Changes to Recreational Programming Within the School Environment and Student Physical Activity: A Longitudinal Examination from Year 2 to Year 3 of the COMPASS Study

by

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AUTHOR'S DECLARATION

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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ABSTRACT

Objective: This study examined the influence of changes to school recreational programming on the prevalence and likelihood of Ontario and Alberta secondary school students meeting the (i) Canadian Society for Exercise Physiology (CSEP) physical activity guideline and (ii) ≥60 minutes of daily moderate to vigorous physical activity (MVPA).

Methods: Student- and school-level data was obtained using Year 2 and Year 3 COMPASS data. This longitudinal analysis assessed how changes to school recreational programming (including the addition, modification or removal of intramurals/non-competitive clubs) within 20 intervention schools influenced student physical activity (PA) levels compared to students who attended a school that made no PA practice changes (True Control Schools; n=43) or made other PA practice changes unrelated to school recreational programming (Other Practice Intervention (OPI) Schools; n=23). PA was measured using two outcome variables: achieving the CSEP guideline and achieving ≥60 minutes of daily MVPA. Descriptive statistics, ANOVA and hierarchical longitudinal analysis were conducted with relevant covariates controlled for within the models.

Results: Significant differences were found in the prevalence of students meeting (i) the CSEP guideline, and (ii) ≥60 minutes of daily MVPA between Year 2 and Year 3 of the COMPASS study. In Year 2, 31.0% of students met the CSEP guideline and 47.8% achieved ≥60 minutes of daily MVPA. In Year 3, 28.5% of students met the CSEP guideline and 52.2% achieved ≥60 minutes of daily MVPA. There were no significant differences in the school-level prevalence of a student meeting the (i) CSEP or (ii) MVPA guideline in intervention schools as compared to control schools respectively. Students that attended School 9 were significantly less likely to meet the CSEP guideline after modifications were made to their school recreational programming in comparison to students who attended true control (RR=0.74) and OPI (RR=0.73) schools.

Moreover, students that attended School 15 were significantly less likely to achieve ≥60 minutes of daily MVPA after modifications were made to their school recreational programming in comparison to students that attended true control (RR=0.71) and OPI (RR=0.71) schools. Students who are male, have weekly spending money of $21-100 or greater than $100, have 1-4 or greater than 5 active friends, are enrolled in physical education, participate in varsity sports or community sports were significantly more likely to meet the CSEP and MVPA guideline. Furthermore, students who began participating in school recreational programming in Year 3 and students who participated in both Year 2 and Year 3 had a significant increase in likelihood of obtaining (i) the CSEP guideline and (ii) ≥60 minutes of daily MVPA compared to students who did not participate in either year.

Conclusion: Current school-based PA programming appears insufficient, as the majority of youth in the COMPASS study are not achieving the recommended amount of PA suggested in the Canadian PA guidelines. This study identified 20 school recreational programming interventions between Year 2 and Year 3 of the COMPASS study. Only two of the interventions were statistically significant, however they did not have the desired effect on student PA. Three school recreational programming interventions that appear promising for future school-based PA research are also discussed. Future research should explore how to improve and tailor specific school recreational options within different contextual settings and with populations at greater risk of inactivity.

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DEDICATION

I would like to dedicate this thesis to my mother, Gillian. Thank you for your constant and unconditional love, encouragement and support throughout my entire life. You continue to be a source of inspiration and strength throughout all of my endeavors. For that, and for everything you do, I am truly grateful.

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CHAPTER ONE: INTRODUCTION

Physical activity (PA) is a vital component for the maintenance of a healthy lifestyle and for the prevention of chronic disease (Janssen & LeBlanc, 2010). Achieving adequate levels of PA during adolescence is of particular importance, given that PA in youth is predictive of PA in adulthood (Telama et al., 2005). However, few youth achieve the necessary amounts of daily PA required for optimal health (Colley et al., 2011). As such, public health initiatives have recently targeted secondary schools as a primary site for improving youth PA levels. This is a promising strategy, as schools provide access to PA facilities and resources to youth from a diverse range of backgrounds and abilities (Kriemler et al., 2011). In addition, schools can provide formalized and structured PA opportunities for students. School recreational programming (including intramurals and non-competitive PA clubs) are a more inclusive approach for schools to engage students in PA. Recreational programs allow students of varying abilities and with varying resources to develop lifelong skills and participate in a variety of PA opportunities within a supportive, non-competitive environment (De Meester, Aelterman, Cardon, De Bourdeaudhuij, & Haerens, 2014; Edwards, Kanters, & Bocarro, 2014). Moreover, participation in school PA programming is associated with higher PA levels (Nelson et al., 2011), improved health (Jewett et al., 2014) and academic outcomes (Fox, Barr-Anderson, Neumark-Sztainer, & Wall, 2010). Thus, schools should have a vested interest in providing effective recreational programs for students.

COMPASS is a prospective cohort study that provides a platform to evaluate multiple youth health behaviours (including PA) and the school environment over time within a convenience sample of Canadian secondary schools and students (Leatherdale, Brown, et al., 2014). To effectively target physical inactivity, as well as improve the health of future generations, further research is necessary. This research project utilized real-world data collected over time as part of the COMPASS study to identify school environments where youth can participate in PA, while aiming to increase the effectiveness of school recreational programming.

CHAPTER TWO: LITERATURE REVIEW

2.1 Importance of Promoting Youth PA in Canada

2.1.1 PA & the Maintenance of Good Health

It has long been understood that participation in PA is important for improved health outcomes. PA provides a variety of short-term health benefits, such as improvements in bone health (Smith et al., 2014), self-esteem (Smith et al., 2014), self-related health (Herman, Hopman, & Sabiston, 2015), cardiorespiratory fitness (Carson et al., 2014) and endothelial function (Warburton, Nicol, & Bredin, 2006), while decreasing depressive symptoms (Janssen & LeBlanc, 2010), adiposity (Janssen & LeBlanc, 2010; Smith et al., 2014), metabolic risk factors (Smith et al., 2014), waist circumference (Carson et al., 2013, 2014) and blood pressure (Carson et al., 2013, 2014). Furthermore, engagement in regular PA helps to prevent the development of chronic disease including cardiovascular disease (Janssen & LeBlanc, 2010; Smith et al., 2014; Warburton et al., 2006), type 2 diabetes (Warburton et al., 2006), obesity (Faulkner, Zeglen, Leatherdale, Manske, & Stone, 2014; Janssen & LeBlanc, 2010; Katzmarzyk et al., 2015; Tremblay & Willms, 2003) and certain types of cancer (Warburton et al., 2006). On a global scale, physical inactivity is responsible for 6% of coronary heart disease, 7% of type 2 diabetes, 10% of breast cancer, 10% of colon cancer and 9% of premature mortality (Lee et al., 2012).

Among Canadian youth, there has also been some evidence to suggest low PA levels are associated with modifiable risk behaviours including sedentary behaviour (Leatherdale & Wong, 2008) and smoking (deRuiter, Cairney, Leatherdale, & Faulkner, 2014; Iannotti, Kogan, Janssen, & Boyce, 2009). Modifiable risk factors are cause for concern given the co-occurrence and prevalence of these behaviours among youth and their potential to increase chronic disease risk (Leatherdale, 2015; Leatherdale & Rynard, 2013). In order to reduce the current and future disease burden associated with physical inactivity and the associated modifiable risk factors, initiatives aimed at improving PA levels must remain an important public health priority.

2.1.2 Impact of Targeting Youth PA Levels

In recent years, the importance of targeting youth PA has been foremost in scientific literature. Numerous studies report a decline in PA levels among youth, specifically during the tenure of secondary school (Colley et al., 2011; Dumith, Gigante, Domingues, & Kohl, 2011; Nader, Bradley, Houts, McRitchie, & O'Brien, 2008). Adolescence proves to be a critical developmental period, where patterns of behaviour established during this time frame have substantial implications for the development of long-term behaviour patterns (Bauer, Yang & Austin, 2004; Simon et al., 2006). Studies using longitudinal data have tracked PA levels from youth into adulthood, finding youth who obtain higher PA levels are more likely to obtain higher PA levels in adulthood (Herman, Craig, Gauvin & Katzmarzyk, 2009; Huotari, Nupponen, Mikkelsson, Laakso, & Kujala, 2011; Telama et al., 2005). This has significant implications for the Canadian health care system and economy, given the $6.8 billion dollar cost associated with physical inactivity in adulthood (Janssen, 2012). In an effort to reduce the medical and fiscal burden associated with physical inactivity, a greater understanding of effective PA interventions for youth is required if public health officials are to prevent this age-related decline in PA.

2.1.3 Current PA Guidelines in Canada

In 2011, The Canadian Society for Exercise Physiology (CSEP) updated the Canadian Physical Activity Guidelines for children, youth and adults (Tremblay et al., 2011). In order to develop evidence-based guidelines based on the most current scientific literature, the guidelines underwent a methodologically rigorous review process in consultation with key stakeholders (Tremblay et al., 2011). For youth specifically (between the ages of 12-17 years old), the guidelines contain three recommendations; (i) accumulate at least 60 minutes of daily moderate-to vigorous-intensity physical activity (MVPA), (ii) complete vigorous-intensity activities on at least three days a week, and (iii) complete muscle and bone strengthening activities on at least 3

days a week (Tremblay et al., 2011). Such guidelines provide Canadian youth with PA targets necessary to obtain the health benefits associated with PA.

2.1.4 Measuring PA in Youth

PA can be measured using objective (direct) or subjective (indirect) measurements. Accelerometers, pedometers and heart rate monitors are all types of objective measures used in PA research (Prince et al., 2008). Objective measures are most often used to increase the accuracy of measurements and to validate self-report measures, given the high rates of internal validity (Prince et al., 2008). However, these measures are expensive, time-consuming, burdensome for participants and difficult to apply on a population level (Prince et al., 2008). Furthermore, direct measures do not capture all PA activities as the instrumentation: may need to be removed during certain activities for safety reasons; may have difficultly tracking certain movements (such as weight lifting); or may only track movement achieved at a certain threshold of intensity or duration. In addition, objective PA measures are not capable of capturing the context of PA participation (i.e. what type of PA and where it was conducted). Subjective measures are commonly used in public health research, given that they are practical and feasible for large study populations at a low cost (Prince et al., 2008). While subjective measures (such as questionnaires) are easy to administer, these self-reports methods tend to have less internal validity due to recall bias and response bias (such as social desirability bias), which may lead to over- or under-estimation of PA levels (Prince et al., 2008).

In large PA studies, using objective measures proves challenging. Therefore, cohort studies often use subjective measures as they have high rates of external validity and do not require active consent. PA is commonly measured in self-report questionnaires using a seven day recall, asking how many hours and/or minutes of PA students completed on each of the last seven days (Fuller, Sabiston, Karp, Barnett, & O'Loughlin, 2011; Hobin et al., 2012a, 2012b). This data

can then be calculated into a continuous measure of PA, such as average daily minutes of PA (Fuller et al., 2011; Hobin et al., 2012a, 2012b) or as a dichotomous variable to compare PA levels to PA guidelines (such as CSEP) (Nichol et al., 2009; Ward et al., 2015).

2.1.5 PA Prevalence among Canadian Youth

Despite the knowledge that regular PA provides immense physiological and mental health benefits (Janssen & LeBlanc, 2010), the majority of Canadian youth are not achieving the recommended levels of PA. Direct measures of PA from the Canadian Health Measures Survey suggest only 9% of males and 4% of females aged 6 to 19 years old are achieving 60 minutes of MVPA at least six days a week (Colley et al., 2011). Furthermore, children aged 6-10 years are more likely to obtain the recommended levels of PA compared to 15-19 year olds (Colley et al., 2011).

As anticipated, self-reported measures of MVPA are substantially higher than objective measures. Among a sample of over 23 000 grade 9 to 12 students in Year 1 of the COMPASS study, 53.1% were considered physically inactive (Leatherdale, 2015). Furthermore, Hobin and colleagues (2012a) reported the average daily MVPA within a sample of over 22 000 Ontario high school students was 151 minutes. These studies suggest considerably higher PA levels than that reported by Colley and colleagues (2011). Considering the large discrepancies in PA prevalence, future research targeting youth PA levels must continue to be explored.

2.2 The Ecological Model

The ecological model has been increasingly used as a framework for public health interventions. The basic tenet of the ecological model is that behaviour is influenced by the inclusion and interaction of multiple levels of variables (Sallis, Bauman, & Pratt, 1998; Sallis et al., 2006). Ecological models examine the influence of intrapersonal (i.e. demographics,

biological factors), interpersonal (i.e. social factors), environmental (i.e. accessibility and quality of school PA facilities) and policy (i.e. mandatory school physical education) factors, which may act as a facilitator or barrier to the adoption of healthy living behaviours (Sallis et al., 1998; Sallis et al., 2006). Since the school is an important setting where youth can participate in PA, the use of the ecologic framework allows for the examination of behavioural influences in combination with environmental and policy supports (such as school PA programming), which may contribute to greater student PA participation (Sallis et al., 1998; Sallis et al., 2006). Moving forward, the development, implementation and evaluation of school-based PA interventions must consider multiple contextual factors, as both student- and school- level characteristics are important considerations for successful school PA programs (Hobin, Leatherdale, Manske, Burkhalter, & Woodruff, 2010; Hobin, Leatherdale, Manske, & Robertson-Wilson, 2010; Hobin et al., 2012a; Leatherdale, Manske, Faulkner, Arbour, & Bredin, 2010; Nichol, Pickett, & Janssen, 2009; Sallis et al., 2006).

2.3 The Importance of the School Environment

The school setting provides a supportive and accessible environment for students to participate in PA. Schools offer access to a large population of youth with varying demographic characteristics, including gender, age, ethnicity and socioeconomic status (SES) (Bocarro, Kanters, Casper & Forrester, 2008; Kriemler et al., 2011; Wechsler, Devereaux, Davis & Collins, 2000) who spend a significant portion of their time there (Hobin et al., 2012b). Furthermore, schools have pre-existing PA infrastructure, including access to facilities and personnel, which make schools a practical setting for student PA opportunities (Boracco et al., 2008; Kriemler et al., 2011; Wechsler et al., 2000). Schools also have the ability to adopt formalized opportunities to increase student participation in PA, such as offering daily physical education classes, competitive and non-competitive athletic programming and policy/curriculum enforcement

(Sallis, Carlson, & Mignano, 2012). Given this unique setting for PA promotion, it is not surprising that a recent systematic review identified school-based PA interventions as a successful strategy for increasing student PA levels (Dobbins, Husson, DeCorby, & LaRocca, 2013).

2.4 School-Level Characteristics Associated With PA

School-level characteristics are an important consideration when evaluating student PA levels. Previous Canadian studies have shown differences between schools account for 3% of the variability in student MVPA among secondary students (Hobin et al., 2012a) and between 4.8% to 7.3% of the variability in student MVPA among elementary students (Faulkner et al., 2014; Leatherdale et al., 2010). Examining school-level differences is necessary in order to determine the most effective means for developing and implementing PA programs in schools with different contextual environments.

2.4.1 School Size

School size appears to influence the number of PA activities available, as well as the percentage of the students that participate in these PA opportunities. Larger schools, which typically have greater financial resources, offer more PA activities as compared to smaller schools (Stearns & Glennie, 2010). Among a random sample of Ontario elementary and secondary schools, Allison and Adlaf (2000) reported that the presence of an intramural program was related to elementary, but not secondary school size; whereby, elementary schools with a greater student body were more likely to offer intramural programming.

While larger schools may offer additional PA opportunities that are not afforded to students in smaller schools, it does not guarantee that a greater number of students are achieving adequate levels of PA. In fact, studies have found that student PA is negatively correlated with school size (Allison & Adlaf, 2000; Feldman & Matjasko, 2005; Stearns & Glennie, 2010). This

makes intuitive sense when considering team sports. Regardless of school size, each respective team has a minimum and maximum number of athletes needed to play (Feldman & Matjasko, 2005; Stearns & Glennie, 2010). Therefore, a greater percentage of students are needed to participate within smaller schools in order to maintain a full roster. This leads to more opportunities for students in smaller schools as compared to students who attend larger schools, merely as a function of relative school size (Cohen, Taylor, Zonta, Vestal, & Schuster, 2007; Feldman & Matjasko, 2005; Stearns & Glennie, 2010).

2.4.2 School Location

School location is a characteristic of the school environment, which is a strong predictor of student PA levels (Leggett, Irwin, Griffith, Xue, & Fradette, 2012). Among a sample of 76 secondary schools in Ontario, between-school differences accounted for a significant amount of variability (4.0%, 2.0%, 2.1%, respectively) in students' time spent in PA across urban, suburban and rural school environments (Hobin et al., 2013). Studies have found students attending rural schools are more likely to achieve higher levels of PA as compared to students attending urban and suburban schools (Hobin et al., 2013; Ismailov & Leatherdale, 2010). However, additional evidence from Canadian elementary schools suggests that suburban school location is associated with greater PA participation (Barnett, O'Loughlin, Gauvin, Paradis, & Hanley, 2006). Given the influence of school location on student PA, additional research is needed to further explore the inconsistencies found within the current literature.

2.4.3 School SES

Current evidence regarding school SES as a predictor of student PA appears mixed. In a Canadian study of grade 6-10 students, none of the three area-level SES measures included within the study were associated with PA (Janssen, Boyce, Simpson, & Pickett, 2006). Among a separate

sample of Canadian youth, students that attended schools of higher SES were identified as less likely to enroll in physical education class (Hobin, Leatherdale, Manske, Burkhalter et al., 2010). Internationally, a recent study using data from the Welsh Health Behaviour in School-Aged Children study found an independent association between school-level SES and various health behaviours, but not for PA (Moore & Littlecott, 2015). These results suggest that using an individual-level SES measure may be a better predictor of PA levels.

However, there is some evidence to suggest that schools with a higher SES may have greater access and availability of school facilities/equipment, which in turn is associated with higher student PA (Barnett et al., 2006). Additional evidence has suggested that school SES explains a significant amount of variance in the number of total PA opportunities available within schools (Stearns, & Glennie, 2010). Given these inconsistencies in the literature, it remains unclear as to what impact school SES plays on student PA levels; thus, warranting further research within this area.

2.4.4 Written School PA Policies/Practices

Written school PA policies, including those related to intramural and club programming, are a formalized method for schools to provide increased opportunities for student PA. One review examining the environmental correlates of PA in youth identified school PA policies as being positively associated with student PA (Ferreira et al., 2006). Furthermore, Faulkner and colleagues (2014) recently identified significant between-school variation in the time spent in light to vigorous PA among a sample of 856 grade five and six students from 18 elementary schools in Ontario. After evaluating over 22 school-level variables, the findings indicated that students attending schools with written school PA policies/practices participated in significantly more minutes of PA per school week compared to students who attended schools without such written policies/practices (Faulkner et al., 2014).

However, other studies have identified discrepancies in the effectiveness of school policies/practices for improving student MVPA. One American middle school study found the effect of school PA policies was not significant and did not alter the likelihood that girls would participate in PA (Bocarro et al., 2012). Additionally, a cross-sectional study using 17 917 students in grades 6-10 from 316 schools who participated in the 2009/2010 Canadian Health Behaviour in School-Aged Children Survey identified a negative association between school policies and programs and student MVPA levels (Button & Janssen, 2014). The authors speculated that schools with a greater number of PA policies and programs may not maintain the same quality of programs or that the implementation may not be properly executed as compared to schools with fewer PA policies and programs.

2.5 Student-Level Characteristics Associated With PA

2.5.1 Demographic Characteristics

Student-level demographic characteristics, including age, gender, ethnicity and SES, have been consistently found to be associated with PA levels. Specifically that older students (Allison, Dwyer, & Makin, 1999; Faulkner et al., 2014; Hobin et al., 2012b, 2013; Leggett et al., 2012), female students (Allison et al., 1999; Faulkner et al., 2014; Hobin et al., 2012a, 2012b, 2013; Kurc & Leatherdale, 2009; Leggett et al., 2012), low SES youth (Hanson & Chen, 2007) and South East Asian, Latin American and African ethnic groups (Kukaswadia, Pickett, & Janssen, 2014) are significantly less likely to participate in PA. When designing and implementing school PA initiatives, it is important to consider how different demographic characteristics may influence student PA levels.

2.5.2 Modifiable Characteristics

Additional student-level characteristics identified within the literature as having an association with student PA include: number of active friends; use of active transportation; enrollment in physical education class; participation in flexibility activities; participation in strength training activities; and participation in intramural, varsity and community sports teams, respectively.

Having active friends appears as a strong predictor of PA, such that students with a greater number of active friends are more likely to engage in PA (Leatherdale et al., 2010; Leggett et al., 2012; Loucaides, Plotnikoff, & Bercovitz, 2007). Irrespective of school location, students who use active transportation to school, are enrolled in physical education class, participate in school intramural programming, school varsity teams, flexibility activities, and resistance training are more likely to spend greater amounts of time engaging in PA (Hobin et al., 2012a, 2012b, 2013).

However, gender discrepancies exist in a similar pattern as described previously. Male students are more likely to use active transportation, enroll in physical education, participate in school intramural leagues, varsity sports teams and strength training as compared to females, whereas more female than male students participate in flexibility-related activities (Hobin et al., 2012b). Additional research using a sample of 25 416 students from 76 Ontario secondary schools identified both male and female students were more likely to engage in higher levels of PA if they participated in intramural programming, varsity sports and community sports teams respectively (Kurc & Leatherdale, 2009). However, further studies with secondary school students have reported no association between participation in varsity sports and being moderately or highly active respectively (Leatherdale et al., 2010). As such, it is evident that student-level factors exert a large and variable influence on student PA levels. To improve the effectiveness and reach of PA opportunities, schools should consider potential student-level characteristics during program development and implementation.

2.6 The Current Landscape of Canadian High School Recreational Programming

2.6.1 School Recreational Programming and PA

For the purpose of this thesis, school recreational programming is defined as structured, non-competitive recreational opportunities before, during and after school for students to participate in PA (i.e. intramural programs and non-competitive PA clubs).

School environments have the ability to offer opportunities for students to engage in PA outside of curriculum requirements through the provision of PA policies, competitive sports and recreational programming (Allison & Adlaf, 2000; Wechsler et al., 2000). However, despite wide availability (Hobin et al., 2012a) school recreational programs are often battling low enrollment (Dwyer, Allison, LeMoine et al., 2006). While the majority of athletics occurs during after school time (Barnett et al., 2006; Guèvremont, Findlay, & Kohen, 2014), some research has suggested increasing the duration and frequency of existing PA programming and providing sports programs before school and during the lunch period may prove as a potential method for improving student participation rates (Powers, Conway, McKenzie, Sallis, & Marshall, 2002). There is also some evidence to suggest schools that offer a greater number of PA programs are more likely to have higher student participation rates (Stearns & Glennie, 2010).

Recent evidence has provided substantial support for increasing recreational opportunities in secondary schools as a method for improving student PA levels. Consistent evidence has shown school PA programming has the potential to positively influence student PA levels (Dobbins et al., 2013; Strong et al., 2005; van Sluijs, McMinn, & Griffin, 2008). Kurc and Leatherdale (2009) reported students were two times as likely to obtain higher PA levels if they participated in school recreational programming. A recent systematic review conducted by Nelson and colleagues (2011) also reported a positive association between sports participation and increased PA. After controlling for age, sex, body mass index (BMI) and school SES, Fuller and colleagues (2011) found Canadian students engaged in higher amounts of total and vigorous

PA activities per week if they attended a school with more intramural sports opportunities, irrespective of a students' own participation in intramural sports. Additional research has also identified intramural programming as an effective format for improving male, but not female PA levels (Bocarro et al., 2014).

For participating students, intramural programs provide greater energy expenditures as compared to participation in varsity sports (Bocarro et al., 2014). This may be as a result of less time devoted to skill instruction and more time actively engaging in the sporting activity. Moreover, the effect of youth sports participation may carry over into adulthood. In a Canadian longitudinal study, the researchers identified a significant relationship between the number of years spent participating in youth sports and PA levels in adulthood (Bélanger et al., 2015). Youth who spent 4-5 years participating in sports were significantly more likely to obtain higher levels of PA at age 24 (Bélanger et al., 2015).

Consistent with evidence regarding PA participation, younger students (Faulkner et al., 2007), males (Cohen et al., 2007; Fuller et al., 2011; Guèvremont et al., 2014; Kurc & Leatherdale, 2009), Caucasian (Cohen et al., 2007) and high SES students (Guèvremont et al., 2014) are more likely to participate in school PA programming.

2.6.2 Student Benefits Associated with School PA Participation

School PA programs may also have important academic and health benefits for participating students. Current evidence has suggested that students who obtain higher PA levels are more likely to succeed academically (Fox et al., 2010). Additional research has also suggested that participation on sports teams is associated with greater academic achievement (Fox et al., 2010; Fredricks & Eccles, 2006; Lipscomb, 2007; Marsh, 1993; Marsh & Kleitman, 2003). Such evidence suggests there may be specific academic benefits for students participating in sports.

As noted previously, consistent evidence has suggested a positive association between participation in school PA programming and increased PA levels (Bélanger et al., 2015; Bocarro et al., 2014; Dobbins et al., 2013; Fuller et al., 2011; Kurc & Leatherdale, 2009; Strong et al., 2005; van Sluijs et al, 2008). Students who participate in sports are also less likely to be overweight and obese (Drake et al., 2012). In addition, improved mental health outcomes have been positively associated with school sports participation, including self-esteem (Harrison & Narayan, 2003), feelings of competency (Madonia, Cox, & Zahl, 2014) and self-rated mental health (Jewett et al., 2014). Furthermore, students involved in school sports report lower depression symptoms, stress levels (Jewett et al., 2014), feelings of sadness, anxiety and suicidal behaviour (Harrison & Narayan, 2003). Given the aforementioned health and academic benefits afforded to students who participate in school PA programming, schools should have a vested interest in improving their recreational programming and increasing the number of students who participate in these programs.

2.6.3 Importance of School Recreational Programming

The school environment provides an opportunity to teach students about sports, skill development and positive behaviours (such as good sportsmanship) (De Meester et al., 2014; Harrison & Narayan, 2003). While school recreational programming may attract students who already engage in varsity or community sports, it may also have the potential to reach a substantial amount of students who are motivated to become skilled and compete, but may not have the resources or desire to play competitively or outside of the school environment (De Meester et al., 2014).

In Canada, varsity sports programs are the most prominent school-based PA opportunities available to high school students outside of physical education class (Hobin et al., 2012a). However, varsity sports involvement typically requires students to have advanced sport skills and

a desire to play in a competitive environment. As noted previously, this may act as a barrier for some students who may have little to no sport-related skills and/or whom desire to play in a more recreational environment (Bauer et al., 2004; De Meester et al., 2014; Dwyer, Allison, Goldenberg et al., 2006). Moreover, schools often require students to maintain minimum grade point averages and attendance requirements for eligibility on varsity teams. Thus, students who are unable to maintain the minimum grades required by their school will be ineligible to participate (Feldman & Matjasko, 2005). Since varsity sports target a limited percentage of the student body, offering non-competitive recreational PA opportunities has become an important component for school PA initiatives.

Intramural and non-competitive club programming can provide students with opportunities to increase overall PA levels (Hobin et al., 2012a, 2012b, 2013; Kurc & Leatherdale, 2009) and provide a supportive, non-competitive environment for skill development and recreational play for students with a range of athletic abilities (Bocarro et al., 2008; Edwards et al., 2014). Recreational programming differs from varsity sports teams in a number of ways, primarily that students of all abilities can participate (Bocarro et al., 2012). Furthermore, school recreational programming eliminates a range of barriers related to participation in varsity and community sports. For female students specifically, the highly competitive nature of varsity sports programs has been identified as a deterrent from participation (Dwyer, Allison, Goldenberg et al., 2006). Among low SES students, additional environmental barriers (such as proximity, cost, and access to facilities/equipment) act as a barrier from participating in varsity and community sports programs (Humbert et al., 2006). Low-SES youth may not have the same resources available to them (such as registration money, access to necessary equipment or available transportation to games at other schools) as their higher-SES peers. Therefore, school recreational programming (i.e. PA programs that are non-competitive and do not require students to have access to transportation, equipment or monetary resources) provides an attractive option for promoting PA among students at a higher risk for physical inactivity. In addition, most school

recreational programs are co-educational, include a variety of traditional and non-traditional sport activities and students only play against other students who attend the same school (Bocarro et al., 2012). Approximately 76% of secondary schools in Ontario offered intramural programs to students in 2006 (Hobin et al., 2012a).

While the provision of school recreational programming eliminates many of the barriers identified by students from participating in PA programs, research examining gender differences within school sports programs have reported that female students perceive that they have fewer PA programs available to them as compared to males (Witmer, Bocarro, & Henderson, 2011). Likewise, the notion that co-educational recreational programming is dominated by male students further prevents female students from participation (Witmer et al., 2011). Moving forward, schools should consider how to eliminate barriers and promote facilitators to enable a greater percentage of their student body (specifically female students) to become involved in school recreational programming.

Recent studies have recommended schools focus on improving current recreational programming as they can be offered at lower administrative costs while reaching a greater percentage of the student body and potentially students at greater risk for inactivity (such as females and low SES students) (Bocarro et al., 2014; Edwards et al., 2014). Such efforts will create an accessible and supportive environment for students of all abilities and demographics to engage in a variety of PA activities that facilitate the development of PA skills needed for a healthy active lifestyle (Bocarro et al., 2008; Edwards et al., 2014). Recent calls for additional research examining school-based recreational PA opportunities have been identified in the literature (Morton, Atkin, Corder, Suhrcke & van Sluijs, 2016), as it may help to inform school PA policies and improve the effectiveness of current school recreational programming.

2.7 The COMPASS Study

COMPASS (Cohort study, Obesity, Marijuana use, Physical activity, Alcohol use, Smoking, Sedentary behaviour) is a prospective cohort study collecting longitudinal data from a convenience sample of Canadian secondary schools and the students that attend those schools (Leatherdale, Brown, et al., 2014). COMPASS annually collects data (2012-2016) on multiple youth health behaviours and the school environment (including the school program and policy environment & built environment characteristics within and surrounding the school). Youth health outcomes examined within COMPASS include: diet, PA, weight status, sedentary behaviour, tobacco use, alcohol use, drug use, school connectedness, bullying and academic achievement. In Year 1 (2012-2013), 43 Ontario schools and 24 173 students participated in the data collections. In Year 2 (2013-2014), data was collected from 89 schools (79 in Ontario, 10 in Alberta) and 45 298 students. With the addition of Alberta schools, COMPASS investigators can now make comparisons over time between provincial policies and programs (Leatherdale, Brown, et al., 2014). In Year 3 (2014-2015), data was collected from 87 schools (78 in Ontario, 9 in Alberta) and 42 355 students. Additional details about COMPASS are available online (https://uwaterloo.ca/compass-system/) or in print (Leatherdale, Brown, et al., 2014).

2.7.1 COMPASS Conceptual Framework

COMPASS is designed to evaluate school policies, programs and built environment characteristics, which facilitate opportunities for improvements in youth health behaviours. This rigorous research, evaluation and knowledge exchange system enables school and research stakeholders to tailor and evaluate natural experiments in the school environment. These natural experiments generate practice-based evidence for the design and implementation of more effective school-based prevention programming. Continuous knowledge translation and exchange with school stakeholders and local prevention resources (such as public health units) creates an

ongoing process of research and practice. By generating practice-based evidence through continual evaluation and tailoring of school interventions, COMPASS can build the capacity of schools to provide effective youth prevention programming.

CHAPTER THREE: STUDY RATIONALE AND RESEARCH QUESTIONS

3.1 Study Rationale

Strategies aimed at improving youth PA levels are a promising approach to reduce the current and future disease burden associated with inactivity (Janssen & LeBlanc, 2010). As it stands currently, a large percentage of Canada youth are not achieving PA levels required for good health (Colley et al., 2011). The school environment has been identified as a setting where a large majority of youth with varying demographic characteristics (including those at the most risk for physical inactivity) can be targeted (Kriemler et al., 2011). Moreover, school recreational programming may be an effective avenue to reach youth. However, there is limited evidence in Canada to suggest how changes in school recreational programs and policies may influence student PA levels over time. To this author's knowledge, there is no longitudinal evidence to date examining how changes to school recreational programming (including the creation, modification and removal of recreational programs) influence a students' likelihood of meeting the CSEP guideline. Given the paucity of research examining the effectiveness of high school recreational programs on improving PA levels within a large population of Canadian youth, this research will aid in filling a large gap in the scientific literature.

COMPASS provides a rigorous scientific platform to evaluate the effectiveness of natural experiments implemented at the school-level on student health behaviours over time (Leatherdale, Brown, et al., 2014). The large sample size of youth attending schools across two Canada provinces provides both substantial power and generalizability of the results. Therefore, well-designed longitudinal studies are necessary in order to identify the components of school recreational programming that promote higher levels of PA and potentially aid in reducing the age-related decline in PA. Understanding such factors is essential for the development of effective school-based prevention programming.

3.2 Research Questions

Question 1a: Between Year 2 and Year 3 of the COMPASS study, is there a significant difference in the prevalence of students meeting the CSEP guideline for physical activity (i.e. ≥60 min/day of MVPA 7x/week, resistance exercise ≥3x/week, and VPA ≥3x/week)?

Question 1b: Between Year 2 and Year 3 of the COMPASS study, is there a significant difference in the prevalence of students meeting the MVPA guideline (i.e. ≥60 min/day of MVPA 7x/week)?

Question 2a: Between Year 2 and Year 3 of the COMPASS study, is there a significant difference in the school-level prevalence of a student meeting the CSEP guideline in schools where changes were made to school recreational programming (intervention schools) as compared to schools where no changes were made to the school recreational programming (control schools)?

Question 2b: Between Year 2 and Year 3 of the COMPASS study, is there a significant difference in the school-level prevalence of a student meeting the MVPA guideline in schools where changes were made to school recreational programming (intervention schools) as compared to schools where no changes were made to the school recreational programming (control schools)?

Question 3a: Between Year 2 and Year 3 of the COMPASS study, did changes in school recreational programming have a significant impact on the likelihood of students meeting the CSEP guideline?

Question 3b: Between Year 2 and Year 3 of the COMPASS study, did changes in school recreational programming have a significant impact on the likelihood of students meeting the MVPA guideline?

CHAPTER FOUR: METHODOLOGY

4.1 Study Design

COMPASS is a longitudinal cohort study (2012-2016) collecting data from a convenience sample of secondary schools across Ontario and Alberta and the grade 9 to 12 students that attend those schools (Leatherdale, Brown, et al., 2014). Consistent with previous literature (Leatherdale & Rynard, 2013), COMPASS utilizes an in-class, whole school sampling method and various data collection tools (to be discussed in subsequent sections) to measure how changes to the school environment, programs and policies influence youth health behaviours over time (Leatherdale, Brown, et al., 2014). The use of a longitudinal quasi-experimental design allows for robust internal control at the student- and school-level (due to the longitudinal design) and robust external validity (due to the quasi-experimental design) (Leatherdale, Brown, et al., 2014). For the current study, longitudinal data analysis was conducted using linked student-level to school-level data from Year 2 (2013-2014) to Year 3 (2014-2015) of the COMPASS study. Year 2 (n=89 schools) and Year 3 (n=87 schools) were chosen for this examination as they have a much larger sample size than Year 1 (n=43 schools).

4.2 Participants

4.2.1 School Recruitment and Sampling

Participating school boards and schools were purposefully sampled. Only English speaking school boards that permit the use of active-information passive-consent procedures were approached to participate. After school board approval, eligible secondary schools (those with at least 100 students per grade and who permit the use of passive consent protocols) were approached to participate (Leatherdale, Brown, et al., 2014). Passive consent protocols are appropriate for collecting self-reported risk behaviour data (as they ensure confidentiality) and are

less prone to bias (Thompson-Haile et al., 2013). Participating schools were given a $200 honorarium and a custom school feedback report (Leatherdale, Brown, et al., 2014). In Year 2, data from a sample of 89 schools (79 in Ontario, 10 in Alberta) was collected. In Year 3, data was collected from a sample of 87 schools (78 in Ontario, 9 in Alberta).

4.2.2 Student Recruitment and Sampling

Active-information, passive consent procedures were used to obtain consent for student participation. Information letters about the COMPASS study were mailed to the parents or guardians of students at participating schools. Students were withdrawn from the study if their parents or guardians contacted the researchers (either through a toll-free number or by email) (Leatherdale, Brown, et al., 2014). Participating students could also choose to withdraw at any point during the data collection. In Year 2, the whole school sample included 45 298 grade 9-12 students. In Year 3, the whole school sample included 42 355 grade 9-12 students. Between Year 2 and Year 3, the linked longitudinal sample included 19 854 students. Complete case analysis samples were derived from the linked longitudinal sample for each respective outcome, and were used for all analysis. In total, 17,051 and 17,371 students had complete CSEP and MVPA outcomes respectively, and complete covariate information for Year 2 and Year 3.

4.2.3 Ethics

The COMPASS study has received ethics approval from the University of Waterloo, Office of Research Ethics and the University of Alberta, Research Ethics Office. Approval has also been granted from participating school boards and schools.

4.3 The COMPASS Questionnaire

The COMPASS questionnaire (Cq) is a 12 page machine-readable paper questionnaire, which collects self-reported information on student health behaviours, health outcomes and sociodemographic characteristics. Self-report methods have been consistently used in other large Canadian school-based studies, such as the Health Behaviour in School-Aged Children Survey (Button & Janssen, 2014), as a valid and reliable measure for collecting student data (Leatherdale & Laxer, 2013; Leatherdale, Laxer, & Faulkner, 2014). Students are given approximately 30-40 minutes (approximately one class period) to complete the survey, which is administered by teachers during a specified day and class period (Leatherdale, Brown, et al., 2014). The Cq includes questions pertaining to weight status, PA, sedentary behaviour, diet, drug and alcohol use, tobacco use, bullying, academic achievement and school connectedness. Due to the active-information, passive-consent procedures used during recruitment, objective PA data could not be collected (and thus PA was measured subjectively through the Cq). At each school, trained COMPASS personnel were present on the day of data collection to answer any questions or concerns about the Cq. The full Cq can be found in Appendix A.

4.4 COMPASS School Programs and Policies (SPP) Questionnaire

As part of each data collection, the COMPASS SPP questionnaire is completed by a school administrator or COMPASS school contact most knowledge about available school programs and policies. The SPP is a paper-based survey that collects information on the presence, absence or changes (addition, removal or modification) of programs, policies and facilities that have the potential to influence student health behaviours. Copies of school handbooks are also provided (if necessary) to obtain additional information about the school programs, policies and facilities (Leatherdale, Brown, et al., 2014). For the Year 2 and Year 3 data collections, the SPP provides preceding years responses with space for schools to indicate if changes were made and

include details about the respective changes. COMPASS staff verifies the information provided on the SPP in a follow up phone call. An example of the Year 3 SPP can be found in Appendix B.

Changes to the provision of school recreational programming between Year 2 and Year 3 were assessed using data from the Year 3 SPP. In total, 3 schools implemented new recreational programming (where none had previously existed), 15 schools modified pre-existing recreational programming and 2 schools removed intramural programming (but kept non-competitive clubs) during Year 3. The remaining 66 schools that did not make any changes to their recreational programming acted as a control group comprised of two levels; 43 schools comprised the true controls (i.e. schools that did not make any PA practice changes between Year 2 and Year 3) and 23 schools comprised the other practice intervention (OPI) controls (i.e. schools that made other PA practice changes between Year 2 and Year 3 that were unrelated to school recreational programming). Additional follow-up was completed by the investigator if the changes made to school recreational programming identified on the SPP required clarification. A description of the changes in school recreational programming can be found in Appendix C.

Between Year 2 and Year 3, all of the intervention schools implemented changes to their recreational programming that met or exceeded the 4 MET value according to the Compendium of Physical Activities (Ainsworth et al., 2011; Arizona State University, 2011). This is important as activities that meet or exceed 4 METs have been characterized as moderate (4-5.9 METs) or vigorous (>6 METs) PA for children and youth (Trost, Loprinzi, Moore, & Pfeiffer, 2011). The only activity offered between Year 2 and Year 3 that did not meet the 4 MET threshold was yoga (n=3). However, each of the three schools that added yoga, also added additional activities (such as basketball) that met or exceeded the 4 MET threshold. Therefore, all of the intervention schools offered recreational programming that engaged students in at least moderate PA, and thus were included in the analysis.

4.5 Measures

As COMPASS acts as the host study, only relevant variables from the COMPASS dataset were chosen for examination.

4.5.1 Response Variables

The outcome of interest is student PA levels, which was examined using two dichotomous response variables: ≥60 minutes of daily MVPA and the CSEP guideline. Leatherdale, Laxer and Faulkner (2014) have identified the test-retest reliability and validity of the Cq PA measures to be consistent with previously used self-report PA measures among youth.

Given the abundance of public health research that specifically examines MVPA as the sole PA measure, achieving ≥60 minutes of daily MVPA serves as a response variable of interest in order to compare results to the available literature. MVPA was calculated through the combination of two questions: (1) "Mark how many minutes of HARD physical activity you did on each of the last 7 days. This includes physical activity during physical education class, lunch, after school, evenings, and spare time" and (2) "Mark how many minutes of MODERATE physical activity you did on each of the last 7 days. This includes physical activity during physical education class, lunch, after school, evenings, and spare time. Do not include time spent doing hard physical activities." Definitions of the two variables are also included for students. Hard physical activities are suggested as jogging, team sports, fast dancing, jump rope and any other physical activities that increase your heart rate and make you sweat. Moderate physical activities are described as lower intensity activities including walking, biking to school and recreational swimming. MVPA is a dichotomous variable, such that students who achieved 60 minutes or more of MVPA daily were coded as 1. Students who did not achieve ≥60 minutes of MVPA daily were coded as 0.

The second response variable, CSEP, was successfully achieved through the completion of three components: (i) Achieving ≥60 minutes of MVPA is the first component of the CSEP guideline and was calculated as described previously for the first response variable, (ii) resistance training (RT) completed at least 3 days/week is the second component of the CSEP guideline. Students were asked, "On how many days in the last 7 days did you do exercises to strengthen or tone your muscles? (e.g., push-ups, sit-ups, or weight-training)". Students who reported 3 to 7 days of RT were coded as 1, whereas students who did not meet the recommendations (0 to 2 days of RT) were coded as 0, and (iii) vigorous physical activity (VPA) completed at least 3 days/week is the third and final component of the CSEP guideline. VPA was analyzed as a dichotomous variable, whereby students who report completing HARD PA on 3 to 7 days were coded as a 1, whereas students reporting HARD PA on 0 to 2 days were coded as a 0.

To determine whether students are achieving the CSEP guideline, the following CSEP variable was created. CSEP is a dichotomous variable created to determine if a student meets the entire CSEP guideline (i.e. achieves ≥60 minutes of daily MVPA, RT 3x/week and VPA 3x/week). For students to be coded as a 1, they must have been coded as a 1 on all three respective variables (MVPA, RT and VPA). If any of the respective variables were coded as a 0, they were coded as a 0 for the CSEP variable.

4.5.2 Student-Level Measures

COMPASS collects student-level covariates, including modifiable characteristics (as described previously), as well as demographic characteristics (including grade, gender, ethnicity and weekly spending money) from each participating student, which were included within the analysis.

To assess active transportation, students were classified as "Active" if they walk or cycle to and from school, "Sometimes active" if they walk or cycle either to or from school or if they

use public transit, and "Inactive" if they travel by car (either as the driver or passenger) or by school bus to school. The number of active friends a student has was categorized as "None", "1-4 friends" or "5 or more friends", as consistent with Leatherdale (2015).

For physical education enrollment, students who indicate they are currently enrolled or have been/will be enrolled in a physical education class in this school year were classified as "Yes". Students who are not enrolled in a physical education class this year were classified as "No". To assess participation in intramural, varsity team and community team sports, students were classified as "Yes" if they report participation or "No" if they report they do not participate or "No Opportunities Available to Participate" if they report that none are offered or available to them.

Demographic characteristics include: Grade (9, 10, 11, 12); gender (Female, Male); ethnicity (White, Black, Asian, Aboriginal, Hispanic, Other, Mixed) and weekly spending money ($0, $1-$20, $21-$100, more than $100, I don't know). Weekly spending money was used as a proxy for individual-level SES and was collapsed into these categories to remain consistent with previous literature (Leatherdale, 2015; Leatherdale & Harvey, 2015).

4.5.3 School-Level Measures

School demographic characteristics were also considered. School location was analyzed using "Large Population Centre", "Medium Population Centre", "Small Population Centre" and "Rural" classifications as defined in the 2011 census data (Statistics Canada, 2011). The 2011 National Household Survey data provided the median household income at each school postal code and was used as a proxy for school-level SES. School size was calculated through school enrollment numbers. Schools with 500 students or less were classified as small, schools with 501 to 1000 students were classified as medium and schools with over 1001 students were considered large.

4.6 Data Analysis

As stately previously, the complete case linked longitudinal samples between Year 2 and Year 3 were used for all analysis. To obtain the necessary longitudinal data, the student-level data from Year 2 and Year 3 must be linked within schools. On each Cq, there are a series of questions where the responses should remain the same over time. The responses to these questions then generate a unique code for each student, which allow for data linkage over time while allowing student responses to remain anonymous (Bredin & Leatherdale, 2013; Qian, Battista, Bredin, Brown & Leatherdale, 2015). The data for students that transfer schools, are absent on the day of the data collection or provide inaccurate data, cannot be linked and therefore were excluded from analyses. Students were included in the data analysis if they were in grades 9, 10 or 11 in Year 2. Students who are enrolled in grade 12 in Year 2 or grade 9 in Year 3 were not included as part of the analysis, as they will not have data for both time points. Furthermore, the Cq student responses and the school responses (i.e. the SPP) for Year 2 and Year 3 were linked by School ID (Bredin & Leatherdale, 2013; Qian et al., 2015). Two linked longitudinal student-level samples were created; one for each respective outcome variable. The CSEP sample included 17,051 students, and the MVPA sample included 17,371 students.

A sensitivity analysis was performed for all research objectives to determine if the findings generated using the linked longitudinal samples were robust. Students were asked, "Were the last 7 days a typical week in terms of the amount of physical activity that you usually do?" Students who reported an atypical week in regards to the amount of PA were removed from the sample for the sensitivity analysis.

Descriptive statistics, ANOVA and hierarchical longitudinal analysis were conducted to answer the research questions. The statistical package SAS version 9.4 was used for all analyses.

For research question 1a and 1b, frequency counts and McNemar's test was used to determine prevalence and test for significant differences, respectively.

For research question 2a and 2b, the linked longitudinal sample was used to examine the changes in the school-level prevalence of students achieving the CSEP guideline and the MVPA guideline respectively, for each school that reported a change in recreational programming (intervention schools) relative to the sample of schools that reported no changes in school recreational programming (control schools). Using a difference-in differences modelling approach, the difference in proportions between the *i*-th intervention school and (pooled) control school was defined as:

$$\Delta P_{Diff}^{(i)} = \Delta P_i - \Delta P_C \ ,$$

where,

ΔP_i denotes the change in proportion observed in the *i*-th intervention school such that $\Delta P_i = P_i^{(at\ year\ 3)} - \ P_i^{(at\ year\ 2)}$, with $P_i^{(at\ year\ j)}$ denoting the proportion of students meeting the respective guideline in the *i*-th intervention school at time *j* for *j* = 2, 3, and ΔP_C denotes the pooled estimate (weighted mean) for change in proportion observed in control schools. Specifically, if *C* denotes the index set of control schools, then

$$\Delta P_C = \frac{\sum_{k \in C} \ w_k \left(P_k^{(at\ year\ 3)} - \ P_k^{(at\ year\ 2)} \right)}{\sum_{k \in C} \ w_k} \ ,$$

where $P_k^{(at\ year\ j)}$ denotes the proportion of students meeting the respective guideline in the *k*-th control school at time *j* for *j* = 2, 3.

ANOVA was performed on ΔP across school type (interventions and control). If ANOVA provided evidence for at least one school being different, a Dunnett's test was performed to determine which intervention school was significantly different from the common control school.

For research question 3a and 3b, a hierarchical longitudinal analysis was performed using the linked longitudinal student-level samples. Relative risk (RR) from Year 2 to Year 3 was calculated to examine the change in a student's probability of meeting the CSEP and MVPA guideline, respectively. To account for the hierarchical nature of COMPASS data (as students are nested within schools) and the longitudinal design (repeated observations over time), a 3 level structure (schools, students and time) was necessary. The generalized estimating equations (GEE) model was used to account for within-school and within-student associations. GEE models are appropriate as the focus is on estimating the average population response, rather than individual responses. Schools were treated as a cluster and students as a sub-cluster. PROC GENMOD was used with Poisson distribution and log link function to estimate the RR (Fang, 2011; Zou, 2004), whereby students who meet the guideline (coded as 1) and all other students who do not meet the guideline (coded as a 0). The model also included measures for each of the 20 interventions (*Intervention*), the change over time (*Year*) and the intervention impact (*School* × *Year*). The intervention impact represents the effects of a change in school recreational programming in each of the 20 intervention schools on the relative increase or reduction in the probability of a student in that school meeting the CSEP (or MVPA) guideline from Year 2 to Year 3 relative to a similar student in the control schools. Student- and school-level covariates were also controlled for within the models.

CHAPTER FIVE: RESULTS

5.1 Research Question 1a: Year 2 to Year 3 Descriptive Statistics (CSEP)

In total, 17,051 linked students had complete CSEP outcomes in Year 2 and Year 3. Within this sample, 31.0% (n=5292) met the CSEP guideline in Year 2 and 28.5% (n=4860) met the CSEP guideline in Year 3.

5.1.1 Descriptive Statistics by Gender: CSEP Sample

Overall, 53.8% of the CSEP sample self-identified as female and 46.2% self-identified as male. Compared to females, a greater percentage of males use active transportation both to and from school (12.8% vs. 9.7%), have five or more active friends (52.9% vs. 33.9%), enroll in physical education (69.1% vs. 60.9%), participate in intramural, (42.3% vs. 37.1%), varsity (48.9% vs 39.1%), and community sports (60.7% vs. 49.1%), as shown in Table 1. Males were also more likely to obtain the CSEP guideline (37.4% vs. 25.6%) in Year 2 as compared to females (p-value <0.0001). In Year 3, 22.4% of females and 35.7% of males met the CSEP guideline (p-value <0.0001). Additionally, changes in intramural participation between Year 2 and Year 3 by sex were examined (Appendix D).

Table 1: Descriptive Statistics for the Year 2 (2013-2014) COMPASS Sample by Gender (CSEP Sample)

		Female (n=9179) %	**Male** (n=7872) %	**Total** (n=17,051) %	**Chi Square**
Grade	9	36.2	38.8	37.4	χ^2=45.1* df=3
	10	34.7	33.2	34.0	
	11	27.5	25.3	26.5	
	12	1.6	2.7	2.1	
Ethnicity	White	78.4	77.3	77.9	χ^2=25.2** df=6
	Black	2.5	3.7	3.0	
	Asian	5.2	5.1	5.1	
	Aboriginal	2.1	2.4	2.3	
	Hispanic	1.6	1.6	1.6	
	Other	3.3	3.5	3.4	
	Mixed	6.9	6.4	6.7	
Weekly spending money	$0	17.9	19.5	18.6	χ^2=83.0* df=4
	$1-20	34.4	34.1	34.3	
	$21-100	25.6	23.1	24.5	
	>$100	8.2	11.6	9.7	
	I don't know	13.9	11.7	12.9	
CSEP Guideline	Did not meet	74.4	62.6	69.0	χ^2=277.6* df=1
	Met	25.6	37.4	31.0	
Active Transportation	Inactive	78.2	71.7	75.2	χ^2=94.2* df=2
	Sometimes Active	12.1	15.5	13.7	
	Active	9.7	12.8	11.1	
# of Active Friends	None	5.5	5.0	5.3	χ^2=641.1* df=2
	1-4	60.6	42.1	52.0	
	5 or more	33.9	52.9	42.7	
Enrolled in PE	Yes	60.9	69.1	64.7	χ^2=124.3* df=1
	No	39.1	30.9	35.3	
Participation in Intramurals	Yes	37.1	42.3	39.5	χ^2=49.2* df=2
	No	59.7	54.5	57.3	
	NOA	3.2	3.2	3.2	
Participation in Varsity Sports	Yes	39.1	48.9	43.6	χ^2=163.9* df=2
	No	59.7	50.0	55.2	
	NOA	1.2	1.1	1.2	
Participation in Community Sports	Yes	49.1	60.7	54.4	χ^2=240.9* df=2
	No	50.2	38.3	44.7	
	NOA	0.7	1.0	0.9	
Notes: *p-value of <0.0001, **p-value of <0.001 PE=Physical Education, NOA= No Opportunities Available to Participate					

5.1.2 Year 2 Descriptive Statistics by CSEP Status

As shown in Table 2, a greater percentage of students met the CSEP guideline who were males, grade 9 students, students of White, Black or Aboriginal ethnicity, those with weekly spending money of $21-$100, greater than $100 or were not sure how much weekly spending money they have, students who use active transportation to or from school, students with five or more active friends, who enroll in physical education and participate in intramural, varsity and community sports respectively.

Furthermore, as shown in Table 3 (p-value <0.0001), those who met the CSEP guideline were less likely to have never participated (31.9% vs. 48.9%) or stopped participated (12.8% vs. 13.4%) in intramurals between Year 2 and Year 3 as compared to students who did not meet the CSEP guideline. Students who met the CSEP guideline were also more likely to have started participating in Year 3 (14.3% vs. 11.2%) or have participated in both Year 2 and Year 3 (35.6% vs. 21.6%).

Table 2: Descriptive Statistics for the Year 2 (2013-2014) COMPASS Sample by CSEP Status

		Did not meet the CSEP Guideline (n=11,759) %	**Met the CSEP Guideline** (n=5292) %	**Total** (n=17,051) %	**Chi Square**
Gender	Female	58.1	44.4	53.8	χ^2=277.6* df=1
	Male	41.9	55.6	43.2	
Grade	9	35.6	41.5	37.4	χ^2=56.8* df=3
	10	34.8	32.1	34.0	
	11	27.5	24.3	26.5	
	12	2.1	2.1	2.1	
Ethnicity	White	77.3	79.1	77.9	χ^2=36.0* df=6
	Black	2.8	3.5	3.0	
	Asian	5.7	3.8	5.1	
	Aboriginal	2.2	2.4	2.3	
	Hispanic	1.7	1.5	1.6	
	Other	3.5	3.2	3.4	
	Mixed	6.8	6.5	6.7	
Weekly spending money	$0	20.6	14.3	18.6	χ^2=145.6* df=4
	$1-20	34.7	33.3	34.3	
	$21-100	23.2	27.2	24.5	
	>$100	8.8	12.0	9.7	
	I don't know	12.7	13.2	12.9	
Active Transportation	Inactive	75.4	74.6	75.2	χ^2=4.4 df=2
	Sometimes Active	13.3	14.5	13.7	
	Active	11.3	10.9	11.1	
# of Active Friends	None	6.4	2.7	5.3	χ^2=702.0* df=2
	1-4	57.5	39.9	52.0	
	5 or more	36.1	57.4	42.7	
Enrolled in PE	Yes	58.5	78.4	64.7	χ^2=631.5* df=1
	No	41.5	21.6	35.3	
Participation in Intramurals	Yes	34.8	50.1	39.5	χ^2=364.7* df=2
	No	62.0	46.8	57.3	
	NOA	3.2	3.1	3.2	
Participation in Varsity Sports	Yes	36.9	58.5	43.6	χ^2=702.7* df=2
	No	62.0	40.3	55.2	
	NOA	1.1	1.2	1.2	
Participation in Community Sports	Yes	48.0	68.7	54.4	χ^2=675.3* df=2
	No	51.3	30.0	44.7	
	NOA	0.7	1.3	0.9	
Notes: *p-value of <0.0001 PE=Physical Education, NOA= No Opportunities Available to Participate					

Table 3: Change in Intramural Participation between Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS Study by Year 3 CSEP Status

	Did not meet the CSEP Guideline (n=12,191) %	**Met the CSEP Guideline** (n=4860) %	**Total** (n=17,051) %	**Chi Square**
Never Participated	48.9	31.9	44.1	χ^2=550.3* df=8
Stopped Participating	13.4	12.8	13.2	
Started Participating	11.2	14.3	12.1	
Always Participated	21.6	35.6	25.6	
NOA to Participating	0.6	1.3	0.8	
Participated to NOA	0.7	1.0	0.8	
NOA to Not Participating	2.1	1.6	2.0	
Did not Participate to NOA	1.2	1.1	1.2	
NOA to NOA	0.4	0.4	0.4	
Notes: *p-value of <0.0001 NOA= No Opportunities Available to Participate				

5.1.3 Prevalence of Students Meeting the CSEP Guideline between Year 2 and Year 3

Overall, there is a statistically significant difference in the prevalence of students meeting the CSEP guideline between Year 2 and Year 3 of the COMPASS study (p-value <0.0001). As shown in Table 4, the likelihood of a student who meets the CSEP guideline in Year 2 but does not meet the CSEP guideline in Year 3 is slightly less likely (14.7%) than a student meeting the CSEP guideline in both years (16.3%) and slightly more likely than a student not meeting the CSEP guideline in Year 2 but meeting the guideline in Year 3 (12.2%).

Table 4: CSEP Status in Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS study

CSEP	*Year 3*			
Year 2	**Did not meet the CSEP Guideline**	**Met the CSEP Guideline**	Total	McNemar's Test Statistic
Did not meet the CSEP Guideline	9680 (56.8 %)	2079 (12.2%)	11,759	S=40.7* df=1
Met the CSEP Guideline	2511 (14.7%)	2781 (16.3%)	5292	
Total	12,191	4860	N=17,051	
Notes: * p-value of < 0.0001				

5.2 Research Question 1b: Year 2 to Year 3 Descriptive Statistics (MVPA)

In total, 17,371 linked students had complete MVPA outcomes in Year 2 and Year 3. Within this sample, 47.8% (n=8306) met the MVPA guideline in Year 2 and 52.2% (n=9065) met the MVPA guideline in Year 3.

5.2.1 Descriptive Statistics by Gender: MVPA Sample

Overall, 53.8% of the MVPA sample self-identified as female and 46.2% self-identified as male. Compared to females, a greater percentage of males use active transportation some of the time (15.6% vs. 12.1%) or use active transportation both to and from school (12.8% vs. 9.7%), have five or more active friends (52.7% vs. 33.8%), enroll in physical education (69.1% vs. 60.8%), participate in intramural, (42.2% vs. 37.1%), varsity (48.7% vs 39.0%), and community sports (60.4% vs. 49.0%), as shown in Table 5. Males were also slightly more likely to obtain 60 minutes of MVPA daily (55.6% vs. 41.1%) as compared to females (p-value <0.0001). In Year 3, 45.4% of females and 54.6% of males completed ≥60 minutes of MVPA daily (p-value <0.0001). Additionally, changes in intramural participation between Year 2 and Year 3 by sex were examined (Appendix D).

Table 5: Descriptive Statistics for the Grade 9-12 Students in the Year 2 (2013-2014) COMPASS Sample by Gender (MVPA Sample)

		Female (n=9345) %	**Male** (n=8026) %	**Total** (n=17,371) %	**Chi Square**
Grade	9	36.3	38.9	37.5	χ^2=46.9* df=3
	10	34.7	33.1	34.0	
	11	27.4	25.3	26.4	
	12	1.6	2.7	2.1	
Ethnicity	White	78.3	77.2	77.8	χ^2=26.7** df=6
	Black	2.5	3.7	3.1	
	Asian	5.2	5.1	5.1	
	Aboriginal	2.2	2.4	2.3	
	Hispanic	1.6	1.6	1.6	
	Other	3.3	3.5	3.4	
	Mixed	6.9	6.5	6.7	
Weekly spending money	$0	17.9	19.6	18.7	χ^2=86.6* df=4
	$1-20	34.5	34.4	34.4	
	$21-100	25.5	23.0	24.3	
	>$100	8.1	11.5	9.7	
	I don't know	14.0	11.5	12.9	
60 Minutes Daily MVPA	Did not meet	58.9	44.4	52.2	χ^2=364.1* df=1
	Met	41.1	55.6	47.8	
Active Transportation	Inactive	78.2	71.6	75.1	χ^2=97.7* df=2
	Sometimes Active	12.1	15.6	13.7	
	Active	9.7	12.8	11.2	
# of Active Friends	None	5.4	5.1	5.3	χ^2=649.1* df=2
	1-4	60.8	42.2	52.2	
	5 or more	33.8	52.7	42.5	
Enrolled in PE	Yes	60.8	69.1	64.6	χ^2=127.9* df=1
	No	39.2	30.9	35.4	
Participation in Intramurals	Yes	37.1	42.2	39.5	χ^2=48.1* df=2
	No	59.7	54.6	57.1	
	NOA	3.2	3.2	3.2	
Participation in Varsity Sports	Yes	39.0	48.7	43.5	χ^2=167.4* df=2
	No	59.9	50.2	55.4	
	NOA	1.1	1.1	1.1	
Participation in Community Sports	Yes	49.0	60.4	54.3	χ^2=240.8* df=2
	No	50.3	38.6	44.9	
	NOA	0.7	1.0	0.8	
Notes: *p-value of <0.0001, **p-value of <0.001 PE=Physical Education, NOA= No Opportunities Available to Participate					

5.2.2 Year 2 Descriptive Statistics by MVPA Status

As shown in Table 6, a greater percentage of students who achieved ≥60 minutes of daily MVPA were males, students in grade 9, of White, Black or Aboriginal ethnicity, those who have weekly spending money of $21-$100 or greater than $100, students who use active transportation some of the time or both to and from school, students with five or more active friends, those who enroll in physical education and participate in intramural, varsity and community sports, respectively.

Furthermore, students who met the MVPA guideline were more likely to have started participating in intramurals in Year 3 (13.2% vs. 11.1%) or have participated in intramurals for both Year 2 and Year 3 (30.8% vs. 20.9%), as shown in Table 7 (p-value <0.0001).

Table 6: Descriptive Statistics for the Year 2 (2013-2014) COMPASS Sample by MVPA Status

		Not meeting 60 minutes of MVPA daily (n=9065) %	**Meeting 60 minutes of MVPA daily** (n=8306) %	**Total** (n=17,371) %	**Chi Square**
Gender	Female	60.7	46.3	53.8	χ^2=364.1*
	Male	39.3	53.7	46.2	df=1
Grade	9	35.3	39.8	37.5	
	10	34.9	33.1	34.0	χ^2=38.6*
	11	27.7	25.0	26.4	df=3
	12	2.1	2.1	2.1	
Ethnicity	White	76.5	79.3	77.8	
	Black	3.0	3.1	3.1	
	Asian	6.2	3.9	5.1	χ^2=53.3*
	Aboriginal	2.2	2.4	2.3	df=6
	Hispanic	1.7	1.5	1.6	
	Other	3.6	3.2	3.4	
	Mixed	6.8	6.6	6.7	
Weekly spending money	$0	21.2	15.9	18.7	
	$1-20	34.9	33.9	34.4	
	$21-100	23.1	25.7	24.4	χ^2=144.6*
	>$100	7.8	11.7	9.6	df=4
	I don't know	13.0	12.8	12.9	
Active Transportation	Inactive	76.1	74.1	75.1	
	Sometimes Active	13.6	13.9	13.7	χ^2=13.6** df=2
	Active	10.3	12.0	11.2	
# of Active Friends	None	6.5	4.0	5.3	
	1-4	58.6	45.1	52.2	χ^2=466.4* df=2
	5 or more	34.9	50.9	42.5	
Enrolled in PE	Yes	57.6	72.3	64.6	χ^2=407.4*
	No	42.4	27.7	35.4	df=1
Participation in Intramurals	Yes	34.0	45.4	39.5	
	No	62.9	51.4	57.4	χ^2=244.4* df=2
	NOA	3.1	3.2	3.1	
Participation in Varsity Sports	Yes	36.3	51.4	43.5	
	No	62.7	47.4	55.4	χ^2=413.0* df=2
	NOA	1.0	1.2	1.1	
Participation in Community Sports	Yes	47.1	62.1	54.3	
	No	52.2	36.8	44.9	χ^2=415.9* df=2
	NOA	0.7	1.1	0.8	
Notes: *p-value of <0.0001, **p-value of <0.001 PE=Physical Education, NOA= No Opportunities Available to Participate					

Table 7: Change in Intramural Participation Between Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS Study by Year 3 MVPA Status

	Not meeting 60 minutes of MVPA daily (n=9343) %	**Meeting 60 minutes of MVPA daily** (n=8028) %	**Total** (n=17,371) %	**Chi Square**
Never Participated	49.7	37.7	44.2	χ^2=336.9* df=8
Stopped Participating	13.4	13.0	13.2	
Starting Participating	11.1	13.2	12.0	
Always Participated	20.9	30.8	25.5	
NOA to Participating	0.6	1.0	0.8	
Participated to NOA	0.7	0.9	0.8	
NOA to Not Participating	2.0	1.8	2.0	
Did not Participate to NOA	1.2	1.1	1.2	
NOA to NOA	0.4	0.4	0.4	
Notes: *p-value of <0.0001 NOA= No Opportunities Available to Participate				

5.2.3 Prevalence of Students Meeting the MVPA Guideline between Year 2 and Year 3

Overall, there is a statistically significant difference in the prevalence of students achieving ≥60 minutes of daily MVPA between Year 2 and Year 3 of the COMPASS study (p-value <0.001). As shown in Table 8, the likelihood of a student who achieves 60 minutes of daily MVPA in Year 2 but does not obtain 60 minutes of MVPA in Year 3, is slightly higher (17.6%) than the likelihood of a student not meeting the MVPA guideline in Year 2 but meeting the MVPA guideline in Year 3 (16.0%). Approximately one third of the sample remain either meeting the daily MVPA requirements in both years (30.2%) or in neither year (36.2%).

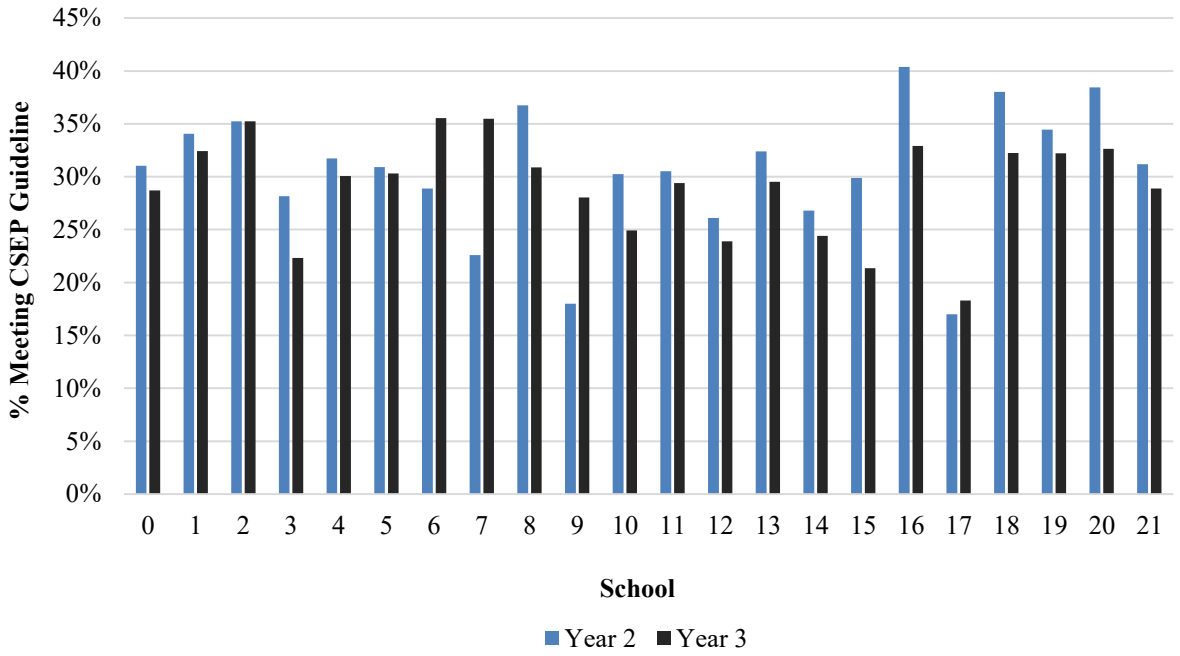
Table 8: MVPA Status in Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS study

MVPA	*Year 3*			
Year 2	**Not meeting 60 minutes of MVPA daily**	**Meeting 60 minutes of MVPA daily**	Total	McNemar's Test Statistic
Not meeting 60 minutes of MVPA daily	6282 (36.2%)	2783 (16.0%)	9065	S=13.2* df=1
Meeting 60 minutes of MVPA daily	3061(17.6%)	5245(30.2%)	8306	
Total	9343	8028	N=17,371	
Notes: * p-value of < 0.001				

5.3 Research Question 2a: Difference-in-Differences Changes in the School-Level Prevalence of Students Meeting the CSEP Guideline

As shown in Figure 1, only four intervention schools that modified pre-existing intramural programs in Year 3 exhibited an increase in the school-level prevalence of meeting the CSEP guideline between Year 2 and Year 3. Additionally, School 19 and 20 both removed intramural programs in Year 3 and show a decrease in the school-level prevalence of meeting the CSEP guideline. The school-level prevalence of students meeting the CSEP guideline ranged from 17.0-40.4% in Year 2 and 18.3-35.5% in Year 3. While these results are not statistically significant, they suggest that certain modifications to pre-existing intramural programs may have the potential to increase the number of students obtaining the CSEP guideline, whereas removing intramural programs may reduce the potential for students to meet the guideline.

Figure 1: School-Level Prevalence of Meeting the CSEP Guideline Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS Study



Notes:
School 0 represents the pooled sample of true control schools (n=43).
School 21 represents the pooled sample of OPI schools (n=23).

Table 9 provides the difference-in-differences changes in the school-level prevalence of students meeting the CSEP guideline between Year 2 and Year 3 relative to the true control schools and the OPI schools, respectively. While none of these changes prove to be significant (at a 5% alpha level), there is a substantial range that the intervention schools increase and decrease the prevalence relative to the true control schools (range: -6.04% to 16.56%) and OPI schools (range: -5.71% to 16.89%). Most notably, School 6 and 7 exhibit a large increase in the school-level prevalence of students meeting the CSEP guideline relative to the true control schools (7.97% and 16.56%) and OPI schools (8.30% and 16.89%), respectively. For School 15, the modifications to intramural programming may have contributed to the 6.04% and 5.71% smaller increase relative to the increase observed the in true control and OPI schools from Year 2 to Year

3. For the schools that removed intramural programming (School 19 and 20), there appears to be mixed results in regards to the difference-in-differences changes in the school-level prevalence of CSEP between Year 2 and Year 3 relative to the control group. As expected, School 20 exhibited a negative change relative the control group. However, School 19 exhibited a larger increase in the school-level prevalence of meeting the CSEP guideline as compared to the control schools. Overall, ten intervention schools (School 1, 2, 4, 5, 6, 7, 11, 13, 17, 19) exhibited a larger increase relative to the increase observed in the true control and OPI schools between Year 2 and Year 3, respectively.

Table 9: Difference-in-Differences Changes in the School-Level Prevalence of Students Meeting the CSEP Guideline Between Year 2 (2013-2014) and Year 3 (2014-2015) Relative to the Control Schools

School	Difference-in-Differences Changes in the School-Level Prevalence of Meeting the CSEP Guideline Relative to True Control Schools[a,c]	ANOVA (True Control Schools)	Difference-in-Differences Changes in the School-Level Prevalence of Meeting the CSEP Guideline Relative to Other Practice Intervention (OPI) Schools[b,c]	ANOVA (OPI Schools)
1	2.32		1.99	
2	2.99		2.65	
3	-3.17		-3.51	
4	0.58		0.25	
5	0.92		0.59	
6	8.30		7.97	
7	16.89		16.56	
8	-4.08	F=0.82,	-4.42	F=0.84,
9	-8.51	df_1= 20,	-8.84	df_1= 20,
10	-2.33	df_2=4403,	-2.66	df_2=4403,
11	2.08	p-value=	1.75	p-value=
12	-0.24	0.6917	-0.58	0.6599
13	0.97		0.63	
14	-1.35		-1.69	
15	-5.71		-6.04	
16	-4.90		-5.23	
17	2.38		2.05	
18	-2.63		-2.97	
19	2.13		1.79	
20	-3.14		-3.47	

Notes:
[a] represents the change in the prevalence of meeting the CSEP guideline within an intervention school between Year 2 and Year 3 relative to the pooled change in the prevalence of meeting the CSEP guideline within the true control schools between Year 2 and Year 3
[b] represents the change in the prevalence of meeting the CSEP guideline within an intervention school between Year 2 and Year 3 relative to the pooled change in the prevalence of meeting the CSEP guideline within the OPI schools between Year 2 and Year 3
[c] none of the 20 intervention schools were found to be significant ($p<0.05$)

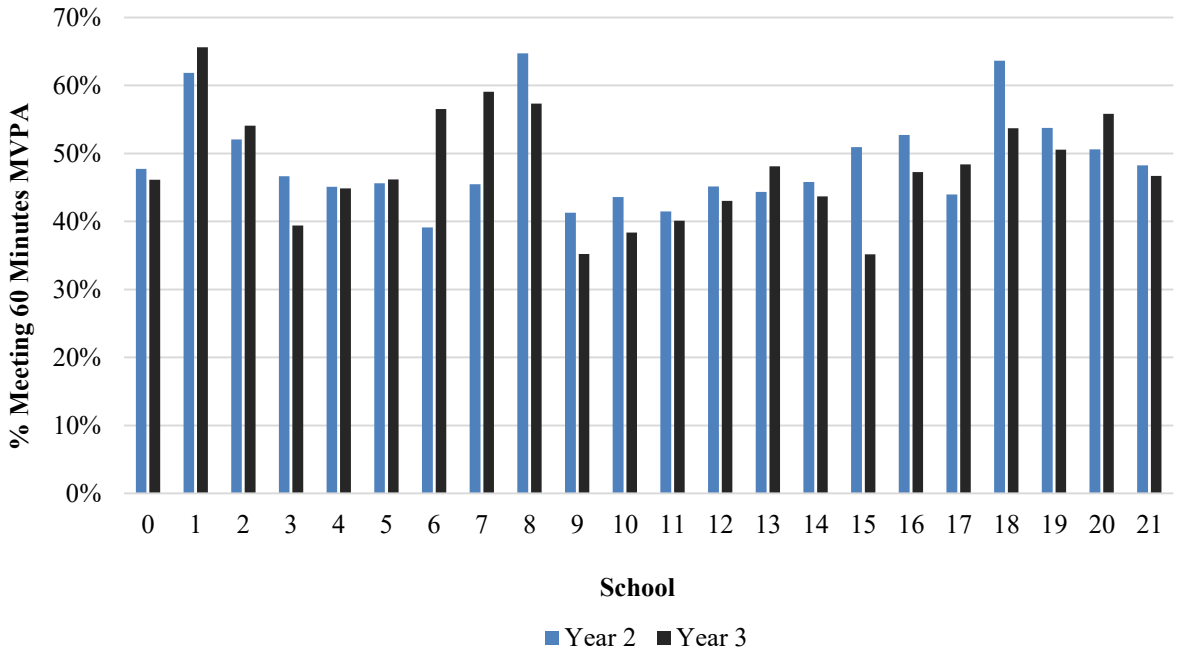
5.4 Research Question 2b: Difference-in-Differences Changes in the School-Level Prevalence of Students Meeting the MVPA Guideline

As shown in Figure 2, there was an increase in the school-level prevalence of achieving ≥60 minutes of daily MVPA between Year 2 and Year 3 for two of the three intervention schools that added new intramural programming, five schools that modified pre-existing intramural programs and 1 school that removed intramural programming in Year 3. Similar to the CSEP results, School 6 and 7 exhibit the largest increases in school-level prevalence of meeting the MVPA guideline. Overall, the school-level prevalence of meeting the MVPA guideline is much higher in comparison to CSEP, ranging from 39.1-64.7% in Year 2 and 35.2- 65.6% in Year 3. Although insignificant, these results suggest that various interventions, including adding or modifying intramural programming, may have the potential to improve student MVPA at the school-level.

Table 10 provides the difference-in-differences changes in the school-level prevalence of students meeting the MVPA guideline between Year 2 and Year 3 relative to the true controls schools and the OPI schools, respectively. In total, ten intervention schools (School 1, 2, 4, 5, 6, 7, 11, 13, 17, 20) exhibited a larger increase relative to the increase observed in the true control and OPI schools between Year 2 and Year 3, respectively. While these results were not significant ($p<0.05$), various schools exhibited important changes in the prevalence of meeting the MVPA guideline relative to the control schools between Year 2 and Year 3. School 6 and 7 exhibited the largest increases in the school-level prevalence of students achieving ≥60 minutes of daily MVPA relative to the true control schools (18.98% and 15.22%) and OPI schools (18.93% and 15.18%) respectively. School 15 and 18 exhibited the largest negative difference-in-differences change relative to the true control schools (-14.17% and -8.33%) and OPI schools (-14.22% and -8.38%), respectively. For School 20, which removed intramural programming in Year 3, the MVPA school-level prevalence exhibited a larger increase by approximately 6% relative to the control schools. Given the considerable range in the school-level MVPA

prevalence, these results may offer some suggestions as to how various interventions influence MVPA levels in schools over time.

Figure 2: School-Level Prevalence of Achieving ≥60 Minutes of Daily MVPA in Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS study



Notes:
School 0 represents the pooled sample of true control schools (n=43).
School 21 represents the pooled sample of OPI schools (n=23).

Table 10: Difference-in-Differences Changes in the School-Level Prevalence of Students Meeting the MVPA Guideline Between Year 2 (2013-2014) and Year 3 (2014-2015) Relative to the Control Schools

School	Difference-in-Differences Changes in the School-Level Prevalence of Meeting the MVPA Guideline Relative to True Control Schools[a,c]	ANOVA (True Control Schools)	Difference-in-Differences Changes in the School-Level Prevalence of Meeting the MVPA Guideline Relative to Other Practice Intervention (OPI) Schools[b,c]	ANOVA (OPI Schools)
1	5.35		5.31	
2	3.63		3.58	
3	-5.63		-5.67	
4	1.38		1.34	
5	2.17		2.13	
6	18.98		18.93	
7	15.22		15.18	
8	-5.77		-5.81	
9	-4.46	F=1.25, df_1= 20, df_2=4208, p-value= 0.1990	-4.50	F=1.26, df_1= 20, df_2=4211, p-value= 0.1978
10	-3.66		-3.70	
11	0.21		0.17	
12	-0.57		-0.61	
13	5.36		5.32	
14	-0.52		-0.57	
15	-14.17		-14.22	
16	-3.87		-3.91	
17	6.04		6.00	
18	-8.33		-8.38	
19	-1.64		-1.68	
20	6.81		6.76	

Notes:
[a] represents the change in the prevalence of meeting the MVPA guideline within an intervention school between Year 2 and Year 3 relative to the pooled change in the prevalence of meeting the MVPA guideline within the true control schools between Year 2 and Year 3
[b] represents the change in the prevalence of meeting the MVPA guideline within an intervention school between Year 2 and Year 3 relative to the pooled change in the prevalence of meeting the MVPA guideline within the OPI schools between Year 2 and Year 3
[c] none of the 20 intervention schools were found to be significant ($p<0.05$)

5.5 Research Question 3a: The Impact of Changes in School Recreational Programming between Year 2 and Year 3 on the Likelihood of Students Meeting the CSEP Guideline

Table 11 presents the relative risks (RR), 95% confidence intervals and p-values of the covariates associated with each of the two models. Model 1 compares the likelihood of students obtaining the CSEP guideline between Year 2 and Year 3 within each of the 20 intervention schools compared to the true control schools. Model 2 compares the likelihood of students obtaining the CSEP guideline between Year 2 and Year 3 within each of the 20 intervention schools compared to the OPI schools.

Within both models, students who reported having $21-100, greater than $100 of weekly spending money or those who did not know how much weekly spending money they had, were significantly more likely to have met the CSEP guideline from Year 2 to Year 3 compared to those students who reported having $0 of weekly spending money. Within both models, males were significantly more likely to meet the CSEP guideline in comparison to females and Asian students were significantly less likely in comparison to White students. Students who reported having 1-4 or 5+ physically active friends, being enrolled in PE, participating in varsity sports or community sports, were significantly more likely to have met the CSEP guideline compared to students who indicated they have no physically active friends, did not enroll in PE and do not participate in varsity or community sports, respectively. Students that indicated there are no community sport opportunities available for them were also significantly more likely to have met the CSEP guideline compared to students who did not participate in community sports. Additionally, students who indicated that they participated in school recreational programming in both Year 2 and Year 3 or started participating in Year 3, were significantly more likely to meet the CSEP guideline compared to those students who did not participate in school recreational programming in either year.

In model 1, students who indicated they were Aboriginal, have $1-20 weekly spending money, do not have varsity sports opportunities available at their school or attend a medium or

large size school, were more likely to have met the CSEP guideline in comparison to students who report being White, having no weekly spending money, do not participate in varsity sports or those who attend a small school, respectively. Additionally, those students who stopped participating in school recreational programming in Year 3 or had none available to them in both Year 2 and Year 3 were significantly more likely to meet the CSEP guideline compared to students who did not participate in either year. Furthermore, as school SES increases, students are slightly less likely to achieve the CSEP guideline.

In model 2, students who reported being in grade 11 or 12 were significantly less likely to obtain the CSEP guideline compared to students in grade 9. Moreover, students that indicated they had no school recreational programming opportunities in Year 2 but participated in Year 3, as well as those students that participated in Year 2 but had no opportunities to participate in Year 3 were more likely to obtain the CSEP guideline compared to students that did not participate in either year. Additionally, students who indicated they are of mixed ethnicity were more likely to achieve the CSEP guideline in comparison to students who reported being White.

For the Intervention Impact, only School 9 was statistically significant in the true control (RR=0.74) and OPI (RR=0.73) models respectively. Those students that attend School 9 were significantly less likely to meet the CSEP guideline after modification of their school recreational programming compared to control students. While insignificant, it is important to note that an a average student attending School 6, 7 or 17, was at least 10% more likely to meet the CSEP guideline from Year 2 to Year 3 in comparison to an average student attending the control schools. Students that attend School 15 or 16 (in either model) or School 8 (in the OPI model) were at least 10% less likely to obtain the CSEP guideline compared to their respective control students from Year 2 to Year 3.

Table 11: Evaluating the Impact of 20 School Recreational Programming Interventions Between Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS study on the Relative Risk of a Student Meeting the CSEP Guideline

Parameter	Model 1: True Control Schools				Model 2: OPI Schools			
		95%CI				95%CI		
	RR	Lower	Upper	P-value	**RR**	Lower	Upper	P-value
Intercept	**0.08**	0.07	0.09	<0.0001	**0.08**	0.06	0.11	<0.0001
Gender								
Male	**1.29**	1.24	1.35	<0.0001	**1.25**	1.19	1.32	<0.0001
Grade in Year 3								
10	1.03	0.97	1.10	0.3004	0.96	0.89	1.03	0.2825
11	0.99	0.93	1.06	0.8510	**0.88**	0.81	0.95	0.0014
12	0.99	0.91	1.08	0.8684	**0.86**	0.77	0.96	0.0073
Ethnicity								
Black	1.02	0.91	1.15	0.6892	0.88	0.78	1.00	0.0544
Asian	**0.86**	0.77	0.96	0.0061	**0.77**	0.68	0.87	<0.0001
Aboriginal	**1.20**	1.07	1.35	0.0018	1.17	0.99	1.38	0.0604
Hispanic	1.04	0.90	1.21	0.5819	0.84	0.68	1.05	0.1222
Other	1.09	0.98	1.21	0.1067	0.97	0.85	1.10	0.6376
Mixed	1.06	0.98	1.15	0.1434	**1.10**	1.00	1.21	0.0413
Weekly Spending Money								
$1-20	**1.19**	1.12	1.27	<.0001	1.07	0.99	1.15	0.0974
$21-100	**1.39**	1.30	1.48	<.0001	**1.24**	1.15	1.35	<0.0001
$100 or more	**1.48**	1.38	1.60	<.0001	**1.38**	1.26	1.51	<0.0001
I don't know	**1.24**	1.15	1.34	<.0001	**1.15**	1.04	1.26	0.0042
Active Transportation								
Sometimes Active	1.05	0.98	1.11	0.1653	1.04	0.97	1.11	0.2846
Active	1.04	0.97	1.10	0.2606	1.05	0.97	1.13	0.1971
# of Active Friends								
1-4 friends	**1.25**	1.12	1.39	<0.0001	**1.38**	1.20	1.59	<0.0001
5+ friends	**1.68**	1.50	1.87	<0.0001	**1.82**	1.58	2.10	<0.0001
Enrolled in PE								
Yes	**1.64**	1.57	1.72	<0.0001	**1.60**	1.51	1.70	<0.0001
Varsity Sports								
Participate	**1.18**	1.12	1.24	<0.0001	**1.22**	1.15	1.30	<0.0001
NOA	**1.22**	1.01	1.47	0.0395	1.09	0.87	1.39	0.4503
Community Sports								
Participate	**1.33**	1.27	1.39	<0.0001	**1.34**	1.26	1.41	<0.0001
NOA	**1.58**	1.32	1.89	<0.0001	**1.55**	1.20	1.99	0.0007
School Location[a]								
Medium Urban					1.00	0.90	1.12	0.9635
Small Urban					0.94	0.84	1.05	0.2744
Only Rural					0.85	0.68	1.06	0.1571

School Size								
Medium School	**1.13**	1.06	1.20	<0.0001	0.93	0.83	1.05	0.2474
Large School	**1.10**	1.02	1.18	0.0133	1.05	0.91	1.22	0.4874
School SES								
	0.98	0.96	0.99	0.0007	1.00	0.97	1.03	0.9859
Year								
Year 3	1.02	0.97	1.08	0.3933	**1.09**	1.02	1.17	0.0150
Change in Intramural Participation								
Stopped Participating	**1.10**	1.03	1.18	0.0035	1.07	0.99	1.16	0.0793
Started Participating	**1.17**	1.10	1.25	<0.0001	**1.15**	1.06	1.25	0.0006
Always Participated	**1.22**	1.15	1.30	<0.0001	**1.19**	1.11	1.28	<0.0001
NOA to Participating	1.15	0.93	1.42	0.2015	**1.44**	1.18	1.76	0.0004
Participating to NOA	1.18	0.97	1.44	0.0909	**1.33**	1.04	1.69	0.0239
NOA to Not Participating	1.04	0.89	1.21	0.6351	1.13	0.95	1.34	0.1645
Not Participating to NOA	1.03	0.85	1.25	0.7598	1.03	0.82	1.31	0.7898
NOA to NOA	**1.35**	1.00	1.83	0.0499	1.08	0.77	1.51	0.6506
Intervention Impact								
Addition of a New Program								
School 1	0.96	0.71	1.29	0.7690	0.93	0.69	1.26	0.6525
School 2	1.08	0.82	1.44	0.5854	1.07	0.80	1.42	0.6641
School 3	0.96	0.69	1.33	0.7863	0.92	0.66	1.28	0.6284
Modification of Pre-Existing Program								
School 4	1.04	0.86	1.27	0.6625	1.03	0.84	1.25	0.8051
School 5	1.06	0.77	1.48	0.7118	1.05	0.75	1.46	0.7822
School 6	1.30	0.71	2.10	0.3945	1.30	0.70	2.40	0.4028
School 7	1.69	0.97	2.94	0.0661	1.65	0.94	2.90	0.0804
School 8	0.90	0.56	1.47	0.6861	0.89	0.55	1.45	0.6398
School 9	**0.74**	0.55	1.00	0.0470	**0.73**	0.54	0.98	0.0354
School 10	0.97	0.75	1.25	0.8017	0.95	0.73	1.24	0.7091
School 11	1.03	0.82	1.29	0.8003	1.01	0.80	1.28	0.9167
School 12	0.94	0.67	1.33	0.7353	0.92	0.65	1.31	0.6572
School 13	0.99	0.66	1.49	0.9611	0.98	0.65	1.48	0.9257
School 14	0.99	0.77	1.28	0.9598	0.97	0.75	1.26	0.8358
School 15	0.77	0.53	1.10	0.1494	0.75	0.52	1.09	0.1297
School 16	0.87	0.64	1.18	0.3740	0.85	0.62	1.16	0.3045
School 17	1.27	0.82	1.99	0.2884	1.25	0.80	1.96	0.3285
School 18	0.91	0.64	1.31	0.6150	0.90	0.63	1.29	0.5697
Removal of Program								
School 19	1.07	0.70	1.63	0.7555	1.05	0.69	1.61	0.8198
School 20	0.91	0.70	1.17	0.4567	0.90	0.69	1.16	0.4170

Notes:
PE=Physical Education, NOA= No Opportunities Available to Participate
[a] Due to only one rural school being in the True Control group, RR's. C.I.'s and p-value's could not be computed for school location.

5.6 Research Question 3b: The Impact of Changes in School Recreational Programming between Year 2 and Year 3 on the Likelihood of Students Meeting the MVPA Guideline

Table 12 presents the relative risks (RR), 95% confidence intervals and p-values of the covariates associated with each of the models. Model 3 is comparing the likelihood of students obtaining the MVPA guideline between Year 2 and Year 3 within each of the 20 intervention schools compared to the true control schools. Model 4 is comparing the likelihood of students obtaining the MVPA guideline between Year 2 and Year 3 within each of the 20 intervention schools compared to the OPI schools.

Within both models, students who reported having $21-100 or greater than $100 of weekly spending money were significantly more likely to have met the MVPA guideline from Year 2 to Year 3 compared to those students who reported having $0 of weekly spending money. Within both models, males were significantly more likely to meet the MVPA guideline in comparison to females and Asian students were significantly less likely in comparison to White students. Students who reported having 1-4 or 5+ physically active friends, using active transportation to and from school, being enrolled in PE, participating in varsity sports or community sports, were significantly more likely to have met the MVPA guideline compared to students who indicated they have no physically active friends, do not actively transport to and from school, did not enroll in PE and do not participate in varsity or community sports, respectively. Students that indicated there are no community sport opportunities available for them were also significantly more likely to have obtained ≥60 minutes of daily MVPA compared to students who did not participate in community sports. Additionally, students who indicated that they participated in school recreational programming in both Year 2 and Year 3, started participating in Year 3 or stopped participating in Year 3, were significantly more likely to meet the MVPA guideline compared to those students who did not participate in school recreational

programming in either year. Furthermore, as school SES increases, students are slightly less likely to obtain ≥60 minutes of MVPA daily.

In model 3, students who indicated they have $1-20 of weekly spending money or those who do not know how much weekly spending money they have, were more likely to achieve ≥60 minutes of daily MVPA compared to students with no weekly spending money.

In model 4, students who reported being in grade 10, 11 or 12 were significantly less likely to obtain the MVPA guideline compared to students in grade 9. Additionally, students who reported being Black or Hispanic were less likely to achieve the MVPA guideline compared to students who reported being White. Students that indicated they had no school recreational programming opportunities in Year 2 but either chose to participate or not participate in Year 3, as well as those students who participated in Year 2 but had no opportunities to participate in Year 3 were more likely to obtain the MVPA guideline compared to students that did not participate in either year. Student whom attended schools in medium urban locations were also significantly more likely to meet the guideline compared to students attending schools in large urban centres.

For the Intervention Impact, only School 15 was statistically significant in both models (RR=0.71). Those students that attend School 15 were significantly less likely to meet the MVPA guideline after modification of their school recreational programming compared to control students. While insignificant, it is important to note that a student that attended School 6, 7, 13, 17 or 20, was at least 10% more likely to meet the MVPA guideline from Year 2 to Year 3 in comparison to students attending the control schools in both models. Whereas students who attended School 18 (in either model) and School 3 (in the OPI model only) were at least 10% less likely to meet the MVPA guideline.

Table 12: Evaluating the Impact of 20 School Recreational Programming Interventions Between Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS study on the Relative Risk of a Student Achieving ≥60 Minutes of Daily MVPA

Parameter	Model 3: True Control Schools				Model 4: OPI Schools			
		95%CI				95%CI		
	RR	Lower	Upper	P-value	**RR**	Lower	Upper	P-value
Intercept	**0.25**	0.22	0.27	<0.0001	**0.29**	0.24	0.35	<0.0001
Gender								
Male	**1.26**	1.23	1.30	<0.0001	**1.25**	1.21	1.29	<0.0001
Grade in Year 3								
10	1.02	0.98	1.06	0.3470	**0.93**	0.89	0.98	0.0059
11	1.01	0.97	1.06	0.6821	**0.91**	0.86	0.96	0.0006
12	1.01	0.96	1.07	0.6777	**0.86**	0.80	0.93	<0.0001
Ethnicity								
Black	0.94	0.87	1.03	0.1769	**0.81**	0.74	0.89	<0.0001
Asian	**0.80**	0.74	0.86	<0.0001	**0.78**	0.71	0.84	<0.0001
Aboriginal	1.03	0.95	1.12	0.4350	1.11	0.99	1.24	0.0704
Hispanic	0.93	0.84	1.04	0.2075	**0.85**	0.74	0.99	0.0320
Other	1.01	0.93	1.09	0.8685	0.95	0.87	1.04	0.2769
Mixed	1.03	0.98	1.09	0.2061	1.01	0.95	1.08	0.7815
Weekly Spending Money								
$1-20	**1.14**	1.09	1.19	<0.0001	1.04	0.99	1.10	0.1019
$21-100	**1.24**	1.19	1.30	<0.0001	**1.14**	1.08	1.20	<0.0001
$100 or more	**1.38**	1.31	1.45	<0.0001	**1.29**	1.21	1.36	<0.0001
I don't know	**1.16**	1.10	1.22	<0.0001	1.06	0.99	1.13	0.0731
Active Transportation								
Sometimes Active	1.03	0.99	1.07	0.1980	1.01	0.96	1.05	0.7590
Active	**1.12**	1.07	1.16	<0.0001	**1.07**	1.02	1.13	0.0069
# of Active Friends								
1-4 friends	**1.10**	1.04	1.18	0.0024	**1.14**	1.05	1.23	0.0022
5+ friends	**1.30**	1.22	1.39	<0.0001	**1.36**	1.25	1.48	<0.0001
Enrolled in PE								
Yes	**1.29**	1.25	1.32	<0.0001	**1.22**	1.18	1.27	<0.0001
Varsity Sports								
Participate	**1.04**	1.00	1.07	0.0433	**1.06**	1.02	1.11	0.0037
NOA	1.13	0.99	1.29	0.0755	0.94	0.79	1.11	0.4478
Community Sports								
Participate	**1.14**	1.11	1.17	<0.0001	**1.15**	1.10	1.19	<0.0001
NOA	**1.24**	1.09	1.42	0.0013	**1.24**	1.04	1.48	0.0188
School Location[a]								
Medium Urban					**1.14**	1.06	1.23	0.0003
Small Urban					1.04	0.96	1.12	0.3157
Rural					1.09	0.95	1.26	0.2160

School Size								
Medium School	1.04	1.00	1.08	0.0750	0.95	0.87	1.02	0.1627
Large School	0.97	0.93	1.02	0.2939	1.04	0.94	1.15	0.4937
School SES								
	0.98	0.97	0.99	<0.0001	**0.98**	0.96	0.99	0.0096
Year								
Year 3	1.01	0.97	1.04	0.7398	**1.06**	1.01	1.12	0.0153
Change in Intramural Participation								
Stopped Participating	**1.06**	1.02	1.11	0.0063	**1.07**	1.01	1.13	0.0168
Started Participating	**1.09**	1.04	1.14	0.0001	**1.07**	1.01	1.13	0.0157
Always Participated	**1.15**	1.10	1.20	<0.0001	**1.14**	1.08	1.20	<0.0001
NOA to Participating	1.12	0.96	1.30	0.1506	**1.20**	1.02	1.39	0.0232
Participating to NOA	1.11	0.97	1.28	0.1325	**1.27**	1.07	1.51	0.0065
NOA to Not Participating	1.05	0.95	1.16	0.3638	**1.14**	1.02	1.28	0.0205
Not Participating to NOA	0.98	0.86	1.11	0.7386	0.96	0.82	1.13	0.6073
NOA to NOA	0.99	0.79	1.25	0.9454	1.06	0.84	1.34	0.5971
Intervention Impact								
Addition of a New Program								
School 1	1.04	0.86	1.26	0.6759	1.03	0.85	1.24	0.7818
School 2	1.09	0.89	1.33	0.4048	1.08	0.88	1.32	0.4630
School 3	0.93	0.75	1.15	0.4942	0.88	0.71	1.10	0.2655
Modification of Pre-Existing Program								
School 4	1.04	0.90	1.19	0.5984	1.03	0.89	1.19	0.6821
School 5	1.06	0.84	1.33	0.6454	1.05	0.83	1.32	0.6826
School 6	1.46	0.94	2.27	0.0901	1.47	0.95	2.28	0.0850
School 7	1.32	0.93	1.88	0.1145	1.32	0.93	1.89	0.1180
School 8	0.91	0.66	1.28	0.5677	0.91	0.66	1.25	0.5544
School 9	0.92	0.76	1.11	0.3728	0.91	0.75	1.11	0.3461
School 10	0.95	0.79	1.15	0.6163	0.95	0.79	1.14	0.5635
School 11	1.00	0.85	1.18	0.9957	0.99	0.83	1.17	0.8997
School 12	0.93	0.76	1.20	0.6925	0.95	0.76	1.19	0.6546
School 13	1.14	0.85	1.53	0.3688	1.15	0.86	1.54	0.3557
School 14	1.00	0.84	1.18	0.9956	0.99	0.84	1.18	0.9213
School 15	**0.71**	0.56	0.91	0.0075	**0.71**	0.56	0.91	0.0070
School 16	0.92	0.74	1.16	0.4932	0.91	0.73	1.14	0.4194
School 17	1.20	0.94	1.52	0.1409	1.19	0.93	1.51	0.1614
School 18	0.88	0.69	1.12	0.3028	0.85	0.66	1.09	0.1957
Removal of Program								
School 19	1.00	0.75	1.34	0.9923	0.99	0.74	1.33	0.9718
School 20	1.12	0.94	1.34	0.2199	1.12	0.94	1.34	0.2116

Notes:
PE=Physical Education, NOA=No Opportunities Available to Participate
[a] Due to only one rural school being in the True Control group, RR's. C.I.'s and p-value's could not be computed for school location.

CHAPTER SIX: SENSITIVITY ANALYSIS

The following chapter provides an overview of the results obtained from the sensitivity analysis. A sensitivity analysis was performed for all research objectives, where students who reported an atypical week in the amount of PA completed were removed from the sample. All statistically significant or directional differences in results between the complete case analysis sample and the sensitivity analysis sample are discussed.

6.1 Research Question 1a: Year 2 to Year 3 Descriptive Statistics (CSEP)

In total, 8400 linked students had complete CSEP outcomes in Year 2 and Year 3 and reported that it was a typical week in terms of the amount of PA obtained. Within this sample, 35.9% (n=3013) met the CSEP guideline in Year 2 and 33.5% (n=2812) met the CSEP guideline in Year 3 (Appendix E).

6.2 Research Question 1b: Year 2 to Year 3 Descriptive Statistics (MVPA)

In total, 8530 linked students had complete MVPA outcomes in Year 2 and Year 3 and reported that it was a typical week in terms of the amount of PA obtained. Within this sample, 52.5% (n=4482) met the MVPA guideline in Year 2 and 51.4% (n=4382) met the MVPA guideline in Year 3 (Appendix F).

Compared to the results using the complete case analysis sample, active transportation is no longer statistically significant and the McNemar's test (Appendix F) does not indicate a statistically significant difference in the prevalence of students meeting the MVPA guideline between Year 2 and Year 3 of the COMPASS study (p-value=0.06).

6.3 Research Question 2a: Difference-in-Differences Changes in the School-Level Prevalence of Students Meeting the CSEP Guideline

The school-level prevalence of students meeting the CSEP guideline ranged in Year 2 from 16.7-51.7% and 19.7-47.6% in Year 3 (Appendix G). Compared to the results using the complete case analysis sample, these maximum prevalence values are much higher (approximately 11-12% higher).

Compared to the complete case analysis sample, a limited number of schools appear to have directional changes in the difference-in-differences changes in the school-level prevalence of students meeting the CSEP guideline relative to both the true control and OPI schools (Appendix G). Within both models respectively, School 1, 4 and 5 exhibit negative difference-in-differences changes and School 10 exhibits a positive change in the difference-in-differences results. Within the OPI model specifically, School 13 and 19 exhibit negative difference-in-differences changes.

6.4 Research Question 2b: Difference-in-Differences Changes in the School-Level Prevalence of Students Meeting the MVPA Guideline

The school-level prevalence of students meeting the MVPA guideline ranged in Year 2 from 31.8%-75.0% and 38.1%-72.7% in Year 3 (Appendix H). Compared to the complete case analysis results, these maximum prevalence values are much higher (approximately 7-9% higher).

A limited number of schools appear to have directional changes in the difference-in-differences changes in the school-level prevalence of students meeting the MVPA guideline relative to both the true control and OPI schools in comparison to the complete case analysis sample (Appendix H). Within both models respectively, School 4 and 5 exhibit negative difference-in-differences changes and School 8 and 19 exhibit positive changes in the difference-in-differences results.

6.5 Research Question 3a: The Impact of Changes in School Recreational Programming between Year 2 and Year 3 on the Likelihood of Students Meeting the CSEP Guideline

A limited number of changes in the statistical significance but not directional changes of the RR are observed among the covariates when compared to the results generated from the complete case analysis sample (Appendix I). In the true control model, Asian ethnicity and having no available varsity sports opportunities are no longer statistically significant. In the OPI model, grade 11 or 12, mixed ethnicity, year and changing from participating in intramurals Year 2 to having no intramurals available Year 3 are not statistically significant, whereas Aboriginal ethnicity becomes statistically significant.

For the Intervention Impact, there are slight changes in the RR that cause directional (but not statistically significant) changes as compared to the complete case analysis models. Within the true control model, School 5 has an RR less than 1 (RR=0.94), School 8 has an RR of 1 and School 10 has an RR slightly greater than 1 (RR=1.10) as compared to the RR's from the complete case analysis model (RR=1.06, 0.90, 0.97 respectively). Within the OPI school model, School 4, 5 and 10 have an RR=0.98, 0.92, 1.05, compared to the RR's from the complete case analysis model (RR=1.03, 1.05, 0.95 respectively). Additionally, School 9 remained statistically significant but only within the OPI model.

6.6 Research Question 3b: The Impact of Changes in School Recreational Programming between Year 2 and Year 3 on the Likelihood of Students Meeting the MVPA Guideline

Within Table 24 (Appendix J), a limited number of changes in the statistical significance but not directional changes of the RR are observed among the covariates when compared to the results generated from the complete case analysis sample. In the true control model, Asian ethnicity and having no available community sports opportunities are no longer statistically significant, whereas Aboriginal ethnicity becomes significant. In the OPI model, grade 10, 11 or

12, Black or Hispanic ethnicity, active transportation, participating in varsity sports, having no available community sports opportunities, year and changing from participating in intramurals Year 2 to having no intramurals available Year 3 or not having any intramural opportunities in Year 2 to either choosing to begin or refrain from participating in Year 3 are not statistically significant. Additionally, in the OPI model, being of Aboriginal ethnicity or students who reported they did not know how much weekly spending money they received became statistically significant.

For the Intervention Impact, there are slight changes in the RR that remain insignificant but cause directional changes as compared to the complete case analysis models. Within both models, School 4 and 5 have RR's slightly less than 1, whereas in the complete case analysis models their respective RR's were slightly above 1. Within both models, School 8 and 19 have RR's slightly above 1, whereas in the complete case analysis models their respective RR's were slightly below or equal to 1.

CHAPTER SEVEN: DISCUSSION

Naturally occurring changes in school recreational programming between Year 2 and Year 3 of the COMPASS study appear to have a limited effect on student PA levels. Perhaps most concerning of these results is the staggeringly low percentage of students obtaining and maintaining adequate PA levels over time. This study adds to the current body of literature as it is the first Canadian study examining how changes to school recreational programming influence a student's likelihood of meeting the CSEP and MVPA guideline respectively. Moreover, this study highlights a limited number of school recreational programming changes, which may negatively affect student PA levels, and thus should be reconsidered by school personnel. It is encouraging that a few schools implemented recreational program changes that appear to be a promising approach for improving student PA levels, however future studies that are adequately powered need to further explore these interventions. Moving forward, schools should consider evidence-based PA programs, as these results suggest that making minor changes to school recreational programming may not be sufficient to improve student PA levels.

7.1 The Influence of School Recreational Program Changes on School- and Student-Level PA

Despite the well-known knowledge that PA is important for the maintenance of good health (Janssen & LeBlanc, 2010), less than a third of COMPASS students are meeting the CSEP guideline in either school year. Perhaps even more concerning is the lower amount of students that maintain the CSEP guideline over time (i.e. only 16.3% of students met the CSEP guideline in both Year 2 and Year 3) and the large percentage of students (56.8%) that never obtain the CSEP guideline in either year. Additionally, a greater percentage of students stopped meeting the CSEP guideline between Year 2 and Year 3 compared to the percentage of students who started meeting the guideline. Of the 17,051 students in the sample, fewer students met the CSEP

guideline in Year 3 in comparison to Year 2, despite many positive improvements in school recreational programming. Given that the number of students meeting the MVPA guideline increased between Year 2 and Year 3, it is suggestive that the decline in CSEP is related to decreases in VPA and RT. Additionally, it can be speculated that the reduced prevalence of students meeting CSEP in Year 3 may be a result of natural declines in PA with age or due to changes in stakeholder involvement (i.e. teachers or administrators who encouraged and supported certain recreational programs may no longer teach at that school and or may not have the capacity to support the program in Year 3). Changes in stakeholder involvement may influence the school culture; whereby, less value is placed on PA and positive PA practices may no longer become a part of daily school life (Rickwood & Singleton, 2012). In Canada, numerous studies have identified the importance and profound influence that school culture has on students' participation in PA (Dowda, Sallis, Mckenzie, Rosengard, & Kohl, 2005; Kelder et al., 2003; Morton et al., 2016; Rickwood & Singleton, 2012; Storey, Spitters, Cunningham, Schwartz, & Veugelers, 2011), and may help to explain why similar changes to school recreational programming are effective in one school environment but not in another. This decline in the number of Canadian youth obtaining the CSEP guideline, despite the growing promotion and implementation of school-based PA interventions, emphasizes the complex and multidimensional nature of this issue.

In general, achieving ≥60 minutes of daily MVPA appears to be substantially easier for students to obtain in comparison to the CSEP guideline. It is promising that the number of students meeting the MVPA guideline increased by approximately 5% between Year 2 and Year 3. In addition, almost a third of students (30.2%) met the guideline in both years. These findings are encouraging, as they suggest that school-based PA interventions may be assisting students in achieving and maintaining sufficient MVPA levels over time. However, it is important to note that while approximately half of students are achieving ≥60 minutes of daily MVPA during either school year, there is still a substantial portion of Canadian youth who do not achieve adequate

levels of daily MVPA. Furthermore, and similar to the CSEP findings, a greater percentage of students stopped achieving ≥60 minutes of daily MVPA between Year 2 and Year 3 compared to the percentage of students who started meeting the MVPA guideline. Despite the considerable work that has been done in the area of school-based PA interventions and student MVPA levels, additional research appears warranted as our current PA programming is clearly insufficient to close the gap on the number of physically inactive students.

It is promising to note that approximately half of the students that met the CSEP and MVPA guideline respectively in Year 3 were students who started participating or participated in school recreational programming for both Year 2 and Year 3. While slightly over 10% of the sample began participating in school recreational programming in Year 3, approximately the same percentage of students stopped participating in Year 3 and almost half of the sample did not participate in school recreational programming in either year. These results confirm existing evidence, which suggests that schools are battling low student participation rates in intramurals and non-competitive clubs (Dwyer, Allison, LeMoine et al., 2006). Additionally, this study supports previous findings, which suggest that a greater percentage of males engage in PA and participated in school recreational programming in comparison to females (Cohen et al., 2007; Fuller et al., 2011; Guèvremont et al., 2014; Kurc & Leatherdale, 2009). Barriers to student participation in school recreational programming should be explored in future research to help identify why students refrain from participating in subsequent years after initial participation or why certain populations (i.e. female students) are less likely to participate at all.

Despite finding that none of the intervention schools showed a significant difference in the school-level prevalence of a student meeting the CSEP or MVPA guideline respectively in the desired direction in comparison to the control schools between Year 2 and Year 3, there are a few practical implications of these results. Both School 6 and School 7 saw substantial increases in the prevalence of students obtaining the CSEP and MVPA guideline respectively compared to control students. While not statistically significant, these increases may still be very meaningful

in real-world settings within schools. According to the Compendium of Physical Activities (Ainsworth et al., 2011), the modifications that both schools made to existing school recreational programming would have provided increased opportunities for moderate PA; whereby, School 6 added an archery club and School 7 expanded their badminton club. Within this school context, it appears that adding opportunities for moderate PA may have assisted students in meeting the MVPA component of the CSEP guideline. Contrary to current literature (Fuller et al., 2011), this study identified that for some schools, adding additional school recreational opportunities reduced the school-level prevalence of students meeting the CSEP guideline in comparison to control schools. As speculated by Button and Janssen (2014), this may be a result of reduced program quality or improper/ineffective implementation practices.

For the two schools that removed intramural programming but continued to provide non-competitive clubs in Year 3, the results appear mixed. The removal of intramural programming in School 19 slightly improved the school-level prevalence of students meeting the CSEP guideline compared to control students. In line with Button and Janssen's (2014) speculation, this may be due to improved program quality for the remaining non-competitive clubs or may suggest that students who participated in intramurals transitioned to non-competitive clubs in Year 3, which may be more effective in assisting students achieve all three components of the CSEP guideline. For School 20, which had a decline in the school-level prevalence compared to the control schools, the removal of intramurals may have eliminated opportunities for students to obtain any one or all of the CSEP components that may not be available in the remaining non-competitive clubs.

Overall, there appears to be large variability in the school-level prevalence of students achieving the CSEP guideline (Year 2:17.0%-40.4%, Year 3:18.3%-35.5%) and the MVPA guideline (Year 2:39.1%-64.7%, Year 3: 35.2%-65.6%). Future research should explore the components of the school and surrounding community environment (including but not limited to the provision of recreational programming), which allow some schools to maintain high

prevalence levels over time. Interestingly, the difference-in-differences changes to the school-level prevalence of students meeting the MVPA guideline are much larger compared to the difference-in-differences changes to the school-level prevalence of students meeting the CSEP guideline within the same school. Given that most school PA programs engage students in some form of MVPA and it is easier for students to obtain one of three components of the CSEP guideline (≥60 minutes of daily MVPA) in comparison to meeting all three, it is not surprising that changes to school recreational programming (specifically the addition of new PA opportunities) generates substantially larger difference-in-differences changes to the school-level prevalence of students achieving the MVPA guideline compared to the CSEP guideline. Only School 7, 9, 11, 14 and 16 exhibited larger difference-in-differences changes within the CSEP model compared to their respective changes within the MVPA model. For School 9, 11 and 16, the changes made to their school recreational programming included the addition of clubs/programs that engaged students in VPA and/or RT activities. By providing those specific PA opportunities, School 9, 11 and 16 may have assisted their students in meeting those two additional components of the CSEP guideline and may offer some explanation as to why those schools exhibited larger difference-in-differences changes in the CSEP model.

On a student-level, many of the results generated by this study support the current body of literature. In both the true control and OPI models, students who are male, have weekly spending money of $21-100 or greater than $100, have 1-4 or greater than 5 active friends, are enrolled in physical education, or participate in varsity sports or community sports, were more likely to meet the CSEP and MVPA guideline respectively. These findings are supportive of previous evidence (Allison et al., 1999; Faulkner et al., 2014; Hanson & Chen, 2007; Hobin et al., 2012a, 2012b, 2013; Kurc & Leatherdale, 2009; Leatherdale et al., 2010; Leggett et al., 2012; Loucaides et al., 2007), whom identified students with these respective demographic and modifiable characteristics are more likely to obtain higher PA levels. Students who actively transport to and from school were also more likely to meet the CSEP and MVPA guidelines.

However, this finding was only significant when MVPA was used as the outcome measure. Within the OPI model specifically, the likelihood of a student achieving the CSEP and MVPA guideline respectively was significantly lower for grade 11 and 12 students in comparison to students in grade 9. This finding is supported by the work of Allison and colleagues (1999), Faulkner and colleagues (2014), Hobin and colleagues (2012b; 2013) and Leggett and colleagues (2012), who reported decreased levels of PA with increasing grade.

Additionally, in both the CSEP and MVPA models, students of Asian ethnicity were less likely to obtain the respective guideline in comparison to White students. Both Black and Hispanic students were significantly less likely to meet the MVPA guideline in the OPI model in comparison to White students. These results are supportive of previous Canadian findings, which identified students of Asian, Latin American and African ethnicities are less likely to engage in PA (Kukaswadia et al., 2014). Interestingly, Aboriginal students (in the true control model) and mixed ethnicity students (in the OPI model) had an increased likelihood of meeting the CSEP guideline in comparison to White students. While these results were unexpected, another recent Canadian study identified high PA levels (an average of 128.7 minutes of MVPA per day) among Aboriginal youth when measured through accelerometry (Gates et al., 2016). Future research should seek to explore why and how Aboriginals students are achieving substantially higher PA levels compared to other ethnicities.

While only significant in the true control model, students who identified that there were no varsity sports opportunities available to them had a 58% increase in the likelihood of obtaining the CSEP guideline. Additionally, students that identified they had no available community sports options available to them were significantly more likely to obtain the CSEP and MVPA guideline respectively. For these students, the increased likelihood of obtaining the respective guidelines may be as a result of higher inclination to participate in intramural activities (if available) or a more deliberate effort to be active in other ways (i.e. active transportation, enrollment in physical education, joining a community fitness center). Such activities may in turn provide alternative

opportunities for students to obtain the necessary MVPA, VPA and RT components. This is an unexpected and novel finding of the study, which further research should seek to explore.

Additionally, both school size and school SES significantly affected a student's likelihood of obtaining the CSEP guideline within the true control school model. Students who attend a medium or large size school exhibited a 13% or 10% increase in the likelihood of achieving CSEP compared to students who attend small schools (i.e. less than 500 students). This result conflicts with current evidence (Allison & Adlaf, 2000; Feldman & Matjasko, 2005; Stearns & Glennie, 2010), which suggests student PA is negatively correlated with school size. Moreover, school size did not have a significant effect on a student's likelihood of meeting the MVPA guideline. School SES also appears to play a small but significant effect, such that as school SES increases, there is a slight reduction in the likelihood of a student meeting the CSEP and MVPA guideline respectively. These school-level characteristics appear to have a variable influence on the attainment of the PA guidelines. Further research may need to examine school-level factors associated with the achievement of the CSEP and MVPA guideline specifically, in order to improve the effectiveness of school recreational programming within different contextual settings.

Likely of greater importance to school administrators are the findings related to participation in school recreational programming and a student's likelihood of achieving the CSEP and MVPA guideline respectively. Students who began participating in Year 3 (who had not participated in Year 2) and students who participated for both Year 2 and Year 3 had a significant 15-22% increase in likelihood of obtaining the CSEP guideline and a significant 7-15% increase in likelihood of obtaining ≥60 minutes of MVPA daily compared to students who did not participate in either year. For students who participated in Year 2 but stopped in Year 3, either by choice (in the CSEP true control school model only) or as a result of the school removing the programming (in the OPI school models only) were also significantly more likely to meet the CSEP and MVPA guideline respectively. These findings suggest that school recreational

programming may teach students some of the skills necessary to continue a healthy and active lifestyle after they cease participation in school PA programs. Moreover, in schools that implemented new recreational programming in Year 3 where none had previously existed (Year 2), students that participated in Year 3 had a significant 44% increase in the likelihood of obtaining the CSEP guideline and a significant 20% increase in the likelihood of achieving the MVPA guideline when holding all other covariates constant (in the OPI model only). This finding supports existing evidence, which suggests students who participate in intramurals and non-competitive clubs are more likely to achieve greater amounts of PA (Hobin et al., 2012a, 2012b, 2013; Kurc & Leatherdale, 2009).

Unfortunately, this study did not find any of the intervention schools to significantly improve a student's likelihood of meeting the CSEP guideline between Year 2 and Year 3. However, students that attended School 6, 7 or 17 were at least 10% more likely to meet the CSEP guideline from Year 2 to Year 3 compared to control school students. In both School 6 and School 17, the only changes made to their school recreational programming was the addition of an archery club. According to CNN (Hanks, 2012), archery has recently become an emerging trend due to a handful of recent and successful box office movies where the protagonist is an archer. Such interest may have spawned the creation of these school-based clubs and may prove to be an effective school-based strategy for engaging students in moderate PA and reducing sedentary time.

Similarly, this study did not find any of the intervention schools significantly improved a student's likelihood of the meeting the MVPA guideline between Year 2 and Year 3. However, students that attended School 6, 7, 13, 17, 20 were at least 10% more likely to meet the MVPA guideline from Year 2 to Year 3 compared to students that attended control schools. It is interesting that students who attended School 20, a school that removed intramural programming but continued to provide non-competitive clubs (such as skiing and dance), were more likely to

achieve the MVPA guideline. As speculated earlier, this may be as a result of improved quality or implementation of the remaining PA clubs (Button & Janssen, 2014).

The results for the other interventions evaluated herein were not as encouraging. Students at School 9 were significantly less likely to meet the CSEP guideline between Year 2 and Year 3 compared to students attending control schools. While it is discouraging that the addition of a dance program did not improve student PA levels, this finding is consistent with previous literature that found after-school dance programs offer limited (Cain et al., 2015) to no (Jago et al., 2015) improvement in PA levels. In addition, it is likely that a myriad of factors influenced this decline in a student's likelihood of meeting the CSEP guideline. For example, in Year 3, an athletic council was formed in School 9 to promote and encourage students to partake in sporting activities. It is possible that this athletic council may have promoted and encouraged varsity sports to a greater extent than school recreational programs given the high level of competition, spectator interest and school spirit that typically accompanies high school sporting events.

This study also found students at School 15 were significantly less likely to meet the MVPA guideline between Year 2 and Year 3 compared to students attending control schools. This is an interesting result, as School 15 had recently built a new fitness room and offered 10 after-school sessions for spinning, yoga and Zumba classes respectively. However, it does make intuitive sense that this may not have had the desired effort on student PA. Firstly, these sessions may not have been offered around the time of year that the students in School 15 took the Cq survey. Since student-level PA data was collected using a 7-day recall question, if there was not a session offered in the past week from the time of data collection, then the effect of these fitness sessions on student PA levels would not be accounted for within these results. It is also unlikely that participation in 10 sessions of PA would cause long-term behaviour change. Ideally, school recreational programs should be available year-round, as students should be consistently encouraged and supported in their attempts to obtain PA (as opposed to offering a program for a

limited period of time). Moreover, previous research has identified that both female (Dwyer, Allison, Goldenberg et al., 2006) and male (Allison et al., 2005) youth in Ontario report a lack of time to participate in PA due to conflicting priorities (such as homework and part-time employment). Therefore, consultation with students may be appropriate to decide the best time of day to offer these classes. It may be that a number of interested students were unable to participate in these sessions due to a lack of time/availability after school.

Moving forward, additional information needs to be collected from school officials and the school environment in order to explore the various contextual factors, which may be influencing students' PA obtainment within each school specifically. Researchers should consider the influence of changes in administration or coaching staff, access to PA facilities/equipment, program offerings and/or promotion strategies between school years and identify what effect this may have on student PA levels. Given the lack of research examining changes in youth CSEP levels over time or the correlates associated with achievement of the CSEP guideline, this study provides an important and necessary scaffold for future research to build upon for improving the effectiveness of school recreational programming in various contexts and among various populations.

7.2 Implications of the Sensitivity Analysis

While the purpose of this research study was to examine the influence of changes in school recreational programming on student PA levels using the complete case analysis sample, the sensitivity analysis elucidates an important finding, which warrants further attention.

Specifically, over half of the sample was excluded in the sensitivity analysis (i.e. reported it was an atypical week in terms of the amount of PA they obtained). This has substantial implications for future research, as studies collecting subjective PA measures may want to consider using a follow-up questionnaire to conduct future sensitivity analyses and thereby

determine the robustness of their results. Moving forward, studies should also consider alternative methodologies for collecting subjective PA data. Within this study, the complete case analysis sample appears to be robust since the results of the sensitivity analysis were relatively consistent and any minor changes in significance were likely a result of the changes in sample size.

7.3 Implications for School Recreational Programming/Policy

COMPASS is the first longitudinal study to examine how changes to school recreational programming influence PA levels among Canadian youth. These findings provide valuable information for the development and implementation of effective school-based PA programming initiatives. Moreover, this study has further highlighted the need for an ecological approach to school PA programming; whereby, student-level characteristics, environmental and policy influences must be considered.

Current school recreational programming appears to provide inadequate opportunities and assistance for students to achieve high levels of PA, specifically the CSEP guideline. The three schools that were successful at improving a student's likelihood of achieving both the MVPA and CSEP guideline modified their current school recreational programming through the addition of activities that target moderate PA levels. Such results suggest that providing additional opportunities for moderate PA engagement (such as an archery or badminton club) may be a feasible method for improving students overall MVPA. Moving forward, school administrators should aim to identify what component of the CSEP guideline that students at their school are failing to achieve (i.e. are students provided with adequate opportunities to obtain MVPA and VPA, but not RT) prior to the implementation or modification of school recreational programming. This knowledge will aid in creating more effective school PA programming through improved resource utilization, tailored to student's needs. Although the number of students meeting the CSEP guideline between Year 2 and Year 3 declined, the number of students

achieving ≥60 minutes of MVPA increased over time. This suggests that the average student is lacking opportunities to engage in VPA and RT at least three times a week. As an alternative, schools should consider providing comprehensive school recreational programming (i.e. offering intramurals and non-competitive clubs that provide all three components of the CSEP guideline). Comprehensive school recreational programming could include offering a fitness club that runs three to five times a week over the lunch hour and includes activities such as weight training, low and high intensity cardiovascular workouts.

Additionally, schools should consider tailoring PA programming or offering additional programming intended to attract less active student populations. School recreational programming specifically designed for females, older students, low-SES students and the Asian student body, may significantly improve the number of students achieving the national PA guidelines. Within the context of this study, tailoring of PA programs to special populations appears to be limited and may prove to be an important component of effective school-based prevention programming. For the long-term success of school PA programming, student buy-in and sustained interest in the activities are essential for high levels of student participation. To address this concern, school officials should consider providing students with the opportunity to be involved in the selection, running and maintenance of school recreational PA activities. Moreover, student participation in school recreational programming may be improved through enhanced promotion/awareness of these opportunities and creating a school culture whereby engagement in PA is valued.

7.4 Implications for Research

In Canadian PA research, the outcome of interest is typically limited to measures of MVPA (as discussed within the literature review). While measures of MVPA are a valid and important outcome of interest, this study highlights the need for research examining the CSEP guideline as an outcome variable, specifically for children and youth. If the Canadian population

is encouraged to obtain this national PA guideline, researchers must further examine the correlates and determinants associated with the obtainment of the CSEP guideline, as well as any barriers and facilitators that deter or support individuals from achieving this guideline. Despite that this study did not find any school recreational program changes to significantly improve a student's likelihood of meeting the CSEP guideline, the results did support meaningful change in a limited number of schools. Additional research should continue to explore how school-based PA interventions can support a student's likelihood of meeting the CSEP guideline.

For school-based research moving forward, researchers should consider how to collect more comprehensive information from school contacts/administrators regarding school programs, policies and environmental factors in a non-burdensome manner. This could include using online-based survey tools, which list a variety of standard response options and therefore may reduce the response time in comparison to a paper-based survey. Future research specifically in the area of school recreational programming should consider how the total number, type, duration and intensity of PA programs offered influences student PA levels. Qualitative research, including student focus groups or staff interviews, may help to explore the barriers and facilitators to intramural and club participation, especially among less active populations (i.e. females, Asian students and low-SES youth).

While previous research has identified that intramural programming eliminates many of the barriers associated with varsity and community sports (Dwyer, Allison, Goldenberg et al., 2006; Humbert et al., 2006), to this author's knowledge, there has been no previous research examining non-athletes (i.e. students that do not participate in either varsity or community sports) and the influence of school recreational programming on their PA levels. This area of research will help to identify if current school recreational programming is targeting both non-athlete and athlete student populations. Additionally, researchers could use accelerometers to objectively measure PA while students are engaging in school recreational programming. Such information would provide an accurate assessment of the time and intensity of PA engagement during school

recreational programs, thus allowing school officials to modify activities to better support students in their obtainment of the CSEP guideline if necessary.

Moreover, future studies should seek to examine how changes to school recreational programming influence PA levels over a longer period of time across additional settings (i.e. other Canadian provinces/territories). Identifying robust and accurate measures of PA recall (given the concern raised by the sensitivity analysis herein) should become a methodological priority for public health researchers.

7.5 Study Limitations

While the COMPASS study provides valuable and robust information about student health behaviours and the school environment, there are some limitations that need to be considered. COMPASS uses a convenience sample of students from Ontario and Alberta schools, therefore the results may not be generalizable on a provincial or national level. Given the small school sample size (n=86), COMPASS is underpowered at the school-level, which may help to explain the lack of statistically significant results identified herein. However, COMPASS is a natural experiment that uses passive consent protocols within a large sample of students, and therefore provides greater external validity. Given the survey-based approach of COMPASS, all student-level data is self-reported. While previous literature has identified students may over- or under-estimate the amount of PA they engage in when using subjective measures due to the potential for recall and response bias (Prince et al., 2008), the test-retest reliability and validity of PA questions on the Cq are consistent with previous self-report measures among youth (Leatherdale, Laxer & Faulkner, 2014).

Of interest to this study specifically, an exhaustive list of the intramurals and non-competitive clubs available at each respective school was not required by the SPP and therefore not available for consideration in the analysis. Without such information, this study could only

examine changes to school recreational programming made between Year 2 and Year 3, but could not account for the total amount or type of programs offered within the schools. Furthermore, the Cq does not provide information on the number or type of intramurals/non-competitive clubs that students are involved in. Therefore, the extent that students participate in these activities cannot be accounted for.

Moreover, the purpose of this study was to examine how changes in school recreational programming influenced the achievement of national PA guidelines. Therefore, both MVPA and CSEP were dichotomized as respective outcome variables. Any improvement in minutes of daily MVPA or any of the respective components of CSEP between Year 2 and Year 3 that did not meet the time, frequency or intensity thresholds of the guidelines would not have been identified. Therefore, changes to school recreational programming may have improved student PA levels (i.e. if a student went from 20 minutes to 40 minutes of daily MVPA between Year 2 and Year 3), but these changes would not have been captured within this study.

Due to the linkage procedures used to track individuals through time, a substantial number of students cannot be linked for various reasons (as discussed in Section 4.6); thereby, greatly reducing the sample size. These data linkage methods, in addition to using a complete case analysis approach, may exclude students with potentially important health behaviour information from the sample. However, longitudinal data analysis has substantial benefits as it has the potential to make casual inferences and thereby provide researchers with information that cannot be obtained using a cross-sectional design.

7.6 Study Strengths

The current study is the first longitudinal study in Canada examining how changes in school recreational programming influence a student's likelihood of achieving the CSEP guideline. Given the paucity of research examining meeting the CSEP as an outcome variable,

this research aids in filling a large gap in the literature. Furthermore, achieving ≥60 minutes of daily MVPA was used as a separate outcome variable in order to compare and contribute to the current body of evidence surrounding youth PA levels and school-based PA programming in Canada.

As this study was conducted longitudinally, potential casual inferences may be drawn from the results. Moreover, the COMPASS study provides a robust data set in that it has a large sample size with a low refusal rate, with many Cq survey items (including the PA questions) having been found similar to other self-report measures (Leatherdale & Laxer, 2013; Leatherdale, Laxer & Faulkner, 2014). For this study specifically, students were only included within the sample if they reported complete covariate and outcome information, thereby producing more accurate statistical estimates.

Moving forward, this data should act as baseline data for future longitudinal COMPASS studies, examining the change in student PA levels over a longer period of time. Since COMPASS is a natural experiment, this study was able to examine the impact of changing school recreational programs over a one year time period on student's achievement of the national PA guidelines in Canada with a high degree of external validity. Under such an approach, these findings add to a limited but growing body of literature focused on the development and implementation of evidence-based school PA programming and allow for the revision of school PA programs for prevention purposes.

CHAPTER EIGHT: CONCLUSION

The majority of secondary school students are not achieving the Canadian PA guidelines, specifically the CSEP guideline. From a public health perspective, these findings are concerning and warrant further attention given the immense health benefits associated with PA. In addition, this study identified changes to school recreational programming that may discourage student PA. These findings should be further explored by school personnel, as they may be a function of improper program execution, minimal student interest or failure to engage students in sufficient PA. A limited number of school recreational program changes that appear to be promising, such as the addition of moderate PA activities, were identified herein and should be considered by schools as a method for improving student PA. These findings are particularly relevant in today's society as school environments that promote healthy active living continue to be of substantial interest to various stakeholders. It is encouraging that this study identified students who participate in school recreational programming are more likely to achieve the CSEP and MVPA guidelines. Therefore, future school- and research-based efforts should offer recreational programs which provide opportunities for students to meet all three components of the CSEP guideline and ensure these programs are well-promoted and encouraged within the school environment. Additionally, this study highlights the importance of evidence-based school prevention programming. Moving forward, additional longitudinal evaluation and mixed-methods studies that are adequately powered may be appropriate to gather a deeper understanding of the role of school recreational programs on student's achievement of the CSEP and MVPA guideline respectively, as well as the contextual influences at play.

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APPENDIX A: COMPASS QUESTIONNAIRE

About You

1. What grade are you in?

- ○ Grade 9
- ○ Grade 10
- ○ Grade 11
- ○ Grade 12

2. How old are you today?

- ○ 13 years or younger
- ○ 14 years
- ○ 15 years
- ○ 16 years
- ○ 17 years
- ○ 18 years or older

3. Are you female or male?

- ○ Female
- ○ Male

4. How would you describe yourself? *(Mark all that apply)*

- ○ White
- ○ Black
- ○ Asian
- ○ Aboriginal (First Nations, Métis, Inuit)
- ○ Latin American/Hispanic
- ○ Other_____

5. About how much money do you usually get each week to spend on yourself or to save?
(Remember to include all money from allowances and jobs like baby-sitting, delivering papers, etc.)

- ○ Zero
- ○ $1 to $5
- ○ $6 to $10
- ○ $11 to $20
- ○ $21 to $40
- ○ $41 to $100
- ○ More than $100
- ○ I do not know how much money I get each week

6. How do you usually travel to and from school? *(If you use two or more modes of travel, choose the one that you spend most time doing)*

To school	From school
○ By car (as a passenger)	○ By car (as a passenger)
○ By car (as a driver)	○ By car (as a driver)
○ By school bus	○ By school bus
○ By public bus, subway, or streetcar	○ By public bus, subway, or streetcar
○ By walking	○ By walking
○ By bicycling	○ By bicycling
○ Other_____	○ Other_____

7. Did you attend this school last year?

- ○ Yes, I attended the same school last year
- ○ No, I was at another school last year

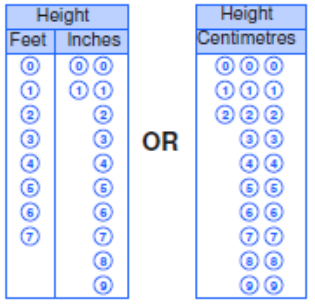
8. How tall are you without your shoes on? (Please write your height in feet and inches **OR** in centimetres, and then fill in the appropriate numbers for your height.)

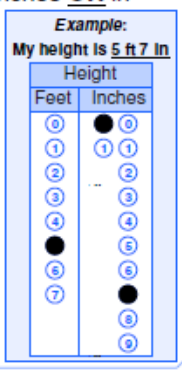
○ **I do not know how tall I am**

"My height is ____feet, _____inches"

OR

"My height is _____ centimetres"





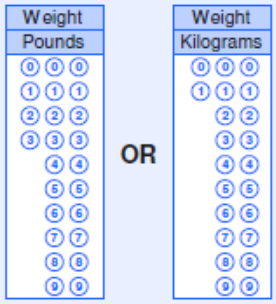
9. How much do you weigh without your shoes on? (Please write your weight in pounds **OR** in kilograms, and then fill in the appropriate numbers for your weight.)

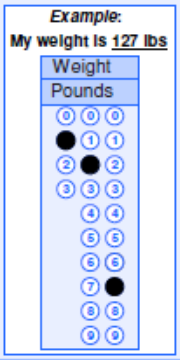
○ **I do not know how much I weigh**

"My weight is _____ pounds"

OR

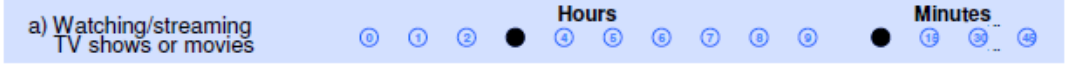
"My weight is _____ kilograms"

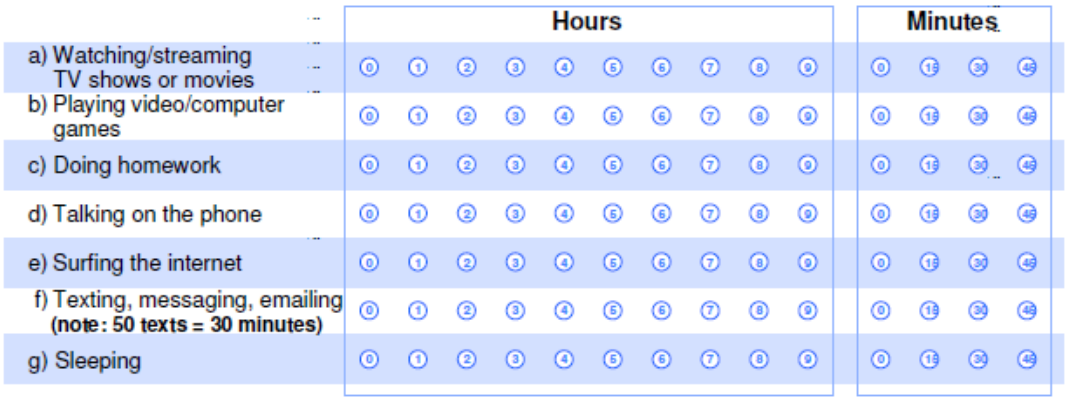




10. How much time per day do you *usually* spend doing the following activities?

For example: If you spend about 3 hours watching TV each day, you will need to fill in the 3 hour circle, and the 0 minute circle as shown below:





○○○○○○○○○○○○○○○○○○○○○○○○○ [serial]

Physical Activity

HARD physical activities include jogging, team sports, fast dancing, jump-rope, and any other physical activities that increase your heart rate and make you breathe hard and sweat.

MODERATE physical activities include lower intensity activities such as walking, biking to school, and recreational swimming.

11. Mark how many minutes of HARD physical activity you did on each of the last 7 days. This includes physical activity during physical education class, lunch, after school, evenings, and spare time.

	Hours					Minutes				
Monday	0	1	2	3	4	0	15	30	45	
Tuesday	0	1	2	3	4	0	15	30	45	
Wednesday	0	1	2	3	4	0	15	30	45	
Thursday	0	1	2	3	4	0	15	30	45	
Friday	0	1	2	3	4	0	15	30	45	
Saturday	0	1	2	3	4	0	15	30	45	
Sunday	0	1	2	3	4	0	15	30	45	

For example: If you did 45 minutes of hard physical activity on Monday, you will need to fill in the 0 hour circle and the 45 minute circle, as shown below:

	Hours					Minutes				
Monday	●	1	2	3	4	0	15	30	●	

12. Mark how many minutes of MODERATE physical activity you did on each of the last 7 days. This includes physical activity during physical education class, lunch, after school, evenings, and spare time. Do not include time spent doing hard physical activities.

	Hours					Minutes				
Monday	0	1	2	3	4	0	15	30	45	
Tuesday	0	1	2	3	4	0	15	30	45	
Wednesday	0	1	2	3	4	0	15	30	45	
Thursday	0	1	2	3	4	0	15	30	45	
Friday	0	1	2	3	4	0	15	30	45	
Saturday	0	1	2	3	4	0	15	30	45	
Sunday	0	1	2	3	4	0	15	30	45	

For example: If you did 1 hour and 30 minutes of moderate physical activity on Monday, you will need to fill in the 1 hour circle and the 30 minute circle, as shown below:

	Hours					Minutes				
Monday	0	●	2	3	4	0	15	●	45	

13. Were the last 7 days a typical week in terms of the amount of physical activity that you usually do?

- ○ Yes
- ○ No, I was *more* active in the last 7 days
- ○ No, I was *less* active in the last 7 days

14. Your closest friends are the friends you like to spend the most time with. How many of your closest friends are physically active?

- ○ None
- ○ 1 friend
- ○ 2 friends
- ○ 3 friends
- ○ 4 friends
- ○ 5 or more friends

15. Are you taking a physical education class at school this year?

- ○ **Yes**, I am taking one **this term**
- ○ **Yes**, I will be taking one or have taken one this school year, **but not this term**.
- ○ **No**, I am not taking a physical education class at school this year

16. **Do you participate in before-school, noon hour, or after-school physical activities organized by your school?** *(e.g., intramurals, non-competitive clubs)*

- ○ Yes
- ○ No
- ○ None offered at my school

17. **Do you participate in competitive school sports teams that compete against other schools?** *(e.g., junior varsity or varsity sports)*

- ○ Yes
- ○ No
- ○ None offered at my school

18. **Do you participate in league or team sports outside of school?**

- ○ Yes
- ○ No
- ○ There are none available where I live

19. **On how many days in the last 7 days did you do exercises to strengthen or tone your muscles?** *(e.g., push-ups, sit-ups, or weight-training)*

- ○ 0 days
- ○ 1 day
- ○ 2 days
- ○ 3 days
- ○ 4 days
- ○ 5 days
- ○ 6 days
- ○ 7 days

20. **How do <u>you</u> describe your weight?**

- ○ Very underweight
- ○ Slightly underweight
- ○ About the right weight
- ○ Slightly overweight
- ○ Very overweight

21. **Which of the following are you trying to do about your weight?**

- ○ **Lose** weight
- ○ **Gain** weight
- ○ **Stay** the same weight
- ○ I am **not trying to do anything** about my weight

22. **How much do your parents, step-parents, or guardians encourage you to be physically active?**

- ○ Strongly encourage
- ○ Encourage
- ○ Do not encourage or discourage
- ○ Discourage
- ○ Strongly discourage

23. **How much do your parents, step-parents, or guardians support you in being physically active?** *(e.g., driving you to team games, buying you sporting equipment)*

- ○ Very supportive
- ○ Supportive
- ○ Unsupportive
- ○ Very unsupportive

○○○○○○○○○○○○○○○○○○○○○○○○ [serial]

Healthy Eating

24. If you do not eat breakfast every day, why do you skip breakfast? *(Mark all that apply)*

- ○ I eat breakfast every day
- ○ I don't have time for breakfast
- ○ The bus comes too early
- ○ I sleep in
- ○ I'm not hungry in the morning
- ○ I feel sick when I eat breakfast
- ○ I'm trying to lose weight
- ○ There is nothing to eat at home
- ○ Other _____

25. In a *usual* school week *(Monday to Friday)*, on how many days do you do the following?

	None	1 day	2 days	3 days	4 days	5 days
a) Eat breakfast	○	○	○	○	○	○
b) Eat breakfast provided to you **as part of a school program**	○	○	○	○	○	○
c) Eat lunch at school - lunch packed and brought from home	○	○	○	○	○	○
d) Eat lunch at school - lunch purchased in the cafeteria	○	○	○	○	○	○
e) Eat lunch purchased at a fast food place or restaurant	○	○	○	○	○	○
f) Eat snacks purchased from a vending machine **in your school**	○	○	○	○	○	○
g) Eat snacks purchased from a vending machine, corner store, snack bar, or canteen **off school property**	○	○	○	○	○	○
h) Drink sugar-sweetened beverages (soda pop, Kool-Aid, Gatorade, etc.) Do not include diet/sugar-free drinks	○	○	○	○	○	○
i) Drink high-energy drinks (Red Bull, Monster, Rock Star, etc.)	○	○	○	○	○	○
j) Drink coffee or tea **with sugar** (include cappuccino, frappuccino, iced-tea, iced-coffees, etc.)	○	○	○	○	○	○
k) Drink coffee or tea **without sugar**	○	○	○	○	○	○

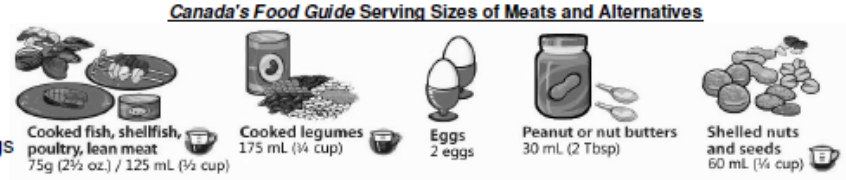
26. On a *usual* weekend *(Saturday and Sunday)*, on how many days do you do the following?

	None	1 day	2 days
a) Eat breakfast	○	○	○
b) Eat lunch	○	○	○
c) Eat foods purchased at a fast food place or restaurant	○	○	○
d) Eat snacks purchased from a vending machine, corner store, snack bar, or canteen	○	○	○
e) Drink sugar-sweetened beverages (soda pop, Kool-Aid, Gatorade, etc.) Do not include diet/sugar-free drinks	○	○	○
f) Drink high energy drinks (Red Bull, Monster, Rock Star, etc.)	○	○	○
g) Drink coffee or tea **with sugar** (include cappuccino, frappuccino, iced-tea, iced-coffees, etc.)	○	○	○
h) Drink coffee or tea **without sugar**	○	○	○

27. YESTERDAY, *from the time you woke up until the time you went to bed*, how many servings of meats and alternatives did you have? *One 'Food Guide' serving of meat and alternatives includes cooked fish, chicken, beef, pork, or game meat, eggs, nuts or seeds, peanut butter or nut butters, legumes (beans), and tofu.*

- ○ None
- ○ 1 serving
- ○ 2 servings
- ○ 3 servings
- ○ 4 servings
- ○ 5 or more servings

***Canada's Food Guide* Serving Sizes of Meats and Alternatives**



28. YESTERDAY, *from the time you woke up until the time you went to bed*, how many servings of vegetables and fruits did you have? *One 'Food Guide' serving of vegetables and fruit includes pieces of fresh vegetable or fruit, salad or raw leafy greens, cooked leafy green vegetables, dried or canned or frozen fruit, and 100% fruit or vegetable juice.*

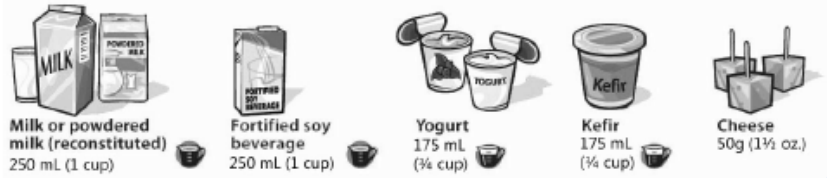
- ○ None
- ○ 1 serving
- ○ 2 servings
- ○ 3 servings
- ○ 4 servings
- ○ 5 servings
- ○ 6 servings
- ○ 7 servings
- ○ 8 servings
- ○ 9 or more servings

***Canada's Food Guide* Serving Sizes of Vegetables and Fruits**

29. YESTERDAY, *from the time you woke up until the time you went to bed*, how many servings of milk and alternatives did you have? *One 'Food Guide' serving of milk or milk alternatives includes milk, fortified soy beverage, reconstituted powdered milk, canned (evaporated) milk, yogurt or kefir (another type of cultured milk product), and cheese.*

- ○ None
- ○ 1 serving
- ○ 2 servings
- ○ 3 servings
- ○ 4 servings
- ○ 5 servings
- ○ 6 or more servings

***Canada's Food Guide* Serving Sizes of Milk and Alternatives**



30. YESTERDAY, *from the time you woke up until the time you went to bed*, how many servings of grain products did you have? *One 'Food Guide' serving of grain products includes bread, bagels, flatbread such as tortilla, pita, cooked rice or pasta, and cold cereal.*

- ○ None
- ○ 1 serving
- ○ 2 servings
- ○ 3 servings
- ○ 4 servings
- ○ 5 servings
- ○ 6 servings
- ○ 7 servings
- ○ 8 servings
- ○ 9 or more servings

***Canada's Food Guide* Serving Sizes of Grain Products**

Your Experience with Smoking

31. Have you ever tried cigarette smoking, even just a few puffs?

- ○ Yes
- ○ No

32. How old were you when you first tried smoking cigarettes, even just a few puffs?

- ○ I have never done this
- ○ I do not know

- ○ 8 years or younger
- ○ 9 years
- ○ 10 years
- ○ 11 years
- ○ 12 years
- ○ 13 years
- ○ 14 years
- ○ 15 years
- ○ 16 years
- ○ 17 years
- ○ 18 years or older

33. Do you think in the future you might try smoking cigarettes?

- ○ Definitely yes
- ○ Probably yes
- ○ Probably not
- ○ Definitely not

34. If one of your best friends were to offer you a cigarette, would you smoke it?

- ○ Definitely yes
- ○ Probably yes
- ○ Probably not
- ○ Definitely not

35. At any time during the next year do you think you will smoke a cigarette?

- ○ Definitely yes
- ○ Probably yes
- ○ Probably not
- ○ Definitely not

36. Do you think it would be difficult or easy for you to get cigarettes if you wanted to smoke?

- ○ Difficult
- ○ Easy
- ○ I do not know

37. Have you ever smoked a whole cigarette?

- ○ Yes
- ○ No

38. Have you ever smoked 100 or more whole cigarettes in your life?

- ○ Yes
- ○ No

○○○○○○○○○○○○○○○○○○○○○○○○ [serial]

39. Have you ever smoked every day for at least 7 days in a row?

- ○ Yes
- ○ No

40. On how many of the last 30 days did you smoke one or more cigarettes?

- ○ None
- ○ 1 day
- ○ 2 to 3 days
- ○ 4 to 5 days
- ○ 6 to 10 days
- ○ 11 to 20 days
- ○ 21 to 29 days
- ○ 30 days *(every day)*

41. Thinking back over the last 30 days, on the days that you smoked, how many cigarettes did you usually smoke each day?

- ○ None
- ○ A few puffs to one whole cigarette
- ○ 2 to 3 cigarettes
- ○ 4 to 5 cigarettes
- ○ 6 to 10 cigarettes
- ○ 11 to 20 cigarettes
- ○ 21 to 29 cigarettes
- ○ 30 or more cigarettes

42. Your closest friends are the friends you like to spend the most time with. How many of your closest friends smoke cigarettes?

- ○ None
- ○ 1 friend
- ○ 2 friends
- ○ 3 friends
- ○ 4 friends
- ○ 5 or more friends

43. Have you ever tried to quit smoking cigarettes?

- ○ I have never smoked
- ○ I have only smoked a few times
- ○ I have never tried to quit
- ○ I have tried to quit once
- ○ I have tried to quit 2 or 3 times
- ○ I have tried to quit 4 or 5 times
- ○ I have tried to quit 6 or more times

44. In the last 30 days, did you use any of the following? *(Mark all that apply)*

- ○ Pipe tobacco
- ○ Cigarillos or little cigars (*plain or flavoured*)
- ○ Cigars (not including cigarillos or little cigars, *plain or flavoured*)
- ○ Roll-your-own cigarettes (tobacco only)
- ○ Loose tobacco mixed with marijuana
- ○ E-cigarettes (electronic cigarettes that look like cigarettes/cigars, but produce vapour instead of smoke)
- ○ Smokeless tobacco (chewing tobacco, pinch, snuff, or snus)
- ○ Nicotine patches, nicotine gum, nicotine lozenges, or nicotine inhalers
- ○ Hookah (water-pipe) to smoke tobacco
- ○ Hookah (water-pipe) to smoke herbal sheesha/shisha
- ○ Blunt wraps (a sheet or tube made of tobacco used to roll cigarette tobacco)
- ○ I have not used any of these things in the last 30 days

Alcohol and Marijuana Use

*Please remember that we will keep your answers **completely confidential**.*

A **DRINK** means: 1 regular sized bottle, can, or draft of beer; 1 glass of wine; 1 bottle of cooler; 1 shot of liquor (rum, whiskey, etc); or 1 mixed drink (1 shot of liquor with pop, juice, energy drink).

45. In the last 12 months, how often did you have a drink of alcohol that was more than just a sip?

- ○ I have never drunk alcohol
- ○ I did not drink alcohol in the last 12 months
- ○ I have only had a sip of alcohol
- ○ Less than once a month
- ○ Once a month
- ○ 2 or 3 times a month
- ○ Once a week
- ○ 2 or 3 times a week
- ○ 4 to 6 times a week
- ○ Every day

46. How old were you when you first had a drink of alcohol that was more than just a sip?

- ○ I have never drunk alcohol
- ○ I have only had a sip of alcohol
- ○ I do not know

- ○ 8 years or younger
- ○ 9 years
- ○ 10 years
- ○ 11 years
- ○ 12 years
- ○ 13 years
- ○ 14 years
- ○ 15 years
- ○ 16 years
- ○ 17 years
- ○ 18 years or older

47. In the last 12 months, how often did you have 5 drinks of alcohol or more on one occasion?

- ○ I have never done this
- ○ I did not have 5 or more drinks on one occasion in the last 12 months
- ○ Less than once a month
- ○ Once a month
- ○ 2 to 3 times a month
- ○ Once a week
- ○ 2 to 5 times a week
- ○ Daily or almost daily

48. In the last 12 months, have you had alcohol mixed or pre-mixed with an energy drink (such as Red Bull, Rock Star, Monster, or another brand)?

- ○ I have never done this
- ○ I did not do this in the last 12 months
- ○ Yes
- ○ I do not know

49. In the last 12 months, how often did you use marijuana or cannabis? (a joint, pot, weed, hash)

- ○ I have never used marijuana
- ○ I have used marijuana but not in the last 12 months
- ○ Less than once a month
- ○ Once a month
- ○ 2 or 3 times a month
- ○ Once a week
- ○ 2 or 3 times a week
- ○ 4 to 6 times a week
- ○ Every day

50. How old were you when you first used marijuana or cannabis?

- ○ I have never used marijuana
- ○ I do not know

- ○ 8 years or younger
- ○ 9 years
- ○ 10 years
- ○ 11 years
- ○ 12 years
- ○ 13 years
- ○ 14 years
- ○ 15 years
- ○ 16 years
- ○ 17 years
- ○ 18 years or older

51. Do you think it would be difficult or easy for you to get marijuana if you wanted some?

- ○ Difficult
- ○ Easy
- ○ I do not know

○○○○○○○○○○○○○○○○○○○○○○○○ [serial]

Your School and You

52. How strongly do you agree or disagree with each of the following statements?

	Strongly Agree	Agree	Disagree	Strongly Disagree
a) I feel close to people at my school.	○	○	○	○
b) I feel I am part of my school.	○	○	○	○
c) I am happy to be at my school.	○	○	○	○
d) I feel the teachers at my school treat me fairly.	○	○	○	○
e) I feel safe in my school.	○	○	○	○
f) Getting good grades is important to me.	○	○	○	○

53. In the last 30 days, in what ways were you bullied by other students? *(Mark all that apply)*

- ○ I have not been bullied in the last 30 days
- ○ Physical attacks (e.g., getting beaten up, pushed, or kicked)
- ○ Verbal attacks (e.g., getting teased, threatened, or having rumours spread about you)
- ○ Cyber-attacks (e.g., being sent mean text messages or having rumours spread about you on the internet)
- ○ Had someone steal from you or damage your things

54. In the last 30 days, how often have you been bullied by other students?

- ○ I have not been bullied by other students in the last 30 days
- ○ Less than once a week
- ○ About once a week
- ○ 2 or 3 times a week
- ○ Daily or almost daily

55. In the last 30 days, in what ways did you bully other students? *(Mark all that apply)*

- ○ I did not bully other students in the last 30 days
- ○ Physical attacks (e.g., beat up, pushed, or kicked them)
- ○ Verbal attacks (e.g., teased, threatened, or spread rumours about them)
- ○ Cyber-attacks (e.g., sent mean text messages or spread rumours about them on the internet)
- ○ Stole from them or damaged their things

56. In the last 30 days, how often have you taken part in bullying other students?

- ○ I did not bully other students in the last 30 days
- ○ Less than once a week
- ○ About once a week
- ○ 2 or 3 times a week
- ○ Daily or almost daily

57. How supportive is your school of the following?

	Very supportive	Supportive	Unsupportive	Very unsupportive
a) Making sure there are opportunities for students to be physically active	○	○	○	○
b) Making sure students have access to healthy foods and drinks	○	○	○	○
c) Making sure no one is bullied at school	○	○	○	○
d) Giving students the support they need to resist or quit tobacco	○	○	○	○
e) Giving students the support they need to resist or quit drugs and/or alcohol	○	○	○	○

58. What academic level was your current or most recent Math course?

- ○ Applied
- ○ Academic
- ○ Other _____

59. In your current or most recent Math course, what is your approximate overall mark?
(Think about last year if you have not taken math this year)

- ○ 90% - 100%
- ○ 80% - 89%
- ○ 70% - 79%
- ○ 60% - 69%
- ○ 55% - 59%
- ○ 50% - 54%
- ○ Less than 50%

60. In your current or most recent English course, what is your approximate overall mark?
(Think about last year if you have not taken English this year)

- ○ 90% - 100%
- ○ 80% - 89%
- ○ 70% - 79%
- ○ 60% - 69%
- ○ 55% - 59%
- ○ 50% - 54%
- ○ Less than 50%

61. What is the highest level of education you would like to get? *(Choose only one)*

- ○ Some high school or less
- ○ High school diploma or graduation equivalency
- ○ College/trade/vocational certificate
- ○ University Bachelor's degree
- ○ University Master's / PhD / law school / medical school / teachers' college degree
- ○ I don't know

62. What is the highest level of education you think you will get? *(Choose only one)*

- ○ Some high school or less
- ○ High school diploma or graduation equivalency
- ○ College/trade/vocational certificate
- ○ University Bachelor's degree
- ○ University Master's / PhD / law school / medical school / teachers' college degree
- ○ I don't know

63. In the last 4 weeks, how many days of school did you miss because of your health?

- ○ 0 days
- ○ 1 or 2 days
- ○ 3 to 5 days
- ○ 6 to 10 days
- ○ 11 or more days

64. In the last 4 weeks, how many classes did you skip when you were not supposed to?

- ○ 0 classes
- ○ 1 or 2 classes
- ○ 3 to 5 classes
- ○ 6 to 10 classes
- ○ 11 to 20 classes
- ○ More than 20 classes

65. How often do you go to class without your homework complete?

- ○ Never
- ○ Seldom
- ○ Often
- ○ Usually

○○○○○○○○○○○○○○○○○○○○○○○○ [serial]

APPENDIX B: SCHOOL POLICIES AND PRACTICES (SPP) QUESTIONNAIRE

Example of a School Policies and Practices (SPP) Year 3

School Policies and Practices Year 3

Please provide as much detail as possible in this chart. We have provided a summary of what was reported in the School Policy and Practices Questionnaire and follow-up interview completed at your school last year. This information will aid the COMPASS team with investigating the impact of your school's changes in policies, practices or environmental factors on student health related behaviour.

Behaviour	**2012-13 Summaries**	**2013-14 Changes**	**Have any changes been made since last school year?** *Please provide details on a) whether past policies, practices, environment and relationships are still in place, and b) whether any new policies, practices, environment changes or relationships are planned or being implemented*	
Healthy Eating	***Is unhealthy eating among students a problem at your school?*** - yes	- No change	Is unhealthy eating among students a problem at your school this year? ☐ Yes ☐ No	
	Policies: - Implemented mandatory PPM 150 (School food and beverage policy) -	- No change	Policy Changes ☐ Yes ☐ No	If yes, please provide details
	Practices: - The school offers a free breakfast program 5 days per week for all students. The program is called Food for Thought. Baskets of food are available to students all day in	- No change	Practices Changes ☐ Yes ☐ No	If yes, please provide details

	the guidance office, the office and certain classrooms. - School offers cooking classes, gardening and field trips to local grocery stores and media literacy on special topics related to healthy eating. - School does not offer or trips to farms/farmer's markets - In the past year, all school staff has not received in-service training, workshops on professional development days and presentations by community for nutrition and promoting positive body image, however PE teachers are constantly updated in areas of food and nutrition and body image. - The school uses Food and Nutrition classes to help students understand nutrition - There are clear guidelines to refer students with a suspected eating disorder to the appropriate health professional or community agency			
	Environment/Equipment: - The school has a cafeteria, vending machines and a snack bar/tuck shop that are operated by a food service company	- No change	Environment or equipment Changes ☐ Yes ☐ No	If yes, please provide details

	-			
	Public Health: - Solved problems jointly regarding healthy eating - Give presentations with the staff on well-being of the students - Last year there was a group of parents that were concerned about the cafeteria and the cost, PHU is working with them to improve the food available to students.	- Staff PD not provided this year	Changes with relationships with Public Health: ☐ Yes ☐ No	If yes, please provide details
Behaviour	**2012-13 Summaries**	**2013-14 Changes**	**Have any changes been made since last school year?** *Please provide details on a) whether past policies, practices, environment and relationships are still in place, and b) whether any new policies, practices, environment changes or relationships are planned or being implemented*	
Physical Activity	***Is physical inactivity among students a problem at your school?*** - No	- No change	*Is physical inactivity among students a problem at your school* your school this year? ☐ Yes ☐ No	
	Policies: - No written policies on physical activity	- No change	Policy Changes ☐ Yes ☐ No	Please provide details on a) whether past policies are still in place, and b) whether new policies are planned or being implemented
	Practices: - In the past year the school has partnered with non-governmental organizations, park and recreation departments, and board itinerant	- The school is offering an after-school fitness class M-F that is open to students and staff.	Practices Changes ☐ Yes ☐ No	If yes, please provide details

	teachers to promote health and/or health related activities. - The majority of students do not have access to indoor physical activity areas on and off school grounds during non-instructional school times because the spaces are being used for other activities - The majority of students have access to outdoor physical activity areas on school grounds during non-instructional times - Students always have access to physical activity equipment such as soccer balls during non-instructional times - Students have access to the school's indoor and outdoor physical activity facilities and equipment outside of school hours - Last year the school offered 8 intramural programs which included fitness, yoga and indoor soccer. - Last year the school offered non-competitive sport clubs like outdoor club or dance club - Last year the school offered 9 school varsity or interschool sport programs			

	- Last year the school participated in special event physical activities like Terry Fox, Foul-shooting, Wicked Wellness -			
	Environments & Equipment: - Change rooms with secure lockers and showers are available for students during physical activity periods. There are no with private changing stalls or curtains. -	- No change	Environment or equipment Changes ☐ Yes ☐ No	If yes, please provide details
	Public Health: - Solved problems jointly regarding physical activity - For the school's walking program, the PHU provides care packages at the end (on walking trails and hiking trails) - PHU heavily involved in bike month	- Walking club is no longer partnered with PHU	Changes with relationships with Public Health: ☐ Yes ☐ No	If yes, please provide details
Behaviour	**2012-13 Summaries**	**2013-14 Changes**	**Have any changes been made since last school year?** *Please provide details on a) whether past policies, practices, environment and relationships are still in place, and b) whether any new policies, practices, environment changes or relationships are planned or being implemented*	
Tobacco Use	***Is tobacco use among students a problem at your school?*** - no	- Yes	*Is tobacco use among students a problem at your school this year?* ☐ Yes ☐ No	

	Policies: - Students are prohibited from smoking on school property, within a specific distance of the school grounds, at sponsored events off of school grounds and in private vehicles parked on schools grounds. This includes smokeless tobacco. - Students adhere to these policies most of the time - Students are not permitted to wear or carry apparel with company names or logos related to tobacco - Smoking is not permitted at any time on Upper Canada District School Board property (including parking lot). Smoking in a person's vehicle, while on UCDSB property, is also in violation of the by-law. The school grounds are monitored by by-law enforcement officers who may impose a fine should a student be found in violation of smoking by-laws – a fine of $305.00 for smoking on school property and/or a fine of $365.00 for selling or sharing cigarettes. Other school-level interventions for those who violate this policy include a	- No change	Policy Changes ☐ Yes ☐ No	Please provide details on a) whether past policies are still in place, and b) whether new policies are planned or being implemented

	letter home and/or contact with the Tobacco Enforcement Officer.			
	Practices: - The first time students are caught smoking on school grounds they are issued a warning, the substance is confiscated and they are fined. Sanctions always get stronger with subsequent violations. - The school does not provide tobacco prevention or cessation programs - In the last year school teachers have not received in-service training, workshops, conferences or presentations regarding tobacco use.	- In-service for teachers not done this year	Practices Changes ☐ Yes ☐ No	If yes, please provide details
	Environments & Equipment: - There is an area off school property but within view of the school where students smoke	- No change	Environment or equipment Changes ☐ Yes ☐ No	If yes, please provide details
	Public Health: - Solved problems jointly regarding tobacco use	- No change	Changes with relationships with Public Health: ☐ Yes ☐ No	If yes, please provide details

Behaviour	2012-13 Summaries	2013-14 Changes	Have any changes been made since last school year? *Please provide details on a) whether past policies, practices, environment and relationships are still in place, and b) whether any new policies, practices, environment changes or relationships are planned or being implemented*	
Alcohol & Drug Use	***Are alcohol and drug use among students a problem at your school?*** - Alcohol: yes - Drug Use: yes	- Alcohol: yes - Drug Use: yes	Are alcohol and drug use among students a problem at your school this year? Alcohol use: ☐ Yes ☐ No Drug use: ☐ Yes ☐ No	
	Policies: - Students are not permitted to wear or carry apparel with company names or logos related to drugs or alcohol - Students adhere to these policies most of the time *Board-level:* - It is the purpose of the Code of Conduct to discourage the use of alcohol and to promote the safety of people in the schools. More specifically, all members of the school community must not give alcohol to a minor and/or be in the possession of, or be under the influence of, or provide others with alcohol. The infractions for which a suspension may be imposed by the principal include possessing	- No change	Policy Changes ☐ Yes ☐ No	Please provide details on a) whether past policies are still in place, and b) whether new policies are planned or being implemented

	alcohol and/or being under the influence of alcohol. A pupil may be suspended only once for an infraction and may be suspended for a minimum of one (1) school day and a maximum of twenty (20) school days. *School-level:* - Alcohol is not permitted on school property, during school-related events, or while visiting other schools - Students must come to school free from the effects of alcohol - All members of the school community must not give alcohol to a minor and/or be in possession of, or under the influence of, or provide others with alcohol. Failure to adhere to this policy may result in consequences: verbal warning; contacting parent/guardian; written assignment; contract agreeing to specific behaviour; detention; personal escort to class; meeting with student; teacher-assigned detentions; referral to behavioural resource teacher/counselor; involvement of parents; referral to principal or vice principal, etc.			

	- Alcohol use can lead to suspensions for up to 20 days - Expulsions may be considered if student are found giving alcohol to a minor • Same with respect to drugs: consequences for trafficking illegal drugs and/or be in possession of, or be under the influence of, or provide others with illegal drugs -			
	Practices: - The first time students are caught using drugs or alcohol on school grounds their parents are informed, they are referred to a school administrator and counsellor, the substance is confiscated, and they are suspended from school. The police are also notified. Sanctions always get stronger with subsequent violations. - The school does not have drug or alcohol prevention programs but offers referral for students in need. - In the last year school teachers have not received in-service training, workshops, conferences or presentations regarding drug and alcohol use.	- No change	Practices Changes ☐ Yes ☐ No	If yes, please provide details

	Environments & Equipment:	- No change	Environment or equipment Changes □ Yes □ No	If yes, please provide details
	Public Health: - Solved problems jointly regarding alcohol and drug use	- No change	Changes with relationships with Public Health: □ Yes □ No	If yes, please provide details
Behaviour	**2012-13 Summaries**	**2013-14 Changes**	**Have any changes been made since last school year?** *Please provide details on a) whether past policies, practices, environment and relationships are still in place, and b) whether any new policies, practices, environment changes or relationships are planned or being implemented*	
Bullying	***Is bullying a problem at your school?*** - Yes	- Yes	*Is bullying a problem at your school this year?* □ Yes □ No	
	Policies: - Accepting Schools Act: The Act requires all school boards to take preventative measures against bullying, issue tougher consequences for bullying, and support students who want to promote understanding and respect for all - an expulsion shall be considered if a student is	- No change	Policy Changes □ Yes □ No	Please provide details on a) whether past policies are still in place, and b) whether new policies are planned or being implemented

	found to be: committing physical assault on another person that causes bodily harm requiring treatment by a medical practitioner; engaging in assault; and/or engaging in another activity that, under a policy of the Board, is one for which expulsion is mandatory			
	Practices: - The school has "Where is the Love" LGBTQ, Assembly followed by workshops, Re:Action 4 Inclusion workshops	- Mental health literacy workshops -	Practices Changes ☐ Yes ☐ No	If yes, please provide details
	Environments & equipment:	- No change	Environment or equipment Changes ☐ Yes ☐ No	If yes, please provide details
	Public Health: - School does not receive help from the public health unit re: bullying	- No change	Changes with relationships with Public Health: ☐ Yes ☐ No	If yes, please provide details

Behaviour	2012-13 Summaries	2013-14 Changes	Have any changes been made since last school year? *Please provide details on a) whether past policies, practices, environment and relationships are still in place, and b) whether any new policies, practices, environment changes or relationships are planned or being implemented*	
Sedentary Behaviour	**Policies:** - No policies specifically related to sedentary behaviour, but policies are in place for social media/technology use	- No change	Policy Changes ☐ Yes ☐ No	Please provide details on a) whether past policies are still in place, and b) whether new policies are planned or being implemented
	Practices:	- No change	Practices Changes ☐ Yes ☐ No	If yes, please provide details
	Environments & Equipment:	- No change	Environment or equipment Changes ☐ Yes ☐ No	If yes, please provide details
	Public Health: - No support received from the public health unit re: sedentary behaviour	- No change	Changes with relationships with Public Health: ☐ Yes ☐ No	If yes, please provide details

2012-13 Response	2013-14 Response	2014-15 Response
Please rank these school/health-related issues in terms of importance to your school from 1 to 10 (1= highest priority…10=lowest priority.): a. Tobacco Use 6 b. Alcohol and other Drug Use 5 c. Healthy Eating 3 d. Physical Activity 4 e. Bullying/ Violence 2 f. Mental Health 1 g. Sexual Health 7 h. Sun safety/ tanning beds 9 i. Obesity/overweight/healthy weight 8 j. Sedentary behaviours /screen-time 10	**Please rank these school/health-related issues in terms of importance to your school from 1 to 10 (1= highest priority…10=lowest priority.):** a. Tobacco Use b. Alcohol and other Drug Use c. Healthy Eating d. Physical Activity e. Bullying/Violence f. Mental Health g. Sexual Health h. Sun safety/tanning beds i. Obesity/overweight/healthy weight j. Sedentary behaviours/screen-time ☐ **Same priority ranking as last year** **If physical activity and healthy eating are top priorities is it because obesity, overweight and/or healthy weight are problems at your school?** ☐ Yes ☐ No	**Please rank these school/health-related issues in terms of importance to your school from 1 to 10 (1= highest priority…10=lowest priority.):** 6 a. Tobacco Use 2 b. Alcohol and other Drug Use 4 c. Healthy Eating 7 d. Physical Activity 3 e. Bullying/Violence 1 f. Mental Health 5 g. Sexual Health 10 h. Sun safety/tanning beds 8 i. Obesity/overweight/healthy weight 9 j. Sedentary behaviours/screen-time ☐ **Same priority ranking as last year** **If physical activity and healthy eating are top priorities is it because obesity, overweight and/or healthy weight are problems at your school?** ☐ Yes ☐ No

Please select the <u>interschool or varsity</u> programs involving physical activity that are/will be offered to students at your school during this school year.

Sport/Game	Junior Girl's	Senior Girl's	Junior Boy's	Senior Boy's
Soccer	○	○	○	○
Cross country running	○	○	○	○
Tennis	○	○	○	○
Basketball	○	○	○	○
Football	○	○	○	○
Field hockey	○	○	○	○
Ice Hockey	○	○	○	○
Volleyball	○	○	○	○
Wrestling	○	○	○	○
Swimming	○	○	○	○
Curling	○	○	○	○
Alpine Skiing	○	○	○	○
Cross-Country Skiing	○	○	○	○
Badminton	○	○	○	○
Rugby	○	○	○	○
Rowing	○	○	○	○
Baseball/softball	○	○	○	○
Track and field	○	○	○	○
Other:_____	○	○	○	○
Other:_____	○	○	○	○
Other:_____	○	○	○	○

APPENDIX C: CHANGES MADE TO SCHOOL RECREATIONAL PROGRAMMING (YEAR 3)

Descriptions of the school recreational programming changes at the 20 intervention schools between Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS study

Description of the Intervention	
Creation of a New School Recreational Program (n=3 schools)	
School 1	An out and abouters club was created as a result of a focus on health and wellness from the student council. The club is involved in monthly hikes and other PA activities.
School 2	The school began offering a weight lifting club and a 100km walk/run club.
School 3	The school began an intramural program that ran throughout the entire school year. Weekly sign-ups were available for various sports (including volleyball, basketball, badminton, pickle ball, dodge ball) and the school devised a schedule each week to accommodate the number of students who wanted to participate.
Modification of Existing Recreational Programming (n=15 schools)	
School 4	The school expanded their non-competitive PA clubs to include ping pong.
School 5	The school expanded their non-competitive PA programming to include yoga and CrossFit.
School 6	The school added an archery club to their non-competitive club programming.
School 7	The school continued to expand their intramural programs, and expanded their badminton club.
School 8	The school implemented a 'house system', whereby students have additional opportunities to participate in friendly grade by grade sports competitions on a monthly basis.
School 9	The school added a dance club to their PA programming.
School 10	The school leadership class facilitated additional intramural activities during lunch. Six intramural activities were offered by the leadership class, including dodgeball, tchuk-ball, dancing, ping-pong, basketball and floor hockey.
School 11	The school expanded their intramural programming by providing a semi pro basketball league (that was only open to students who didn't play on the varsity team), a dodge ball competition and a flag football league.

School 12	The school offered additional times for students to participate in recreational programming (i.e. began offering intramurals during the lunch hour as well as their previous before/after school options).
School 13	The school offered additional non-competitive PA opportunities (such as yoga) and extended their intramural programs to include volleyball, basketball and badminton.
School 14	The school added an archery club for students.
School 15	The school provided after school spinning, yoga and Zumba sessions (10 sessions of each activity) for students.
School 16	The school added a walking club and a girl's only fitness club to their non-competitive club programming. The school also added ultimate frisbee as an additional intramural activity.
School 17	The school offered a new archery club for students.
School 18	The school offered both daily and weekly intramurals that change according to the season and student interest.
Removal of Recreational Programming (n=2 schools)	
School 19	The school removed intramural programming, but continued to provide non-competitive clubs (such as outdoor club and dance).
School 20	The school removed intramural programming, but continued to provide non-competitive clubs (such as skiing and dance).
Notes: Control schools (n=66) reported no changes to the recreational programming at their school between Year 2 and Year 3. Of the 66 control schools, 43 made no PA practice changes between Year 2 and Year 3 (true control group), and 23 schools made other PA practice changes that were unrelated to school recreational programming (OPI group)	

APPENDIX D: CHANGES IN INTRAMURAL PARTICIPATION BETWEEN YEAR 2 AND YEAR 3 BY SEX

Table 13: Change in Intramural Participation between Year 2 (2013-2014) and Year 3(2014-2015) of the COMPASS Study by Sex: CSEP Sample

	Female (n=9179) %	**Male** (n=7872) %	**Total** (n=17,051) %	**Chi Square**
Never Participated	47.2	40.4	44.1	χ^2=91.8* df=8
Stopped Participating	13.0	13.5	13.2	
Started Participating	11.4	12.9	12.1	
Always Participated	23.4	28.0	25.6	
NOA to Participating	0.7	0.9	0.8	
Participated to NOA	0.8	0.8	0.8	
NOA to Not Participating	2.0	1.9	2.0	
Did not Participate to NOA	1.2	1.1	1.2	
NOA to NOA	0.5	0.4	0.4	
Notes: *p-value of <0.0001 NOA= No Opportunities Available to Participate				

Table 14: Change in Intramural Participation between Year 2 (2013-2014) and Year 3(2014-2015) of the COMPASS Study by Sex: MVPA Sample

	Female (n=9345) %	**Male** (n=8026) %	**Total** (n=17,371) %	**Chi Square**
Never Participated	47.2	40.6	44.2	χ^2=89.7* df=8
Stopped Participating	13.0	13.4	13.2	
Started Participating	11.3	12.9	12.0	
Always Participated	23.4	28.0	25.5	
NOA to Participating	0.7	0.9	0.8	
Participated to NOA	0.7	0.8	0.8	
NOA to Not Participating	2.0	1.9	2.0	
Did not Participate to NOA	1.2	1.1	1.2	
NOA to NOA	0.5	0.4	0.4	
Notes: *p-value of <0.0001 NOA= No Opportunities Available to Participate				

APPENDIX E: YEAR 2 TO YEAR 3 CSEP DESCRIPTIVE STATISTICS (SENSITIVITY ANALYSIS)

Table 15: Descriptive Statistics for the Year 2 (2013-2014) COMPASS sample by Gender (Sensitivity Analysis CSEP Sample)

		Female (n=4173) %	**Male** (n=4227) %	**Total** (n=8400) %	**Chi Square**
Grade	9	36.2	37.4	36.8	χ^2=21.3* df=3
	10	35.1	33.3	34.2	
	11	27.2	26.5	26.9	
	12	1.5	2.8	2.1	
Ethnicity	White	81.3	79.8	81.5	χ^2=18.2** df=6
	Black	2.2	3.5	2.8	
	Asian	4.1	4.2	4.2	
	Aboriginal	1.8	1.9	1.9	
	Hispanic	1.4	1.5	1.5	
	Other	2.6	3.1	2.8	
	Mixed	6.6	6.0	6.3	
Weekly spending money	$0	17.1	18.5	17.8	χ^2=47.3* df=4
	$1-20	35.0	33.7	34.4	
	$21-100	23.0	24.0	25.0	
	>$100	8.3	12.1	10.3	
	I don't know	13.6	11.5	12.5	
CSEP Guideline	Did not meet	70.4	58.0	64.1	χ^2=139.7* df=1
	Met	29.6	42.0	35.9	
Active Transportation	Inactive	78.6	71.9	75.3	χ^2=50.4* df=2
	Sometimes Active	11.6	15.6	13.6	
	Active	9.8	12.5	11.1	
# of Active Friends	None	5.6	4.3	4.9	χ^2=336.8* df=2
	1-4	58.2	39.5	48.8	
	5 or more	36.2	56.2	46.3	
Enrolled in PE	Yes	61.7	71.0	66.4	χ^2=82.0* df=1
	No	38.3	29.0	33.6	
Participation in Intramurals	Yes	39.0	44.6	41.9	χ^2=27.8* df=2
	No	58.3	52.7	55.4	
	NOA	2.7	2.7	2.7	
Participation in Varsity Sports	Yes	40.3	53.1	46.7	χ^2=137.9* df=2
	No	58.6	46.0	52.3	
	NOA	1.1	0.9	1.0	
Participation in Community Sports	Yes	52.8	64.0	58.5	χ^2=121.2* df=2
	No	46.6	34.9	10.7	
	NOA	0.6	1.1	0.8	
Notes: *p-value of <0.0001, **p-value of <0.01 PE=Physical Education, NOA= No Opportunities Available to Participate					

Table 16: Descriptive Statistics for the Year 2 COMPASS Sample by CSEP status (Sensitivity Analysis)

		Did not meet the CSEP Guideline (n=5387) %	**Met the CSEP Guideline** (n=3013) %	**Total** (n=8400) %	**Chi Square**
Gender	Female	54.5	41.1	49.7	χ^2=139.7* df=1
	Male	45.5	58.9	50.3	
Grade	9	34.8	40.2	36.8	χ^2=28.0* df=3
	10	34.8	33.1	34.2	
	11	28.0	24.9	26.9	
	12	2.4	1.8	2.1	
Ethnicity	White	80.4	80.9	80.5	χ^2=22.9** df=6
	Black	2.4	3.6	2.8	
	Asian	4.7	3.2	4.2	
	Aboriginal	1.7	2.1	1.9	
	Hispanic	1.5	1.5	1.5	
	Other	2.8	8.8	2.8	
	Mixed	6.5	5.9	6.3	
Weekly spending money	$0	20.2	13.5	17.8	χ^2=97.8* df=4
	$1-20	35.5	32.4	34.4	
	$21-100	23.2	28.1	25.0	
	>$100	9.1	12.6	10.4	
	I don't know	12.0	13.4	12.4	
Active Transportation	Inactive	74.8	76.0	75.2	χ^2=3.1 df=2
	Sometimes Active	13.6	13.6	13.6	
	Active	11.6	10.4	11.2	
# of Active Friends	None	6.3	2.5	4.9	χ^2=414.6* df=2
	1-4	55.6	36.7	48.8	
	5 or more	38.1	60.8	46.3	
Enrolled in PE	Yes	58.7	80.0	66.4	χ^2=393.5* df=1
	No	41.3	20.0	33.6	
Participation in Intramurals	Yes	36.2	51.9	41.8	χ^2=196.8* df=2
	No	61.1	45.5	55.5	
	NOA	2.7	2.6	2.7	
Participation in Varsity Sports	Yes	38.2	62.0	46.7	χ^2=441.7* df=2
	No	60.8	37.0	52.3	
	NOA	1.0	1.0	1.0	
Participation in Community Sports	Yes	50.8	72.3	58.5	χ^2=394.6* df=2
	No	48.6	26.5	40.7	
	NOA	0.6	1.2	0.8	

Notes: *p-value of <0.0001, **p-value of <0.001
PE=Physical Education, NOA= No Opportunities Available to Participate

Table 17: Change in Intramural Participation between Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS Study by Year 3 CSEP Status (Sensitivity Analysis)

	Did not meet the CSEP Guideline (n=5588) %	**Met the CSEP Guideline** (n=2812) %	**Total** (n=8400) %	**Chi Square**
Never Participated	48.6	29.5	42.2	χ^2=374.4* df=8
Stopped Participating	13.5	12.1	13.0	
Started Participating	10.8	15.2	12.3	
Always Participated	22.9	38.6	28.2	
NOA to Participating	0.5	1.1	0.7	
Participated to NOA	0.5	0.9	0.7	
NOA to Not Participating	1.7	1.4	1.6	
Did not Participate to NOA	1.1	0.8	1.0	
NOA to NOA	0.4	0.5	0.4	
Notes: *p-value of <0.0001 NOA= No Opportunities Available to Participate				

Table 18: Change in Intramural Participation between Year 2 (2013-2014) and Year 3(2014-2015) of the COMPASS Study by Sex: Sensitivity Analysis CSEP Sample

	Female (n=4173) %	**Male** (n=4227) %	**Total** (n=8400) %	**Chi Square**
Never Participated	46.1	38.4	42.2	χ^2=68.8* df=8
Stopped Participating	13.0	13.0	13.0	
Started Participating	11.1	13.4	12.3	
Always Participated	25.3	30.9	28.2	
NOA to Participating	0.5	0.8	0.7	
Participated to NOA	0.7	0.7	0.7	
NOA to Not Participating	1.7	1.5	1.6	
Did not Participate to NOA	1.1	0.9	1.0	
NOA to NOA	0.5	0.4	0.4	
Notes: *p-value of <0.0001 NOA= No Opportunities Available to Participate				

Table 19: CSEP Status in Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS Study (Sensitivity Analysis)

CSEP	*Year 3*			
Year 2	**Did not meet the CSEP Guideline**	**Met the CSEP Guideline**	Total	McNemar's Test Statistic
Did not meet the CSEP Guideline	4289 (51.1%)	1098 (13.1%)	5387	S=16.9* df=1
Met the CSEP Guideline	1299 (15.5%)	1714 (20.4%)	3013	
Total	5588	2812	N=8400	
Notes: *p-value of < 0.0001				

APPENDIX F: YEAR 2 TO YEAR 3 MVPA DESCRIPTIVE STATISTICS (SENSITIVITY ANALYSIS)

Table 20: Descriptive Statistics for the Grade 9-12 Students in the Year 2 (2013-2014) COMPASS Sample by Gender (MVPA Sample): Sensitivity Analysis

		Female (n=4239) %	**Male** (n=4291) %	**Total** (n=8530) %	**Chi Square**
Grade	9	36.2	37.5	36.8	χ^2=22.1* df=3
	10	35.2	33.2	34.2	
	11	27.1	26.5	26.8	
	12	1.5	2.8	2.2	
Ethnicity	White	81.2	79.8	80.4	χ^2=20.2** df=6
	Black	2.2	3.6	2.9	
	Asian	4.2	4.1	4.2	
	Aboriginal	1.8	1.9	1.9	
	Hispanic	1.4	1.5	1.5	
	Other	2.5	3.1	2.8	
	Mixed	6.7	6.0	6.3	
Weekly spending money	$0	17.1	18.5	17.8	χ^2=50.3* df=4
	$1-20	35.2	33.8	34.5	
	$21-100	25.9	23.8	24.8	
	>$100	8.2	12.4	10.4	
	I don't know	13.6	11.5	12.5	
60 Minutes Daily MVPA	Did not meet	55.3	39.7	47.5	χ^2=206.5* df=1
	Met	44.7	60.3	52.5	
Active Transportation	Inactive	78.6	72.0	75.2	χ^2=51.5* df=2
	Sometimes Active	11.6	15.5	13.6	
	Active	9.8	12.5	11.2	
# of Active Friends	None	5.5	4.3	4.9	χ^2=340.6* df=2
	1-4	58.4	39.7	49.0	
	5 or more	36.1	56.0	46.1	
Enrolled in PE	Yes	61.5	71.0	66.3	χ^2=85.0* df=1
	No	38.5	29.0	33.7	
Participation in Intramurals	Yes	39.1	44.7	41.9	χ^2=27.5* df=2
	No	58.2	52.7	55.4	
	NOA	2.7	2.6	2.7	
Participation in Varsity Sports	Yes	40.3	53.0	46.7	χ^2=139.4* df=2
	No	58.7	46.1	52.3	
	NOA	1.0	0.9	1.0	
Participation in Community Sports	Yes	52.8	63.9	58.4	χ^2=120.8* df=2
	No	46.6	35.0	40.8	
	NOA	0.6	1.1	0.8	

Notes: *p-value of <0.0001, **p-value of <0.01
PE=Physical Education, NOA= No Opportunities Available to Participate

Table 21: Descriptive Statistics for the Year 2 (2013-2014) COMPASS Sample by MVPA Status (Sensitivity Analysis)

		Not meeting 60 minutes of MVPA daily (n=4048) %	**Meeting 60 minutes of MVPA daily** (n=4482) %	**Total** (n=8530) %	**Chi Square**
Gender	Female	57.9	42.3	49.7	χ^2=206.5*
	Male	42.1	57.7	50.3	df=1
Grade	9	34.7	38.8	36.8	
	10	34.6	33.8	34.2	χ^2=18.0**
	11	28.4	25.4	26.8	df=3
	12	2.3	2.0	2.2	
Ethnicity	White	80.2	80.7	80.4	
	Black	2.5	3.2	2.9	
	Asian	4.8	3.6	4.2	χ^2=17.2***
	Aboriginal	1.5	2.2	1.9	df=6
	Hispanic	1.5	1.5	1.4	
	Other	2.9	2.7	2.8	
	Mixed	6.6	6.1	6.4	
Weekly spending money	$0	20.7	15.2	17.8	
	$1-20	36.1	33.0	34.6	
	$21-100	22.8	26.7	24.8	χ^2=86.0*
	>$100	8.4	12.1	10.3	df=4
	I don't know	12.0	13.0	12.5	
Active Transportation	Inactive	75.8	74.8	75.2	
	Sometimes Active	13.5	13.6	13.6	χ^2=1.6 df=2
	Active	10.7	11.6	11.2	
# of Active Friends	None	6.5	3.5	4.9	
	1-4	56.8	41.9	49.0	χ^2=282.4* df=2
	5 or more	36.7	54.6	46.1	
Enrolled in PE	Yes	57.5	74.2	66.3	χ^2=266.1*
	No	42.5	25.8	33.7	df=1
Participation in Intramurals	Yes	35.8	47.5	41.9	
	No	61.6	49.8	55.4	χ^2=122.2* df=2
	NOA	2.6	2.7	2.7	
Participation in Varsity Sports	Yes	37.5	54.9	46.7	
	No	61.6	44.0	52.3	χ^2=264.9* df=2
	NOA	0.9	1.1	1.0	
Participation in Community Sports	Yes	50.2	65.9	58.4	
	No	46.2	33.1	40.8	χ^2=232.4* df=2
	NOA	0.6	1.0	0.8	
Notes: *p-value of <0.0001, **p-value of <0.001, ***p-value of <0.01 PE=Physical Education, NOA= No Opportunities Available to Participate					

Table 22: Change in Intramural Participation Between Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS Study by Year 3 MVPA Status (Sensitivity Analysis)

	Not meeting 60 minutes of MVPA daily (n=4148) %	**Meeting 60 minutes of MVPA daily** (n=4382) %	**Total** (n=8530) %	**Chi Square**
Never Participated	49.6	35.2	42.2	χ^2=228.7* df=8
Stopped Participating	13.3	12.9	13.1	
Started Participating	10.8	13.6	12.2	
Always Participated	22.3	33.8	28.2	
NOA to Participating	0.5	0.8	0.7	
Participated to NOA	0.5	0.8	0.7	
NOA to Not Participating	1.7	1.5	1.6	
Did not Participate to NOA	1.0	0.9	1.0	
NOA to NOA	0.4	0.5	0.5	
Notes: *p-value of <0.0001 NOA= No Opportunities Available to Participate				

Table 23: Change in Intramural Participation between Year 2 (2013-2014) and Year 3(2014-2015) of the COMPASS Study by Sex: MVPA Sample (Sensitivity Analysis)

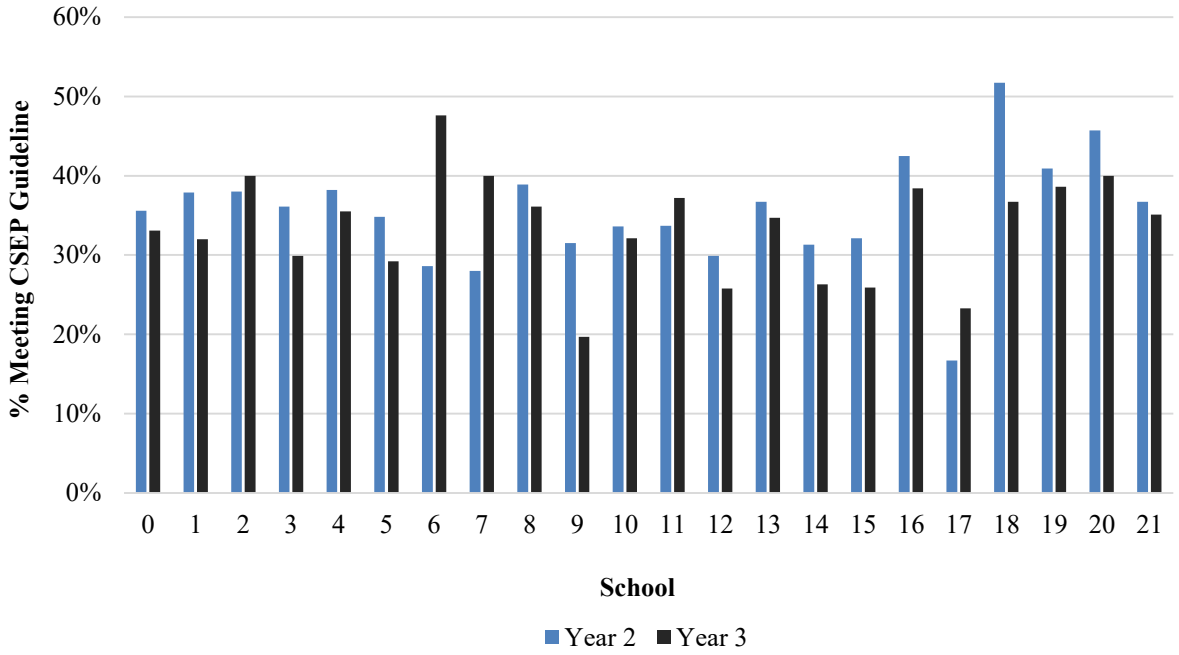
	Female (n=4239) %	**Male** (n=4291) %	**Total** (n=8530) %	**Chi Square**
Never Participated	46.0	38.4	42.2	χ^2=67.3* df=8
Stopped Participating	13.1	13.0	13.1	
Started Participating	11.1	13.4	12.2	
Always Participated	25.4	30.1	28.2	
NOA to Participating	0.5	0.8	0.7	
Participated to NOA	0.6	0.7	0.7	
NOA to Not Participating	1.7	1.5	1.6	
Did not Participate to NOA	1.0	0.9	1.0	
NOA to NOA	0.5	0.4	0.5	
Notes: *p-value of <0.0001 NOA= No Opportunities Available to Participate				

Table 24: MVPA Status in Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS Study (Sensitivity Analysis)

MVPA	*Year 3*			
Year 2	**Not meeting 60 minutes of MVPA daily**	**Meeting 60 minutes of MVPA daily**	Total	McNemar's Test Statistic
Not meeting 60 minutes of MVPA daily	2660 (31.2%)	1388 (16.3%)	4048	S=3.5 df=1 p-value=0.06
Meeting 60 minutes of MVPA daily	1488 (17.4%)	2994 (35.1%)	4482	
Total	4148	4382	N=8530	

APPENDIX G: DIFFERENCE-IN-DIFFERENCES CHANGES IN THE SCHOOL-LEVEL PREVALENCE OF STUDENTS MEETING THE CSEP GUIDELINE (SENSITIVITY ANALYSIS)

Figure 3: School-Level Prevalence of Meeting the CSEP Guideline Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS Study (Sensitivity Analysis)



Notes:
School 0 represents the pooled sample of true control schools (n=43).
School 21 represents the pooled sample of OPI schools (n=23).

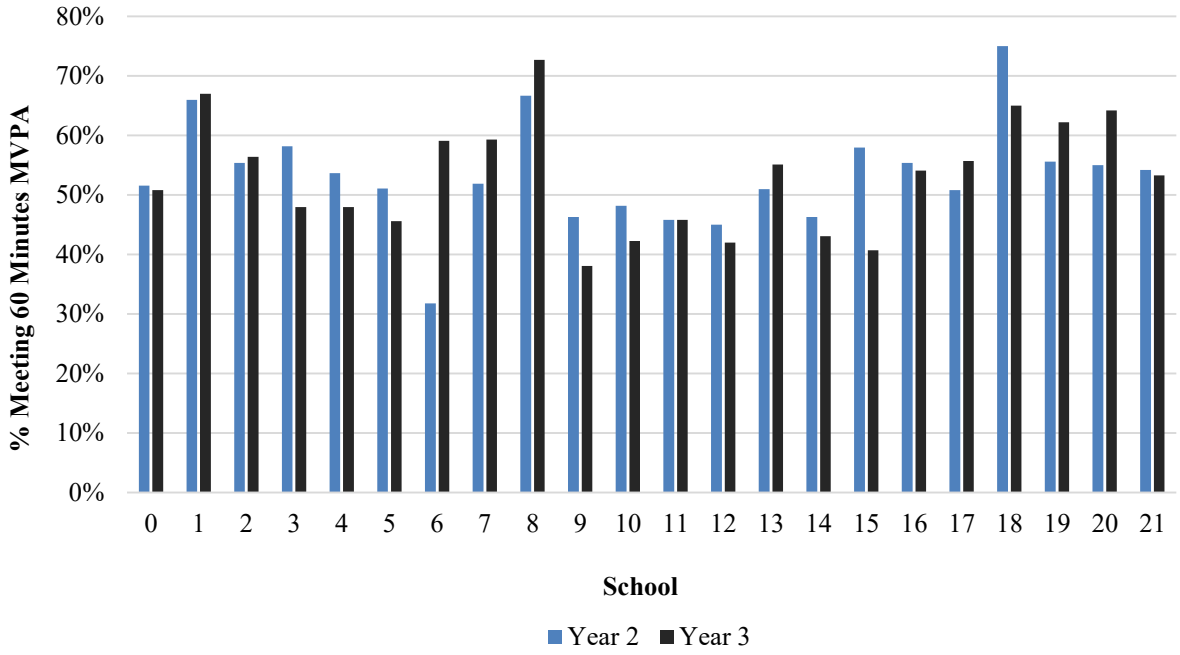
Table 25: Difference-in-Differences Changes in the School-Level Prevalence of Students Meeting the CSEP Guideline Between Year 2 (2013-2014) and Year 3 (2014-2015) Relative to the Control Schools (Sensitivity Analysis)

School	Difference-in-Differences Changes in the School-Level Prevalence of Meeting the CSEP Guideline Relative to True Control Schools[a,c]	ANOVA (True Control Schools)	Difference-in-Differences Changes in the School-Level Prevalence of Meeting the CSEP Guideline Relative to Other Practice Intervention (OPI) Schools[b,c]	ANOVA (OPI Schools)
1	-3.32	F=0.63, df_1= 20, df_2=1965, p-value= 0.8966	-4.22	F=0.61, df_1= 20, df_2=1965, p-value= 0.9057
2	4.50		3.60	
3	-3.68		-4.58	
4	-0.13		-1.03	
5	-3.12		-4.01	
6	21.55		20.65	
7	14.50		13.60	
8	-0.28		-1.17	
9	-9.31		-10.21	
10	1.01		0.11	
11	5.99		5.09	
12	-1.62		-2.52	
13	0.46		-0.44	
14	-2.50		-3.40	
15	-3.67		-4.57	
16	-1.61		-2.51	
17	9.17		8.27	
18	-12.50		-13.40	
19	0.23		-0.67	
20	-3.21		-4.11	

Notes:
[a] represents the change in the prevalence of meeting the CSEP guideline within an intervention school between Year 2 and Year 3 relative to the pooled change in the prevalence of meeting the CSEP guideline within the true control schools between Year 2 and Year 3
[b] represents the change in the prevalence of meeting the CSEP guideline within an intervention school between Year 2 and Year 3 relative to the pooled change in the prevalence of meeting the CSEP guideline within the OPI schools between Year 2 and Year 3
[c] none of the 20 intervention schools were found to be significant ($p<0.05$)

APPENDIX H: DIFFERENCE-IN-DIFFERENCES CHANGES IN THE SCHOOL-LEVEL PREVALENCE OF STUDENTS MEETING THE MVPA GUIDELINE (SENSITIVITY ANALYSIS)

Figure 4: School-Level Prevalence of Achieving ≥60 Minutes of Daily MVPA in Year 2 (2013-2014) and Year 3 (2014-2015) of the COMPASS study (Sensitivity Analysis)



Notes:
School 0 represents the pooled sample of true control schools (n=43).
School 21 represents the pooled sample of OPI schools (n=23).

Table 26: Difference-in-Differences Changes in the School-Level Prevalence of Students Meeting the MVPA Guideline Between Year 2 (2013-2014) and Year 3 (2014-2015) Relative to the Control Schools (Sensitivity Analysis)

School	Difference-in-Differences Changes in the School-Level Prevalence of Meeting the MVPA Guideline Relative to True Control Schools[a,c]	ANOVA (True Control Schools)	Difference-in-Differences Changes in the School-Level Prevalence of Meeting the MVPA Guideline Relative to Other Practice Intervention (OPI) Schools[b,c]	ANOVA (OPI Schools)
1	1.74		1.88	
2	1.76		1.90	
3	-9.44		-9.29	
4	-4.91		-4.76	
5	-4.79		-4.64	
6	28.04		28.19	
7	8.18		8.32	
8	6.32		6.47	
9	-7.44	F=0.92, df_1= 20, df_2=1999, p-value= 0.5650	-7.30	F=0.89, df_1= 20, df_2=1998, p-value= 0.5955
10	-5.07		-4.93	
11	0.77		0.91	
12	-2.23		-2.09	
13	4.85		5.00	
14	-2.36		-2.21	
15	-16.52		-16.37	
16	-0.58		-0.44	
17	5.69		5.83	
18	-9.23		-9.09	
19	7.43		7.58	
20	9.94		10.09	

Notes:
[a] represents the change in the prevalence of meeting the MVPA guideline within an intervention school between Year 2 and Year 3 relative to the pooled change in the prevalence of meeting the MVPA guideline within the true control schools between Year 2 and Year 3
[b] represents the change in the prevalence of meeting the MVPA guideline within an intervention school between Year 2 and Year 3 relative to the pooled change in the prevalence of meeting the MVPA guideline within the OPI schools between Year 2 and Year 3
[c] none of the 20 intervention schools were found to be significant ($p<0.05$)

APPENDIX I: CHANGES IN SCHOOL RECREATIONAL PROGRAMMING BETWEEN YEAR 2 AND YEAR 3 ON THE LIKELIHOOD OF STUDENTS MEETING THE CSEP GUIDELINE (SENSITIVITY ANALYSIS)

Table 27: Evaluating the Impact of 20 School Recreational Programming Interventions on the Relative Risk of a Student Meeting the CSEP Guideline (Sensitivity Analysis)

Parameter	Model 1: True Control Schools				Model 2: OPI Schools			
		95%CI				95%CI		
	RR	Lower	Upper	P-value	**RR**	Lower	Upper	P-value
Intercept	**0.09**	0.08	0.12	<0.0001	**0.08**	0.05	0.11	<0.0001
Gender								
Male	**1.25**	1.18	1.31	<0.0001	**1.19**	1.12	1.27	<0.0001
Grade in Year 3								
10	1.03	0.96	1.12	0.4186	1.00	0.91	1.09	0.9282
11	0.99	0.92	1.08	0.8788	0.94	0.85	1.03	0.1867
12	0.97	0.87	1.08	0.5480	0.98	0.85	1.12	0.7421
Ethnicity								
Black	1.07	0.93	1.24	0.3540	1.03	0.88	1.21	0.7050
Asian	0.96	0.83	1.10	0.5397	**0.79**	0.67	0.94	0.0087
Aboriginal	**1.40**	1.20	1.63	<0.0001	**1.24**	1.01	1.53	0.0410
Hispanic	1.11	0.92	1.33	0.2780	0.91	0.69	1.19	0.4869
Other	1.14	0.98	1.32	0.0917	1.05	0.89	1.24	0.5772
Mixed	1.07	0.97	1.19	0.1643	1.08	0.95	1.22	0.2256
Weekly Spending Money								
$1-20	**1.11**	1.02	1.21	0.0145	1.07	0.97	1.18	0.1755
$21-100	**1.28**	1.17	1.39	<0.0001	**1.28**	1.15	1.41	<0.0001
$100 or more	**1.37**	1.25	1.51	<0.0001	**1.31**	1.17	1.47	<0.0001
I don't know	**1.20**	1.08	1.32	0.0005	**1.18**	1.05	1.33	0.0061
Active Transportation								
Sometimes Active	1.04	0.96	1.13	0.3658	0.99	0.91	1.08	0.8458
Active	1.01	0.93	1.10	0.8029	1.01	0.91	1.11	0.8815
# of Active Friends								
1-4 friends	**1.19**	1.03	1.38	0.0152	**1.58**	1.29	1.95	<0.0001
5+ friends	**1.58**	1.37	1.83	<0.0001	**2.03**	1.64	2.50	<0.0001
Enrolled in PE								
Yes	**1.58**	1.48	1.67	<0.0001	**1.58**	1.47	1.70	<0.0001
Varsity Sports								
Participate	**1.20**	0.89	1.29	<0.0001	**1.22**	1.13	1.32	<0.0001
NOA	1.28	0.98	1.66	0.0667	1.02	0.74	1.41	0.9163
Community Sports								
Participate	**1.30**	1.23	1.38	<0.0001	**1.37**	1.27	1.48	<0.0001
NOA	**1.51**	1.17	1.94	0.0017	**1.68**	1.20	2.36	0.0027
School Location[a]								
Medium Urban					1.08	0.95	1.23	0.2658
Small Urban					0.99	0.86	1.13	0.8407
Rural					0.78	0.59	1.03	0.0783

School Size								
Medium School	**1.14**	1.06	1.24	0.0009	0.93	0.81	1.08	0.3526
Large School	**1.11**	1.01	1.22	0.0316	1.10	0.92	1.32	0.3044
School SES								
	0.98	0.96	1.00	0.0389	0.99	0.96	1.03	0.6670
Year								
Year 3	1.02	0.95	1.09	0.5964	1.07	0.98	1.17	0.1211
Change in Intramural Participation								
Stopped Participating	**1.09**	1.00	1.19	0.0494	1.06	0.95	1.17	0.3020
Started Participating	**1.23**	1.13	1.33	<0.0001	**1.24**	1.12	1.37	<0.0001
Always Participated	**1.24**	1.15	1.34	<0.0001	**1.20**	1.10	1.32	<0.0001
NOA to Participating	1.22	0.91	1.62	0.1800	**1.49**	1.15	1.93	0.0024
Participating to NOA	1.14	0.87	1.50	0.3333	1.08	0.73	1.60	0.6910
NOA to Not Participating	1.08	0.87	1.34	0.4945	1.12	0.88	1.43	0.3498
Not Participating to NOA	1.13	0.87	1.48	0.3699	1.25	0.93	1.68	0.1397
NOA to NOA	1.38	0.93	2.04	0.1125	1.00	0.65	1.56	0.9874
Intervention Impact								
Addition of a New Program								
School 1	0.89	0.61	1.29	0.5330	0.85	0.58	1.25	0.4094
School 2	1.09	0.76	1.56	0.6233	1.05	0.73	1.52	0.7744
School 3	0.97	0.65	1.45	0.8792	0.91	0.61	1.36	0.6132
Modification of Pre-Existing Program								
School 4	1.02	0.80	1.32	0.8506	0.98	0.76	1.26	0.8743
School 5	0.94	0.62	1.44	0.7894	0.92	0.60	1.40	0.6871
School 6	1.58	0.70	3.57	0.2748	1.60	0.71	3.60	0.2599
School 7	1.55	0.71	3.38	0.2689	1.49	0.69	3.23	0.3150
School 8	1.00	0.54	1.83	0.9873	0.98	0.53	1.80	0.9481
School 9	0.69	0.46	1.04	0.0735	**0.66**	0.44	0.99	0.0455
School 10	1.10	0.78	1.55	0.5770	1.05	0.75	1.49	0.7606
School 11	1.20	0.89	1.60	0.2277	1.14	0.85	1.53	0.3740
School 12	0.89	0.58	1.37	0.5989	0.85	0.55	1.31	0.4617
School 13	0.96	0.56	1.65	0.8948	0.95	0.55	1.62	0.8424
School 14	0.93	0.66	1.30	0.6675	0.88	0.63	1.23	0.4485
School 15	0.83	0.52	1.32	0.4355	0.79	0.50	1.26	0.3306
School 16	0.96	0.64	1.46	0.8602	0.48	0.61	1.41	0.7273
School 17	1.63	0.84	3.13	0.1457	1.59	0.83	3.05	0.1659
School 18	0.77	0.49	1.21	0.2565	0.75	0.48	1.17	0.2003
Removal of Program								
School 19	1.09	0.64	1.86	0.7543	1.07	0.63	1.83	0.8024
School 20	0.92	0.65	1.29	0.6163	0.88	0.63	1.23	0.4561

Notes:
PE=Physical Education, NOA= No Opportunities Available to Participate
[a] Due to only one rural school being in the True Control group, RR's. C.I.'s and p-value's could not be computed for school location.

APPENDIX J: CHANGES IN SCHOOL RECREATIONAL PROGRAMMING BETWEEN YEAR 2 AND YEAR 3 ON THE LIKELIHOOD OF STUDENTS MEETING THE MVPA GUIDELINE (SENSITIVITY ANALYSIS)

Table 28: Evaluating the Impact of 20 School Recreational Programming Interventions on the Relative Risk of a Student Achieving ≥60 minutes of Daily MVPA (Sensitivity Analysis)

Parameter	Model 3: True Control Schools				Model 4: OPI Schools			
		95%CI				95%CI		
	RR	Lower	Upper	P-value	**RR**	Lower	Upper	P-value
Intercept	**0.26**	0.22	0.30	<0.0001	**0.31**	0.24	0.39	<0.0001
Gender								
Male	**1.25**	1.21	1.30	<0.0001	**1.25**	1.20	1.30	<0.0001
Grade in Year 3								
10	1.03	0.97	1.09	0.2959	0.98	0.92	1.04	0.5055
11	1.06	1.05	1.07	0.8392	0.95	0.88	1.02	0.1250
12	0.98	0.91	1.06	0.6825	0.94	0.85	1.03	0.1791
Ethnicity								
Black	1.02	0.92	1.13	0.7264	0.94	0.83	1.06	0.2955
Asian	0.93	0.84	1.02	0.1204	**0.86**	0.77	0.97	0.0111
Aboriginal	**1.21**	1.08	1.36	0.0011	**1.18**	1.03	1.36	0.0201
Hispanic	1.03	0.90	1.18	0.6984	0.91	0.76	1.10	0.3484
Other	1.00	0.90	1.12	0.9630	0.93	0.83	1.06	0.2854
Mixed	1.08	1.01	1.16	0.0325	1.06	0.97	1.15	0.2194
Weekly Spending Money								
$1-20	**1.10**	1.04	1.16	0.0012	1.03	0.99	1.13	0.0972
$21-100	**1.21**	1.14	1.28	<0.0001	**1.15**	1.07	1.23	<0.0001
$100 or more	**1.30**	1.22	1.39	<0.0001	**1.24**	1.15	1.34	<0.0001
I don't know	**1.17**	1.09	1.26	<0.0001	**1.10**	1.01	1.19	0.0278
Active Transportation								
Sometimes Active	1.03	0.97	1.09	0.3578	0.99	0.93	1.05	0.6806
Active	**1.09**	1.03	1.16	0.0020	1.04	0.98	1.11	0.2224
# of Active Friends								
1-4 friends	**1.10**	1.01	1.20	0.0274	**1.21**	1.08	1.35	0.0012
5+ friends	**1.29**	1.18	1.40	<0.0001	**1.39**	1.24	1.57	<0.0001
Enrolled in PE								
Yes	**1.27**	1.22	1.32	<0.0001	**1.24**	1.18	1.30	<0.0001
Varsity Sports								
Participate	**1.07**	1.03	1.13	0.0027	1.05	1.00	1.11	0.0693
NOA	1.17	0.97	1.42	0.0920	0.97	0.77	1.22	0.7916
Community Sports								
Participate	**1.10**	1.05	1.14	<0.0001	**1.15**	1.10	1.21	<0.0001
NOA	1.16	0.96	1.40	0.1349	1.25	0.98	1.60	0.0725
School Location[a]								
Medium Urban					**1.10**	1.00	1.20	0.0494
Small Urban					1.07	0.98	1.17	0.1492
Rural					1.05	0.88	1.25	0.6179

School Size								
Medium School	1.03	0.98	1.09	0.2677	0.96	0.88	1.06	0.4617
Large School	0.99	0.93	1.06	0.8523	1.09	0.97	1.24	0.1572
School SES								
	0.99	0.97	1.00	0.0249	**0.96**	0.94	0.99	0.0013
Year								
Year 3	1.03	0.98	1.07	0.2970	1.05	0.99	1.12	0.1229
Change in Intramural Participation								
Stopped Participating	**1.08**	1.02	1.15	0.0064	**1.06**	0.99	1.13	0.1193
Started Participating	**1.13**	1.06	1.20	<0.0001	**1.09**	1.02	1.18	0.0138
Always Participated	**1.15**	1.09	1.21	<0.0001	**1.12**	1.05	1.20	0.0003
NOA to Participating	1.19	0.97	1.47	0.0976	1.13	0.92	1.39	0.2533
Participating to NOA	1.07	0.88	1.30	0.4991	1.24	0.96	1.60	0.0995
NOA to Not Participating	1.06	0.91	1.23	0.4562	1.13	0.96	1.32	0.1512
Not Participating to NOA	1.13	0.95	1.35	0.1700	1.03	0.83	1.28	0.7707
NOA to NOA	1.05	0.78	1.42	0.7262	1.10	0.83	1.46	0.5230
Intervention Impact								
Addition of a New Program								
School 1	1.00	0.79	1.27	0.9978	0.99	0.78	1.26	0.9661
School 2	1.02	0.79	1.33	0.8659	1.03	0.79	1.33	0.8519
School 3	0.89	0.68	1.17	0.4178	0.86	0.65	1.13	0.2834
Modification of Pre-Existing Program								
School 4	0.92	0.77	1.11	0.3968	0.92	0.76	1.10	0.3544
School 5	0.93	0.69	1.25	0.6096	0.93	0.69	1.25	0.6349
School 6	1.76	0.92	3.34	0.0864	1.81	0.96	3.43	0.0666
School 7	1.16	0.70	1.91	0.5689	1.15	0.70	1.88	0.5929
School 8	1.10	0.74	1.62	0.6388	1.10	0.75	1.32	0.6203
School 9	0.85	0.65	1.11	0.2277	0.85	0.65	1.10	0.2154
School 10	0.93	0.72	1.19	0.5673	0.99	0.72	1.19	0.5433
School 11	1.02	0.82	1.27	0.8524	1.01	0.81	1.26	0.9140
School 12	0.93	0.69	1.25	0.6113	0.92	0.69	1.24	0.5942
School 13	1.09	0.74	1.60	0.6653	1.10	0.75	1.60	0.6323
School 14	0.97	0.77	1.22	0.7754	0.93	0.76	1.21	0.7002
School 15	**0.70**	0.51	0.96	0.0267	**0.70**	0.51	0.95	0.0234
School 16	0.99	0.73	1.35	0.9632	0.99	0.73	0.135	0.9542
School 17	1.15	0.82	1.63	0.4218	1.16	0.83	1.63	0.3895
School 18	0.90	0.67	1.22	0.5066	0.89	0.66	1.20	0.4424
Removal of Program								
School 19	1.17	0.80	1.71	0.4121	1.17	0.80	1.71	0.4079
School 20	1.16	0.91	1.48	0.2438	1.16	0.91	1.48	0.2251

Notes:
PE=Physical Education, NOA= No Opportunities Available to Participate
[a] Due to only one rural school being in the True Control group, RR's. C.I.'s and p-value's could not be computed for school location.