are posed in this study: (1) how does participation in interscholastic sports change over the high school interscholastic sports experience and (2) how do gender and school size influence these patterns?

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METHODS

This panel study of 412 Wisconsin public high schools prospectively examines participation prevalence in high school sports among freshman students in 2000-2001, and tracks the risk of attrition when they reach senior year, in 2003-2004. In order to calculate sport specific participation prevalence, gender-specific numbers of participating students in each grade are divided by the number of boys or girls in that grade for each academic year.

Study Population and Data

Publicly available data from 2 sources are linked for analysis: the Wisconsin Interscholastic Athletic Association (WIAA) high school sport participation data and Wisconsin Department of Public Instruction (DPI) enrollment data. Individual student names are not included in these public data sets. School totals, not individual students, are reflected in this analysis.

Sport participants are athletes who complete a season in a WIAA-sanctioned sport in a given academic year (from 2000-2001 through 2003-2004). As the governing board on all interscholastic sports in Wisconsin, WIAA maintains a direct-report relationship with high school athletic directors and coaches. Enrollment numbers are obtained by school and gender for the grade and year of interest through the Wisconsin DPI enrollment database. These numbers are used to calculate a sport-specific participation prevalence fraction, reflecting each school's enrolled boys and girls who participate in a given sport during each year of interest.

Of the 520 public high schools in Wisconsin, 412 reported at least 1 of 24 sports to WIAA, and were successfully matched with DPI enrollment information. Schools that did not report student participation counts to WIAA—such as Department of Corrections schools, adult high schools, and other institutions that do not offer WIAA sports programs—were not included in the study. In order to examine attrition from freshman to senior year, we focus our analysis on those schools and sports reporting to WIAA from 2000-2001 to 2003-2004.

Data Analysis

Results are reported prospectively for all sports using school size characteristics. Because the majority of Wisconsin public schools only offer certain sports to males (football, summer baseball, wrestling, and hockey) or females (gymnastics), we repeated analyses only for “shared gender” sports—where both males and females participate. Measuring shared gender sports limits the analysis to only those sports available to both genders,

to determine the relative level of involvement in sports for which equal access is presumed.

To address the first research question, we examined participation prevalence by sport in freshman year as well as attrition from freshman to senior year. Reported proportions in Table 1 are expressed as both participation prevalence and risk of attrition (the difference in prevalence from freshman to senior year). Because proportions are the unit of observation, tests for significant differences among the schools reporting in both 2000-2001 and 2003-2004 use transformed proportions where $t(p) = [\arcsine(\sqrt{p})]$. This “variance stabilizing” transformation is used 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} Participation prevalence is reported by individual sport, all sports, and shared gender sports.

To address the second research question, we focused on attrition among boys and girls in small and large schools. Equal tertiles of small, medium, and large schools are calculated using the average class enrollment over the 4-year study period. Accordingly, school class sizes with 71 or fewer students are considered small, a medium school has between 71 and 182 students, and a large school has over 182 students. The effects of school size on participation can be seen in Figures 1 and 2. Table 2 compares initial involvement in male and female interscholastic sports for small and large schools, and reports the relative impact of gender and school size on initial involvement as a prevalence ratio. Participation prevalence and prevalence ratios are reported for all sports to measure overall participation trends among boys and girls, as well as for shared gender sports. Table 3 compares the attrition rate from freshman to senior year by gender for small and large schools. The rate of attrition is used to calculate associated risk ratios, both of which are reported for all sports and for shared gender sports.

RESULTS*Participation Prevalence of Schools Reporting a Freshman Year Sport*

Participation prevalence for the panel of schools reporting in the freshman (2000-2001) and senior (2003-2004) academic year is reported in Table 1. Across individual sports, participation prevalence varies widely. Football has the highest percent of freshman boy participants (36.1%), and volleyball has the highest participation prevalence of freshman girls' sports (27.6%).

Table 1. Participation Prevalence in Freshman and Senior Year with Attrition (Relative Percent Change) and Associated Significance, Among a Panel of Schools in Freshman and Senior Year

Sport	Gender	Schools (N)	Freshman 2000-2001	Senior 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 freshman and senior year proportions

For sports offered to both female and male students, participation prevalence in freshman year is similar for basketball (20.5% among girls and 20.4% among boys), softball and baseball (14.8% and 14.4%), and cross country (2.9% and 3.0%). Girls are more likely than boys to participate in volleyball (27.6% versus 3.6%) and swimming (4.7% versus 2.4%), whereas they are less likely to participate in golf (1.8% versus 7.9%).

The participation prevalence for freshmen 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 freshman girls and boys attending small schools as compared to large schools. About 36% of female freshman attending small schools participate in sports, compared to only 20% of female freshmen attending large schools. A similar pattern is reported among freshman boys, with greater participation in small schools (38%) compared to large schools (25%).

Attrition from Freshman to Senior Year

Participation prevalence in senior year and attrition from

freshman to senior year are also reported in Table 1. Among 5 gender-specific sports, 4 sports show declines while boys' hockey shows an increase in participation prevalence. Football has the highest percent of freshmen boy participants, and shows a relative decrease of 35%, from 36.1% to 23.5% of senior boys participating. Wrestling and summer baseball respectively lose 26% and 39% of the initial participants. On the other hand, boys' hockey grows from 2.0% to 3.7% of enrolled pupils. The only reported girl-specific sport is gymnastics, which declines 41% from freshman to senior year.

In 18 shared-gender sports, 13 sports exhibit attrition while 5 sports show increases in participation prevalence (Table 1). Attrition is greater among girls than boys 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%). The only shared-gender sport that shows female growth and male attrition is golf. Participation gains are seen in girls' and boys' cross country, which increase by 14% and 37%, respectively.

Tests of significance using arcsine-transformed proportions among a cohort of schools reporting the sport of interest in both freshman (2000-2001) and senior years (2003-2004) are reported in Table 1. Significant ($P<0.05$) attrition is reported in 10 of 18 shared-gender sports, including those sports with the highest prevalence of freshman participation. Significant gains are reported for boys' cross country. Among 5 gender specific sports, significant attrition is observed in 4 sports, while boys' hockey reports a significant increase.

Dividing all schools into tertiles demonstrates the strong effect that school size has on participation prevalence as well as gender differences in the risk of attrition. Graphic illustrations of these trends by school size are shown for girls' (Figure 1) and boys' (Figure 2) shared-gender sports through high school. In girls' 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 girls participate in a shared-gender sport, but only 9.8% of senior girls participate. Boys' shared-gender sports show a similar pattern of declining participation. Among small schools, 23.2% of freshman boys participate, and by senior year participation drops to 18.9%. On the other hand, large schools show a decline in boys' participation from 14.7% of freshman boys to 10.2% of senior boys.

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.

Attrition rates reveal substantial gender disparities regardless of school size. However, the gender disparity is more apparent in small schools (risk of attrition ratio=0.4) than in large schools (risk ratio=0.7). This seems to suggest that policies promoting equal participation among genders have different impacts in small and large schools.

DISCUSSION

Significant attrition from freshman to senior year occurs in most (17 of 23) high school sports, including sports with the highest participation among freshmen. Sports such as football, wrestling, softball, baseball, basketball, volleyball, soccer, boys' golf, and gymnastics all show highly significant declines. On the other hand, significant gains are reported for boys' cross country and hockey, with slight increases in girls' cross country and golf, boys' tennis, and boys' swimming. Further analysis by school size characteristics indicate that gender-

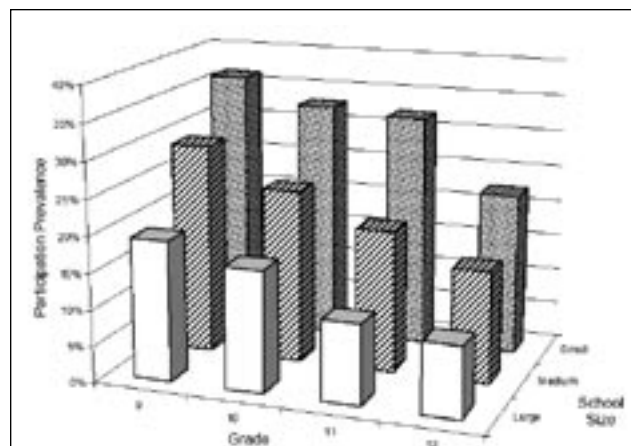


Figure 1. Female participation prevalence of shared gender sports by grade and school size from freshman to senior year among Wisconsin public high schools: 2000-2001 to 2003-2004.

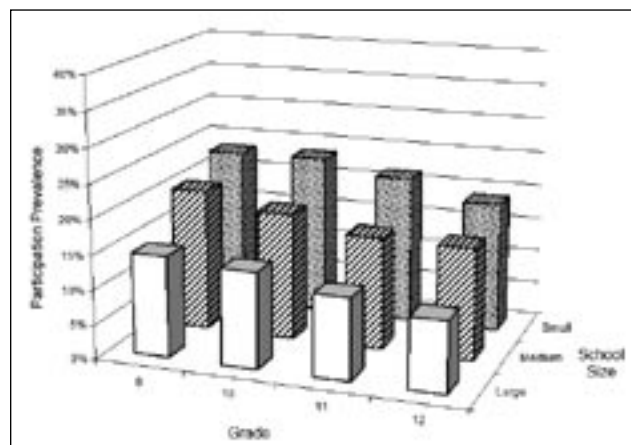


Figure 2. Male participation prevalence of shared gender sports by grade and school size from freshman to senior year among Wisconsin public high schools: 2000-2001 to 2003-2004.

based attrition is higher for female participants, and the greatest gender disparity occurs in the small schools.

Policies such as Title IX have been enacted to guarantee equal access and participation in interscholastic sports regardless of gender. As a result, in Wisconsin public schools girls may choose from 10 sports, while boys may choose from 13 sports. Given the many choices, one might expect both genders to have comparable access to sports regardless of the school they attend. However, the results of this study indicate Wisconsin students attending small schools are more likely to participate in sports than students attending large schools, and with less attrition over time. Even though there is higher attrition in large schools, the gender disparity in risk of attrition is more apparent in small schools. This is evident in both shared-gender sports and all sports,

Table 2. Participation Prevalence and Associated Prevalence Ratios in High School Sports among Freshman Students in Wisconsin, 2000-2001

	School Size		Prevalence Ratio (Small versus Large Large Schools)
	Small	Large	
All Sports			
Female	36%	20%	1.8
Male	38%	25%	1.5
Prevalence Ratio (male versus female)	1.1	1.3	NA
Shared-Gender Sports			
Female	36%	19%	1.9
Male	23%	15%	1.6
Prevalence Ratio (male versus female)	0.6	0.8	NA

Table 3. Attrition from Freshman to Senior Year among Small and Large Schools for both Gender Specific Sport and All Sport with Associated Risks of Attrition

	School Size		Prevalence Ratio (Small versus Large Large Schools)
	Small	Large	
All Sports			
Female	-39%	-49%	0.8
Male	-17%	-35%	0.5
Prevalence Ratio (male versus female)	0.4	0.7	NA
Shared-Gender Sports			
Female	-39%	-49%	0.8
Male	-18%	-31%	0.6
Prevalence Ratio (male versus female)	0.5	0.6	NA

suggesting that policies like Title IX have different impacts in small and large schools.

Many factors can contribute to a specific sport's participation prevalence, including cultural and media influences, policy considerations, facility access issues, and cost. First, cultural and media influences may contribute to participation prevalence. For example, this research shows that basketball, a majorly publicized sport in America, has relatively high male and female participation prevalence in freshman year. It has been suggested that affinity toward certain high school sports stems from cultural and media influences that encourage youths to identify with professional athletes, and

students are more likely to take up the sport of an admired "pro."²⁵

Second, 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 girls' volleyball has been promoted more actively than other girls' sports.²⁶ The effects are evident among Wisconsin public high schools, as volleyball is the most popular girls' sport. Another example is seen in girls' hockey, which is gaining popularity as more schools offer the program.²⁷ However, at present it appears that while Title IX has been relatively successful in promoting equal access to sports, rates of attrition are very different when comparing different-sized schools. This research finds that large schools do not have as apparent a disparity in gender-based attrition as small schools, where girls are nearly twice as likely to stop playing a sport as boys. Our research suggests that school size has a substantial impact on the ability to balance male/female attrition.

Facility access issues and equipment costs are a third possible contributor to differing patterns of sports participation. WIAA figures indicate that among Wisconsin public high schools, fewer schools offer gymnastics or hockey than are able to offer basketball, track and field, or cross-country. Not all schools have the capital for facility construction, maintenance, and insurance costs. Thus, many schools may decide not to fund a sport that requires specific infrastructure if the costs encumber other aspects of education.

Several considerations may explain why attrition occurs from freshman to senior year. High school interscholastic sports largely follow a competitive model where 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 student participation, and forced participation may have adverse effects.^{6,29,30} Although this research does not account for different levels of competition such as junior varsity and varsity programs, the findings suggest that given the overall and sport-specific rates of attrition, maintaining a spectrum of competitive levels through high school could allow for more sustained involvement.

Attrition may also be a component 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 boys' and girls' sports.³¹ At the same time most of these schools provide choices in

interscholastic sports. While students are cut from the most popular sports, less popular sports may be in need of willing players, and low participation levels may contribute to encouraging involvement at all skill levels. This could contribute to why low participation prevalence sports tend to have comparatively less attrition, and in some cases show gains.

Nationally and in Wisconsin, current measures of high school interscholastic sports participation are derived by dividing the statewide number of participants by the statewide number of enrolled students.³² Alternatively, our measurement approach examines participation prevalence trends on the school level, not the state level. To best measure the ability of interscholastic athletic programs to sustain physical activity over the course of high school, it is necessary to take school and sport attributes into account.

A surveillance mechanism that measures time trends of participation among class cohorts can be used to evaluate how well school-sanctioned sports programs promote physical activity. Furthermore, this is an approach that measures the success of high school athletics programs in another way than wins and losses, and can help identify aspects of the school environment that extend the time youths are engaged in physical activity.

For example, these findings suggest that attrition is greater among girls' sports than boys' sports, especially in the smallest schools. Such information can help identify ways high school athletics programs can encourage physical activity throughout high school and into the future. An effective physical activity improvement initiative could utilize this information and reward athletic programs that successfully maintain participants' physical activity levels.³³ Increasing access and opportunities to engage in physical activity, while effectively reinforcing youth physical activity patterns, may be an investment that enables society to avoid spending future health care dollars by promoting healthy lifestyles today.³³

There are also limitations to this study since the school, not the individual, is the level of analysis. In terms of the DPI enrollment data, we assume any given school's pool of participants is similar for freshman and senior classes (accounting for yearly enrollment) and that the point in time estimate is accurate. Another limitation is that specialization, 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 recre-

ational leagues for after school physical activity are provided to pupils. Lastly, WIAA does not require schools to report junior varsity and varsity sport programs separately, and therefore their effects on attrition could not be measured. It should be noted that this study focuses on public schools and cannot be generalized to private high schools, as other research has suggested there are differences between public and private students' activity behaviors.³⁴

CONCLUSION

Three findings are of interest to public and school health practitioners. First, this research demonstrates that the majority of high school sanctioned interscholastic sports show evidence of attrition, including those sports with the highest prevalence of freshmen participation. Second, small schools tend to have better participation rates than large schools, but in small schools girls are twice as likely to stop participating in a sport as boys. This finding is not as apparent in large schools, suggesting that the potential for Title IX to allow equal access for both genders is partly determined by school size. And finally, measuring participation prevalence and attrition across the high school interscholastic sports experience is not presently a common measure of participation, but has the potential for broad application.

This paper demonstrates the necessary components are available to move beyond conventional collection and reporting methods. Interscholastic sports associations in Wisconsin and other states only report aggregate numbers, and do not consistently track the trends of sustained participation. Along with improving measures of athletic program efficacy, improving methods of data collection and reporting can help determine how to best promote physical activity through the course of high school.

Interscholastic sports participation is one existing avenue to extend the amount of time students are active, and encouraging youths to engage in physical activity throughout high school is one component of a multi-pronged strategy to fight obesity. Focusing on interscholastic sports seems logical, as participation has been associated with favorable health, social, and academic outcomes in and beyond high school. As we begin to refine our understanding of the contribution of interscholastic sports to lifelong physical activity, measuring how participation varies across sports, genders, and school characteristics is fundamental to developing effective program interventions to reduce the future burden of obesity-related disease.

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Wisconsin Medical Journal

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The *Wisconsin Medical Journal* (ISSN 1098-1861) is the official publication of the Wisconsin Medical Society and is devoted to the interests of the medical profession and health care in Wisconsin. The managing editor is responsible for overseeing the production, business operation and contents of the *Wisconsin Medical Journal*. The editorial board, chaired by the medical editor, solicits and peer reviews all scientific articles; it does not screen public health, socioeconomic or organizational articles. Although letters to the editor are reviewed by the medical editor, all signed expressions of opinion belong to the author(s) for which neither the *Wisconsin Medical Journal* nor the Society take responsibility. The *Wisconsin Medical Journal* is indexed in Index Medicus, Hospital Literature Index and Cambridge Scientific Abstracts.

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