ASSOCIATION BETWEEN SCREEN TELEVISION AND

BULLYING BEHAVIOR: AN ANALYSIS OF OREGON

ELEMENTARY SCHOOL HEALTH BEHAVIOR

SURVEY, 2004-05

by

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A THESIS

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LIST OF ABBREVIATIONS

Abbreviation	Definition
AAP	American Academy of Pediatrics
aOR	Adjusted odds ratio
CA HKS	California Healthy Kids Survey
CDC	Centers for Disease Control and Prevention
CI	95 % Confidence Interval
KP	Kaiser Permanente
N	Number of students in sample
NR	Not reported
ODE	Oregon Departments of Education
ODHS	Oregon Department of Human Services
ODHS-OFH	Oregon Department of Human Services-Office of Family Health
OESHBS	Oregon Elementary School Health Behavior Survey
OFH	Office of Family Health
OR	Unadjusted or crude odds ratio
ORs	Odds ratios
%	Percentage
SY	School year
TV	Television
YRBSS	Youth Risk Behavior Surveillance System

LIST OF DEFINITIONS

Aggression / Aggressive behavior: Refers to physical or verbal attack, hostile or antisocial behavior, with the potential to injure the target person.[1]

Antisocial behavior: Based on Merriam-Webster online dictionary (http://www.merriam-webster.com/dictionary), antisocial behavior refers to behavior deviating from the social norm, including those that are hostile or harmful.

Bullying/ bullying behavior: A form of aggressive behavior in which 1) the behavior is intended to harm or disturb, 2) the behavior occurs repeatedly over time, and 3) there is an imbalance of power with a more powerful person or group attacking a less powerful one. Bullying behavior could be physical (hitting or pushing), or non-physical (name-calling, threats, rumors, shunning or exclusion).[2]

Children: The word children as used in this report refers to young children and adolescents less than 13 years of age.[3]

Elementary school aged children: Children aged 5 to 12 where the age range for 4th, 5th, and 6th grade is 9 to10 years, 10 to 11 years, and 11 to 12 years, respectively.

Excessive TV viewing or high TV-viewing: Hours of TV viewing that exceeds AAP's recommendation. AAP recommends no television viewing for children under the age of 2 and no more than 2 hours of TV per day for children ages 2 to 21.

Psychological symptoms: Refers to symptoms of depression, anxiety, dissociation and posttraumatic stress.[4]

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[1] Johnson MO. Television violence and its effect on children. *J Pediatr Nurs.* 1996 Apr;11(2):94 99.

[2] Nansel TR, Overpeck M, Pilla RS *et al.* Bullying behaviors among US youth. *JAMA.* 2001 Apr;285(16):2094-2100.

[3] Derived from American Academy of Pediatrics' definitions for children and adolescence (http://www.aap.org/topics.html), Merriam-Webster Online Thesaurus – where children refers to preteen http://www.merriam-webster.com/thesaurus/children), and average age for 6th graders. According to AAP, the word "children" refers to individuals aged 0 to 10 years old, and "adolescence" refers to youth aged 11 to 21.

[4] Singer MI, Miller DB, Shenyang G. Contributors to violent behavior among elementary and middle school children. J *Pediatr.* 1999 Oct;104(4):878-884.

Screen time: Refers to the length of time watching television (TV) or movies on VHS tape or DVD; playing video games on a computer, game boy, or other game device; spending time on computer (J Rystrom; Pediatrics; P Wu; Pediatrician; Kaiser Permanente Northwest; written communication; April 2006)

Screen TV time: Refers to the amount of TV viewing hours. (The type of media measured in OESHBS is TV. Although the OESHBS question asks about amount of "TV or video movies" watching, the answer category refers to only TV so the word "screen TV time" is used to clarify the type of media measured in OESHBS. For more information about the actual OESHBS question, please refer to the methods section of this report.)

ACKNOWLEDGEMENTS

Ua ib tug neeg phem,

Ces xyaum ib ntsis xwb.

Ua ib tug neeg zoo

Ces xyaum ib txhis.

(Hmong proverb)

To be a "bad" person,

Is just one day.

To be a "good" person

Is a life time effort.

(English translation)

ABSTRACT

Background

Excessive exposure to television (TV) among preschool and school aged children is associated with adverse health outcomes, including aggressive behaviors. Bullying is associated with negative health outcomes. Being a bully victim is associated with school absenteeism and social isolation; being a bully perpetrator is associated with criminal activities. This study investigates whether TV viewing hours is significantly associated with bullying behaviors by: (1) assessing the unadjusted and school-adjusted association, (2) assessing the gender association, and (3) assessing the association adjusted for school, grade and gender.

Methods

This secondary data analysis utilizes the Oregon Elementary Schools Health Behavior Survey (OESHBS) 2004-05, which was administered to students from 5 elementary schools in Oregon. Self-reported bullying behaviors in the **previous month** (physical bully, physical victim, rumor perpetrator, and rumor victim) were used to predict self-reported TV viewing on the previous day (< 2 hours vs. ≥ 2 hours). Descriptive statistics, inferential tests, and logistic regression models were conducted using SPSS statistical analysis software.

Results

Overall, 36.2 % (199 of 554) participants reported watching 2 or more hours of TV on the previous day, and 12% reported being perpetrators of physical bullying in the previous month. Girls and boys equally reported having watched 2 or more hours of TV on the previous day (36.5% vs. 36.0%). Perpetrators of physical bullying (unadjusted odds ratio (OR) = 3.04, 95% confidence interval (CI) = 1. 79-5.17) and students who were physically victimized (OR = 1.58, CI = 1.10-2.27) in the previous month were significantly more likely to watch 2 or more hours of TV on the previous day. The relationship between TV viewing hours and physical bully perpetrator persisted when stratified by gender (male-specific OR = 2.98, CI = 1.57-5.66, female-specific OR = 2.57, CI = 1.28-9.95); however, the association between TV viewing hours and physical bully victim was significant only among males (OR = 2.42, CI = 1.45 4.05). After simultaneously adjusting for school, grade, and gender, TV viewing hours was significantly associated with physical bully perpetrator (aOR = 2.84, CI = 1.15-5.18); with male physical bully victim (aOR = 1.99, CI = 1.14-3.49); and with grade 6 (aOR = 3.00, CI = 1.56-5.76).

Discussion / Public Health Implications

Among both boys and girls, TV viewing hours was significantly associated with being perpetrators of physical bullying. TV viewing hours was associated with physical victimization among boys. Although causality was not able to be concluded, both directions of the association need to be considered in program recommendations. The findings support decreasing TV viewing among children and increasing children, families, caretakers and community's awareness about the adverse effects of television and bullying behavior.

Conclusion

This study illustrates that many elementary children in Oregon continue to watch more than 2 hours of TV each day, exceeding AAP's recommendation for daily TV viewing hours. Results of this thesis support a plan to decrease television viewing among elementary school children, and to raise awareness about the importance of bullying prevention in elementary schools. Acting upon these results stands to promote the health and education of elementary school children in Oregon.

INTRODUCTION AND BACKGROUND

Television Viewing among Children

Television (TV) is a source of information and entertainment. Reputable internet sites related to TV viewing (*e.g.*, Media Awareness Network, The Prevention Researcher, The Museum of Broadcast Communications) assert that educational or high quality children TV programs can be beneficial to children. For example, TV programs that show previews of books motivate children to read because previews introduce children to book titles which may be of interest to them; high quality TV programs can teach children about other cultures, values (such as sharing of toys), and life lessons; high quality news shows and documentaries help young people learn about the world and develop critical thinking skills about society. The effects of TV on school performances has been studied extensively.[1] For instance, some investigators found that preschoolers exposed to educational TV programs scored better on reading and math exams during adolescence, and receive better grades in school compared those without the quality exposure.[1,2,3] Conversely, a recent study reported that 34% of children aged 4 to 6 years living in households where the TV is on always or most of the time ("heavy" TV viewing) are less likely to be able to read compared with 56% of children living in households where TV is on none or some of the time.[4] Scholarly critics,[5] and researchers in the United States (U.S.), Canada, and Europe concluded that high TV-viewing hours (more than 2 hours) has a negative effect on school achievement.[1,3,6,7,8] Furthermore, high TV-viewing hours has been found to be associated with aggressive behavior and other adverse effects. Pre-school and elementary school children are especially vulnerable to the negative effects of TV because many of them cannot differentiate

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between what they see on TV and in real life.[1,9] According to American Academy of Pediatrics (AAP), *"Television can inform, entertain and teach us. However, some of what TV teaches may not be what you want your child to learn,"* [9] especially when the TV is watched for more than 2 hours.

TV Viewing Guidelines & Rationale

To reduce the effect that TV viewing may have on children and adolescents, AAP issued a guideline in February of 2001 recommending "no more than 1 to 2 hours of quality" TV and videos a day for older children (aged 2 to 21 years) and no screen time for children less than 2 years."[10(p425)] Regardless of the quality of the TV program, TV viewing is not recommended for children under age 2 because their brain is still developing rapidly. According to AAP, human interaction is most important for children under 2 years old for the development of language and social skills.[9] There appears to be a consensus that the average American child's TV viewing hours exceeds the recommendation.[1,10-14]

The AAP guideline for limiting screen time focuses on individuals from birth through age 21 because exposure to TV affects children and adolescents differently than adults. Due to their age, children and adolescents are more vulnerable to TV influence. According to Strasburger, media provide information and shape attitude; children have less experience and their thinking skills are not as developed so they are more willing to believe information from TV or other types of media.[11] For example, 6 year olds are less likely to understand the intent of advertisement.[11] The negative effects of TV (and other media) on aggression among elementary school children is of great concern because after the age of four their interaction with the surroundings -- family, community, peers, and

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mass media -- increases and becomes more complex.[15] Adolescents are also susceptible to the negative effects of TV. Because adolescents tend to be easily influenced by peer pressure, media may function as a "super peer," [11] and adolescents might get influenced by inappropriate situations or behavior observed on TV programs.

Exposure to televised violence has been shown to affect aggression, generate fear and has a desensitizing effect. The negative effects of TV on children and adolescents are explained by theories of the effect of media violence on aggression. Based on the Bandura's social (social cognitive) learning theory, children learn how to behave from repeatedly observing and imitating what they see around them, on TV or other media.[11, 16] Kuntsche[17] found that reports of having "said or done nasty and unpleasant things" to another student was significantly associated with excessive TV viewing among those aged 12 to 14 years. A study conducted by Anderson and Dill showed that what children see while playing violent video games enables them to practice new aggression tactics that they later imitate when they are in a real life conflict situation.[17] According to Huesmann's social information processing theory, the use of violent media alters the perception and interpretation of real-life events so several effects could result from being exposed to media violence.[11] In addition to the effect on aggression, the young viewer may become fearful that the world is a dangerous place, so he or she might become afraid of the surroundings, other children, or adults. For instance, the person develops "violent opinion" that the school playground is unsafe.[17] Another effect is that media violence desensitizes children to real life violence; [11] by watching TV violence, children become less sympathetic to real life violence or human cruelty. Repeated exposure to violence on television might cause fear at first but children become less fearful over time; therefore,

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children become no longer afraid of the behavior and instead began to see them as normal.[18]

U.S. Trends in TV Viewing

The average American child or adolescent spent an average of 3 to 4 hours watching TV each day based on studies published between 1997 and 2001;[10,16] thus, by the time the child is 70 years old he or she would have watched TV for about 7 to 10 years.[1,10] As early as 1989, the average American child spent more time watching television than any other activity except sleeping.[11,12,16] In an international study including the United States, the average TV viewing per day was 3 and 4 hours among 11, 13 and 15 year old adolescents.[14] A new study among children from 6 months to 6 years old found that children less than 6 years old spend an average of 2 hours a day using screen media, which is more than time than many spend reading or having someone read to them.[4] A study conducted in 2003-04 found that children age 6 to 13 years reported having watched an average of 3 hours of TV a day. [20]

Factors that Affect Excessive TV Viewing / Strategies for Reducing TV Viewing

Why are children watching so much TV? Several home-environmental factors are related to excessive TV viewing among children and adolescents: friends[21] and family TV viewing behavior,[22,23] access to pay TV,[23] having a TV in the child's room,[24,25] having the TV on even when no one is watching (background TV),[4] lack of parental monitoring (referring to knowing where the child is or who his/her friends are, having a curfew)[26] or lack of concern about the negative effects of TV, maternal mantel distress,[27] unsupervised weekend TV viewing,[14] society's TV viewing culture, and the availability of TV in almost every home. In modern society the TV has become a form of

baby sitter -- the TV is often used to keep children occupied as parents struggle to meet daily responsibilities.

Individual factors that have been proposed to be risk factors for excessive TV viewing among elementary level children include being obese and having physical conditions that hinder active leisure activities. Based on health education principles, other predisposing factors could be lack of knowledge or resources about alternative leisure activities for children. There might be a combination of reasons why children and adolescents are watching a lot of TV. Due to the negative effects of excessive TV viewing, strategies have been created to limit TV viewing, along with other media.

Strategies in the U.S.A. to reduce children's television viewing hours include national TV- Turnoff Week every April (http://www.tvturnoff.org/). The American Medical Association, American Academy of Pediatrics, National Education Association, President's Council on Physical Fitness and Sports, and Kaiser Permanente are some of the sponsors of this activity. Advocates of appropriate and less TV viewing among children and adolescents recommend that clinicians assess the home environment for children and family's TV viewing behavior, and encourage parents and caretakers to limit children's TV viewing hours as well as the use of other media.[28]

TV and Bullying Behavior / Overview of Bullying

The concept of bullying includes both psychological and physical bullying-related behaviors. The psychological act of bullying includes verbal or non-physical forms of bullying, such as calling another student mean names, making fun of someone, teasing, spreading false rumors, and trying to make others dislike a student. [29] Kuntshce[17] called these behaviors indirect violent behaviors (*e.g.*, saying hurtful things) and doing nasty or

unpleasant things to someone else. Physical bullying behaviors include hitting, kicking, pushing, shoving, locking a person indoors,[14] fighting,[17] and slapping.[30] A review of the literature on bullying indicates that a one-time joke or unacceptable behavior is not considered a bullying behavior; in order to be considered bullying behavior, the behavior must be repetitive. Additionally, a bullying behavior must involve an imbalance of power between the perpetrator and victim; for example, a bully perpetrator is someone who is older physically or psychologically stronger than the victim. The victim is considered weaker because the person is younger or "gives in" to the behavior – by crying or becoming visibly upset. The functional definition of bullying is clear, but the two criteria (*i.e.,* must involve an imbalance of power, and the behavior must be repetitive) to justify a behavior as a bullying behavior could impede the identification of a bullying situation.

School bullying was first studied by researchers in Europe, and eventually became a topic of interest among researchers in China, Australia, and the U.S.A. Research studies focusing on TV viewing and bullying demonstrated that amount of TV watched is associated with bullying behavior. Health experts agree that bullying behavior among children aged 6 to 11 is correlated with hours of TV watched at age 4 (J. Rystrom; Pediatrics; P. Wu; Pediatrician; Kaiser Permanente Northwest; oral communication; April 2006).

Table 1 provides a summary of research studies that found an association between TV viewing hours and bullying, aggression or violent behavior. The first three studies used TV viewing hours as the dependent variable. Kuntsche[17] conducted a study in Switzerland and found that increased TV viewing hours was associated with non-

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physical bullying (such as saying or doing nasty or unpleasant things, teasing others) and physical bullying (hitting other kids). However, in the multivariate analysis, only the association between high TV watching and non-physical forms of bullying was significant after controlling for grade, linguistic region, and nationality (boys-OR=2.17, CI=1.39-3.38); girls-OR=2.75, CI=1.47-5.16).

In an international study including the U.S. and 7 other countries, Kuntsche and colleagues[14] found that the overall frequency of TV viewing hours was significantly associated with both physical bullying ("kicked and pushed") and verbal bullying ("called names" and "spread rumors"); however, only verbal form of bullying remained significantly associated with TV viewing after adjustment in the multivariate regression analysis. There was a modest association (regression coefficient, B=0.386) between TV viewing and physical bullying among children with high weekend TV viewing hours, after controlling for verbal forms of bullying, gender, age, and country. The authors concluded that there is little or no parental monitoring or limitation with TV programs during the weekend, so children might be more exposed to inappropriate or violent TV programs compared to weekday TV viewing where parents limit TV viewing hours and monitor type of TV program children watch. The authors hypothesized that during the weekday there are other activities, such as homework or school activities that limit the number of hours of TV that children watch.

Ozmert, Toyran and Yurdakok[1] conducted a study in Turkey and found that aggressive behavior scores was significantly correlated with overall TV viewing hours (r = 0.22). The correlation persisted and became stronger after controlling for gender and SES (r = 0.43). The mean aggressive score was 7 to 10 among subjects with 2 or more

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hours of TV per day compared to a mean score of 6 among those with 2 or less hours of TV daily. However, in the multivariate model, TV viewing was not statistically associated with aggression but with only social and attention problems, after controlling for gender, grade, competency (referring to school achievement, social, and activity levels and other problem behaviors) and other problem behaviors that included aggression. Due to the lack of association between TV viewing and aggression in the multivariate model, the authors hypothesized that there is an interaction between excessive TV viewing and social isolation (which they did not test).

Three other studies found an association between violent behavior and TV viewing hours. Singer and colleagues conducted a cross-sectional study in Ohio. They found that student's violent behaviors were associated with number of television viewing hours (B, regression coefficient for daily TV hours = 0.05), after adjusting for gender, grade, race, two parent family, residency (rural, central city), parental monitoring, recent and past exposure to violence.[26]

The last two studies conducted in the U.S. were longitudinal in design. Zimmerman, Glew, Christakis, *et al* found that subsequent bullying behavior was associated with hours of television viewed per day after adjusting for age, gender, race or ethnicity, baseline bullying, parents income and education, and other predictors including cognitive stimulation and emotional support (adjusted OR=1.06, CI=1.02-1.11).[12] Johnson, Cohn, Smailes, *et al* conducted a study in New York to investigate whether TV viewing hours during adolescence and adulthood is associated with an increased likelihood of subsequent aggressive behavior.[30] Compared to those with less than 1 hour of TV per day, assault or physical fights (adjusted OR=1.57, 95%CI=1.13-2.16) and any

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aggressive act against someone at mean age 16 or 22 (adjusted OR=1.58, CI=1.16-2.16) were associated with TV viewing of 2 or more hours at mean age 14. Subsequent assault or physical fight (adjusted OR=2.62, CI=1.58-4.33) and aggressive act (adjusted OR=1.57, CI=1.04-2.38) at age 30 was associated with high TV- viewing hours at mean age 22.

Table 1. Research studies with a significant association between TV viewing hours and bullying, aggression or violent behaviors

Source (Citation)	Study Design	Dependent Variables	Independent Variables	Results
Kuntsche, E. 2004. (17)	Cross-sectional	TV viewing hours	*Non-physical bullying:* Say or do nasty and unpleasant things; Repeatedly teased others. *Physical bullying:* Hitting others; Fighting with others	*Unadjusted analysis:* TV viewing associated with physical and non-physical bullying. *Adjusted analysis:* TV viewing associated with non-physical bulling
Kuntsche E, W Pickett, M Overpeck, *et al*, 2006. (14)	Cross-sectional	TV viewing hours	*Non-physical bullying:* Calling mean names; Spreading rumors. *Physical bullying:* Kick, Push	*Unadjusted analysis:* TV viewing associated with physical and non-physical bullying. *Adjusted analysis:* TV viewing associated with non-physical bulling
Ozmert W, Toyran M, Yurdakok K, 2002. (1)	Cross-sectional	TV viewing hours	Aggressive behavior score	*Unadjusted analysis:* TV viewing correlated with mean aggressive score *Adjusted analysis:* TV viewing associated with social and attention problem
Singer MI, Miller DB, Guo S, *et al*,1999. (26)	Cross-sectional	*Physical bullying:* Slapping; Hitting or punching	TV viewing hours	*Unadjusted analysis and adjusted analysis:* TV viewing associated with physical bullying
Zimmerman FJ, Glew GM, Chistakis DA, *et al*, 2005. (12)	Longitudinal	Subsequent bullying	TV viewing hours	*Unadjusted analysis and adjusted analysis:* TV viewing associated with subsequent bullying behavior
Johnson JG, Cohen P, Smailes EM, *et al*, 2002. (30)	Longitudinal	Subsequent assault, physical fight, any aggressive act against someone	TV viewing hours	*Unadjusted analysis and adjusted analysis:* TV viewing associated with physical fight, aggression, and assault

Contrarily, other investigators have found no association between TV viewing hours and bullying behaviors. For one example, Gupta, Nwosa, Nadel, *et al* found that aggressive behavior was not associated with amount of TV watched, but, instead with unemployment status of parents and single parent household.[13] This study implies that in some minority children of low-income households, social factors might have a greater impact on children's aggression or violent behavior.

Negative Effects of TV/ Overview of Violence, Aggression, and Bullying

Many potential negative health effects have been attributed to TV watching, including: violent behavior, aggression or bullying;[1,3,10,12,14,17,30,42] decreased academic performance; [1,10] body image and dieting; [5,10] risk for obesity; [10,15,28] sleep problems; [31-33] attention deficit hyperactivity disorder (ADHD); [1,34] social isolation; [1,35] addiction symptoms, tobacco and alcohol use, and early sexual initiation.[10]

Violence refers to threats that cause physical harm or use of physical force or power against oneself or other people;[36] examples of violence includes domestic violence, suicide, child maltreatment, suicide, school shooting, physical fight. Aggression refers to forceful action or behavior with the intention to dominate (http://www.merriam-webster.com/aggression) and includes behaviors that cause psychological or physical injuries.[16] The term "bullying," also refer to as harassment, [38] is a form of aggressive behavior[26] comprising interrelated forms of non-physical (*e.g.,* calling someone mean names, teasing, spreading rumors)[12] and physical (*e.g.,* hitting, kicking, pushing, and fighting) forms of violence.

It has been debated by researchers that violent behaviors could include bullying behaviors, but the term "bullying" should not be used to refer to violent behaviors.

Violent behavior such as murder and rape are at the far spectrum of the high injury scale. Calling murder or rape a bullying behavior would diminish the severity of harm to the victim and soften the criminal consequences to the perpetrator, a result that is not preferred. Despite the difference in their concepts, literature on violence, aggressive and bullying show a similarity among the three with their negative effects on the emotional, psychological and social well-being of a person.[36] Violent, aggression or bullying behaviors has been shown to be associated with TV watching.

TV and Violence

Pediatric research studies have focused primarily on the effects of TV on violence, with school performance as the second most popular topic.[1] Media based research related to effects of TV violence involves counting identifiable violent behaviors in television programs to learn about the content of TV program.[11] One such study is a multi-site three-year study (1994-97) called National Television Violence Study (funded by the cable industry and conducted by 4 universities located throughout the U.S.) that responded to public health concerns about TV's negative effect on society. The study found that 60% of American TV programs contained violence, and that children's TV programs contained the most violence (67%).[10, 11] Findings from the study showed that televised violence is glamorized and violent acts (especially those portrayed by cartoons) are not given any consequences; therefore, young children perceive such behavior as model behavior in which they might later imitate. AAP recognizes that violence on TV and other types of media (movies, music, video, and video games) poses significant risk to the health of children and adolescents.[14]

Forty years of social science research suggests that violent TV programming has the ability to generate aggressive behavior in young people.[16] The few experimental and longitudinal studies on television violence published prior to 1992 and until 2007[15,18,39,40] found strong association between exposure to TV violence and subsequent aggressive or antisocial behavior among children and adolescents.[11] Although TV violence has been found not to be associated with aggressive behavior,[41] these studies demonstrated that viewing TV violence occurs prior to the incidence of the bullying behavior, strengthening the plausibility of a causal relationship.

Amount of TV viewing is another area of media effects research. According to Strasburger,[11] the quality (content of TV program) and quantity (length) of TV exposure are equally important in studying the effects of TV on children and adolescents. Research studies that measure amount of TV viewing showed that length of TV viewing hours is persistently associated with violent behaviors such as hitting, kicking or hitting someone.[12,14,17,26] A 17-year longitudinal study found that number of TV viewing hours during early childhood was a risk factor for subsequent aggression against other children.[30] Another study found that trauma symptoms and high level of violent behavior were found only among students that watched 6 or more hours of TV a day.[17]

Challenges in Interpreting Data on TV Viewing and Violent Behaviors

Literature reviewed demonstrate that youth violence, aggression or bullying behavior is associated with TV violence as well as with TV viewing hours. Scholarly debates assert that other factors, other than TV alone, are responsible for violent or aggressive behavior. For instance, majority of research studies on effects of TV are cross-sectional in design so confounding and reverse causation cannot be excluded.[16] One

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classic experimental study found that after showing a "violent" video program with bobby doll to a young sample of students, the kids became more aggressive with the bobby doll.[11] One limitation of that study is that baseline bullying behavior was not adjusted for. Due to individual biological make-up, a person might be aggressive because of his or her underlying aggression (genetic predisposition). However, aggressive behaviors could also be learned through exposure to family violence or violence in the neighborhood. According to Kuntsche, media violence (or TV viewing) might not be a strong predictor of aggression.[17]

Reverse causation, in addition to confounding factors, is another factor to consider when interpreting research findings on aggressive behaviors, TV violence or TV viewing hours, especially when the research studies do not have information about the time frame of the TV viewing and the occurrence of the aggressive behaviors. Watching TV violence could lead to aggression or aggression could lead to watching TV violence; and, excessive TV viewing could lead to aggression or aggression could lead to excessive TV viewing. Compared to reverse causation, confounding factors have received more attention by scholars in their attempts to understand if youth violence is a result of screen TV or mainly a result from interrelated factors. Despite the complexity of media research, the few longitudinal research studies mentioned above provide evidence of an association between TV viewing hours and aggression.

Public Health and the Implication of Bullying

Published research studies on bullying showed that bullying is associated with negative health outcomes for both the person doing the harm (perpetrator) and the target person (victim). Experiencing repeated victimization is associated with negative school

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outcomes – such as absenteeism and poor academic performance – and health consequences, including frequent colds and flu,[43] psychiatric symptoms[44] and fear; decreased self-confidence, reluctance to play in the school play ground or neighborhood, and physical injury. Additionally, being teased repeatedly could result in sadness and anger.[44] The impact of childhood bullying on the psychological and physical health of the victimized person lingers into adulthood. Among some children, childhood victimization has been shown to be a risk factor for victimizing others during adulthood.[36]

Negative health outcomes for the perpetrator of bullying behavior include school absenteeism because the individual is on school probation as a result of the behavior, or because the person is skipping school due to fear of getting into trouble. Other negative outcomes include relationship difficulty later in life due to deficiency in appropriate interpersonal skill to solve a problem with a partner. A perpetrator's aggressive behavior in early childhood has been shown to continue into adulthood, and the behavior is linked with juvenile and adult criminal activities.[26]

Bullying among children in schools is a serious public health issue,[12] and has received national and international attention to advance the understanding of its etiology and to develop prevention strategies. According to Singer *et al*, among all child behavior problems, aggressive behavior (including bullying behavior that involves hitting or punching) has the most detrimental impact on the social and psychological health of children, family and society.[26] However, prevention of bullying competes with other acts of violence that have a defined physical injury such as intentional harm where morbidity

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per event could be measured.[46] The majority of research on bullying has been done in Europe and Australia.[47]

Literature reviewed yielded few studies assessing amount of TV viewing and bullying among elementary school students of 4th, 5th, and 6th graders. A study in Ohio by Singer and colleagues assessed the association between TV viewing and aggressive behavior among 3rd to 8th graders;[26] however, only physical forms of bullying (referring to hitting, slapping or punching) were assessed. Other research studies focus on children under 3 years old[1] and adolescents. [14,17]

In Oregon, no state-level school-based survey existed before year 2003 to evaluate the health status of 4th, 5th, and 6th graders. The CA HKS (targeted at grades 5 to 12) contains information on nutrition, risk behaviors including bullying behavior, and TV watching among 5 to 12 graders; during SY 2003-04, 34% of 5th graders watched 2 or more hours of TV on the previous day, and more than 42% of 5th graders have hit or pushed other kids or have been physically victimized. [48] Data from 2003 Youth Risk Behavior Surveillance System showed that about 50% of 6th graders, 55% of 7th graders and 54% of 8th graders had been involved in physical fight.[49] In Texas, the SPAN project consists of information on nutrition, TV viewing behavior and physical health status among 4th, 8th, and 11th graders.[49] Based on a literature reviewed, this study using Oregon Elementary School Health Behavior Survey (OESHBS) data is the first of its kind to investigate the association between TV viewing hours and bullying characteristics among elementary level students in 4th, 5th, and 6th grade.

Study Rational

This thesis is a secondary data analysis of OESHBS 2004-05 data. The primary goal of this study was to assess if TV viewing hours was associated with bullying behaviors among 4th to 6th graders from five elementary schools during SY 2004-05 in Oregon. This was accomplished with three specific aims as stated below. The aims of this investigation are exploratory and hypothesis-generating, as they were developed after a preliminary examination of the survey data.

Changing children's TV viewing habits might result in decreased bullying behavior, increased reading time with improved academic performance, and increased engagement in active play and physical activities. Ideally, results from this study will foster (i) health promotion programs in reducing TV viewing hours among elementary level children and increasing awareness among children, families, caretakers, and stakeholders in Oregon about the adverse effects of TV viewing and bullying behavior, and (ii) facilitate assessment of school bullying and anti-bullying program. The long-term outcomes of reducing TV viewing include improved mental, social, and academic status of elementary school-aged children and adolescents and their families, as well as a media literate community.

Research Question / Specific Aims

This study sought to answer the research question: **Is there an association between excessive television viewing ($\geq$ 2 hours per day) and bullying behaviors among a sample of Oregon elementary school children?** This was accomplished using three specific aims.

- **Specific Aim #1: Assess unadjusted and school-adjusted associations between television viewing hours (<2 hrs vs. ≥ 2 hours per day) and bullying behaviors.** The statistical analysis included cross-tabulations to assess cell count values, and chi-square analysis to obtain inferential statistics. The analysis was repeated while adjusting for school because the participants are from five schools. Logistic regression analysis was used to compute unadjusted and adjusted odds ratios.

- **Specific Aim #2: Assess stratified associations between television viewing hours (<2 hrs vs. ≥ 2 hours per day) and bullying behaviors.** Gender was used as a stratifying variable on the relationships between TV viewing and bullying variables. Cross-tabulations and chi-square analysis were used to assess cell count values, stratum-specific odds ratios and gender-adjusted (pooled) odds ratios.

- **Specific Aim #3: Assess adjusted associations between television viewing hours (<2 hrs vs. ≥ 2 hours per day) and bullying behaviors, while controlling for other variables in a multivariable model.** Multivariate logistic regression models were built to obtain adjusted association while controlling for school, grade, and gender.

PRELIMINARY STUDIES

Description

The OESHBS (also referred to as OEHS) is a coordinated school-based health survey developed and was pilot tested in school year (SY) 2003-04 to assess the health status of elementary school aged children in grades 4 to 6th in Oregon. The survey questionnaire was modeled after youth surveys in Texas (TX) and California (CA). Funded by a grant by Oregon Department of Education (ODE) and Department of Human Services (ODHS), the survey questionnaire was developed by a diverse team from schools, ODE, ODHS, and community at large. A cross-sectional survey study of elementary school students, the purpose of OESHBS was to help Office of Family Health (OFH) and schools better assess children's health needs, as well as plan and develop public health programs.

Survey Design

The following results are based on data from the second year OESHBS collected during SY 2004-05 with a total sample size of 554. Results from this thesis could be compared with youth health surveys -- such as California Healthy Kids Survey (CA HKS), Youth Risk Behavior Survey (YRBS), similar studies in Canada[46] and Washington (WA), and other related studies.

Due to a gap in school-based, state-level data in Oregon on the health of elementary school children, a collaborative effort among state and local stakeholders resulted in the development of Oregon's very first state-level survey for assessing health behaviors of children grades 4 to 6. The survey, consisting of 41 questions, contains self-reported information on demographic and health behavior in areas of nutrition, media

use, safety, weight and tobacco and drugs. The OESHBS questionnaire was modeled after two elementary, middle, and high school level surveys from TX and CA which have been validated (R. Stanton; Nutritionist; ODHS-OFH; oral communication; August 2006): CA HKS targets 5to12 grade and Texas School Physical Activity and Nutrition survey (SPAN) targets 4th, 8th and 11th grades. The CA HKS has been administered for the last 10 years. Texas SPAN has been validated and published (the article is available at http://www.dshs.state.tx.us/obesity/pdf/SPAN%20AJPH%20Article%202004.pdf).[49]

OESHBS was pilot tested during SY 2003-04 in one school that subsequently participated in the survey during SY 2004-05. The survey questionnaire was revised upon feedback from students and school staff. (The final OESHBS questionnaire is in Appendix A.) The school information was not an item on the questionnaire, and was identified using a five- digit school code at the point of data entry.

Using a convenience sampling method, the survey was offered to five schools that were part of the Healthy Kids Learn Better program (a coordinated school health approach involving schools and communities statewide to reduce physical, social and emotional barriers to learning) funded by Centers for Diseases Control and Prevention (CDC). All 5 schools that were offered the survey participated. The principal at each school was given the survey to hand to his or her staff. For class that students took twice a week, such as physical education (PE), the survey was given randomly throughout the weekday (between Tuesday and Friday), while making sure that a class did not take the survey twice.

A general survey protocol guideline was provided to each participating school. However, survey administration procedures were left to school district, principals, and

staff. Passive and active parental consents were used, depending on each school's district policy. There was a higher chance of knowing what type of consent was used when OFH staff and school staff worked closely to administer the survey. Passive consent was used at two schools (Schools A and D), but others were unclear.

Due to different levels of literacy among students, the survey was orally read by the staff administering the survey and students self-reported their responses by marking on the survey questionnaire. The length of classroom time for completing the survey was 20-30 minutes. Overall, 30% of 4th, 5th, and 6th grade students completed the survey based on estimated student enrollment data for SY 2004-05 obtained from ODE website (http://www.ode.state.or.us/data/reports/toc.aspx#Students), and this response rate assumes that all students were offered the survey. The response rates for each school are presented in **Table 2** to give an idea of percent of students who completed the survey at each school.

Table 2.   Summary of response rates, OESHBS, SY 2004-05

School Code	Student Enrolled *	# Students per school completed	Response Rate per School	Overall Response Rate
A	578	212	0.37	0.29
B	138	52	0.38	
C	348	127	0.37	
D	529	106	0.20	
E	346	57	0.17	
TOTAL:	*1939*	*554*		

* *Note:* Estimated student enrollment based on ODE data for SY 2004-05 (available at http://www.ode.state.or.us/data/reports/toc.aspx#Students).

Student attendance for the month the survey was administered was available for two schools (A and D), thus allowing for a more precise calculation of participation rates for these two schools. For example, in school A, 243 students attended school during the

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month the survey was administered, resulting in a response rate of 87% for school A compared with a response rate of 38% when the estimated student enrollment (via ODE) for SY 2004-05 was used. Furthermore, in school D, exactly 113 students attended school in the month the survey was administered, resulting in a response rate of 94% for school D compared to 20% when using estimated student enrollment for SY 2004-05. Student enrollment for the month the survey was administered should be collected at each school in future OESHBS to provide more accurate information on student participation rate.

The low response rate for school D and E is not related to students not being there to take the survey. When comparing response rates between the five schools, it is important to note that not all the five schools surveyed had 4th, 5th, and 6th grades. All 5 schools surveyed had grade 4, 3 schools had grade 5, and 2 schools had 6th grade. In Oregon, grade 6 is mostly in middle school. (R. Stanton; Nutritionist; ODHS-OFH; oral communication; January 2008). School A has all 4 to 6th grades, and school C has only grades 4 and 5. **Table 5** in the results section (on page 34) provides a summary of the grade distributions by school.

Data Descriptions

The 2004-05 OESHBS dataset (housed at ODHS-OFH) contains 42 variables (41 of them are based on the survey questions and school code makes the other variable). Data entry for 2004-05 data was done in Office of Family Health (OFH) using SPSS (Statistical Package for the Social Sciences). Definitions of the variables are in Appendix B.

METHODS / RESEARCH DESIGN

Data Source

The data for this analysis was obtained from the ODHS-OFH and was in SPSS format. The data came from OESHBS collected during SY 2004-05, with a total sample size of 554. (See preliminary studies for more information of the survey.) There was no identifying information on the dataset that could be linked to the respondents. Approval for the study was obtained from Oregon Health & Science University's Institutional Review Board (IRB).

Data Management

Data management techniques included recoding variables and keeping records of any changes made to the dataset. In the original OESHBS dataset, some of the variables were initially labeled as "1, 2, 3…*etc,*" and were used as is for the frequency procedures. These variables were recoded to "0, 1, 2…*etc*" for the crosstabs procedures and logistic regression analysis.

In cross-sectional studies, the choice of outcome and independent variables depends on the investigator's cause-and-effect hypothesis.[58] However, there was no cause-and-effect hypothesis for this study. TV viewing was chosen as the dependent variable. Published research studies have used TV both as a dependent and independent variable. Majority of research studies on TV viewing hours and bullying behaviors are cross-sectional by design, so the direction of association can be either way. This study only analyzed TV hours as an outcome variable because the TV question refers to behavior from **yesterday,** and the bullying questions refer to bullying behaviors in the **past month.** (See description of independent variables below for more information.)

<u>Dependent variable</u>

The dependent variable of interest (TV viewing hours) was determined from one OESHBS question referring to the media "TV" or "video movies." Screen time encompasses time spent watching television, movies on VHS tape or DVD, as well as playing video games on a computer or other game devices such as Game Boy, Nintendo, PSP (a mini version of Play Station), Wii, Game Cube, X-Box, Play Station, etc (D. Vue; A. Vue; Elementary students; oral communication; October 2007). In OESHBS, television viewing refers specifically to hours of TV watched **yesterday** (with possible responses of none, 1 hour or less, 2 hours, 3 or more hours). Therefore, the variable name was chosen as TV hours, instead of screen time. The variable will often be referred to as TV viewing hours or TV hours throughout this report. This thesis study focused on using TV viewing hours as a dichotomized variable. However, TV viewing hours was explored using its initial response categories (none, 1 or less hour, 2 hour, and 3 or more hours) to assess for trend in prevalence of TV viewing hours. The dependent variable was derived from OESHBS survey question #16 which reads as follows:

16. **Yesterday,** how many hours did you watch TV or video movies?
❑ None; I did not watch TV yesterday
❑ 1 hour or less
❑ 2 hours
❑ 3 or more hours

Table 3a summarizes the recoding procedures for TV outcome variable. TV variable was dichotomized (< 2 hrs, ≥ 2 hrs) based on AAP (2001) guideline states that children age 2 to 21 should watch less than 2 hours per day. Literature reviewed showed a consensus that TV viewing hours exceeding the recommendation is considered excessive or prolonged viewing; therefore, TV viewing of 2 or more hours will sometime

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be referred to as "excessive" or "prolonged" TV viewing hours in this report. Students

who reported that they did not watch TV and 1 hour or less hour of TV were categorized

into the < **2 hours of TV**; those who reported to have watched 2 and 3 hours or more

were categorized into the ≥ **2 hours of TV**. Similar cut-off values have been used by

other researchers.[1, 14]

Table 3a. Dependent Variable Recoding: TV Viewing

OESHBS Question	Possible Responses: Initial Value and Label	Variable Name: Original	Possible Reponses: Recoded Value and Label	Source for recode
16. **Yesterday**, how many hours did you watch TV or video movies?	1: None; I did not watch TV yesterday 2: 1 hour or less 3: 2 hours 4: 3 or more hours	TV	0: < 2 hours 1: >= 2 hours	American Academy of Pediatrics (2001)

Independent variables

Bullying variables were the main independent variables of interest. The bullying

variables consisted of binary variables **physical bully** (you hit/push other kids) and

physical victim (other kids hit/push you), **rumor perpetrator** (you spread mean rumor

or lies) and **rumor victim** (other kids spread mean rumor or lies about you). All four

bullying variables were measured as forced questions (No/Yes). Following are the survey

questions and their possible response for which the independent variables were derived:

26. During the **past month**, have **you** hit or pushed other kids at school when you were not playing around?
❏ No
❏ Yes

27. During the **past month**, did **other kids** hit or push you at school when they are not just playing around?
❏ No
❏ Yes

28. During the **past month**, have **you** spread mean rumors or lies about other kids at school?
❑ No
❑ Yes

29. During the **past month**, did **other kids** at school spread mean rumors or lies about you?
❑ No
❑ Yes

The recoding procedures for the binary independent variables involved recoding the answer categories and renaming the variable as shown in **Table 3b**. The variables were renamed to characterize the bullying behavior as physical (hit or push) or non-physical (rumor or lies), and to clarify the person as a perpetrator or victim.

Table 3b. Independent Variables Recoding: Bullying Variables

OESHBS Question	Possible Responses: Initial Value and Label	Variable Name: Initial	Possible Responses: Recoded Value and Label	Variable Name: Recoded
26. During the **past month**, have **you** hit or pushed other kids at school when you were not playing around?	1: No 2: Yes	You hit	0: No 1: Yes	Physical bully
27. During the **past month**, did **other kids** hit or push you at school when they are not just playing around?	1: No 2: Yes	Other hit	0: No 1: Yes	Physical victim
28. During the **past month**, have **you** spread mean rumors or lies about other kids at school?	1: No 2: Yes	You Rumor	0: No 1: Yes	Rumor perpetrator
29. During the **past month**, did **other kids** at school spread mean rumors or lies about you?	1: No 2: Yes	Other Rumor	0: No 1: Yes	Rumor victim

Inspired by the article *Social behavior and peer relationships of victims, bully-victims, and bullies in kindergarten,*[50] the physical bully and physical victim variables were combined to create a composite variable called **direct bully** with four categories: non-involved, physical bully only, physical victim only, and both physical bully and

victim; a four-category composite variable (**indirect bully**) was created by combining the rumor perpetrator and rumor victim variables: noninvolved, rumor perpetrator only, rumor victim only, and both rumor perpetrator and victim.

<u>Covariates</u>

The **covariates** (potential confounders) selected were school, grade, and gender -- the only three available socio-demographic variables collected in the OESHBS. The school and grade variables are structural confounders due to OESHBS implementation protocol, so it's important to adjust for them in the associations. In this report, the school and grade information are presented for descriptive purpose but not to identify safer or friendlier school. The OESHBS does not collect information on age. In general, a student is put into a school grade based on his or her age; therefore, grade is considered a proxy measurement for age in this thesis study. The gender and grade covariates were derived from the following survey questions:

1. Are you a girl or boy?
   - ❑ Girl
   - ❑ Boy

2. What grade are you in?
   - ❑ 4th grade
   - ❑ 5th grade
   - ❑ 6th grade

The covariates and their coding structure are summarized in Table 3c. For purpose of confidentiality, each school names were recoded using a single capital letter.

Table 3c. Covariates Recoding: Demographic Variables

OESHBS Question	Possible Responses: Initial Value and Label	Variable Name: Initial Label	Possible Responses: Recoded Value and Label
None (See Preliminary Studies for more information)	1: [school name] 2: [school name] 3: [school name] 4: [school name] 5: [school name]	School	0: A 1: B 2: C 3: D 4: E
1. Are you a girl or boy?	1: Girl 2: Boy	Gender	0: Male 1: Female
2. What grade are you in?	4: 4th grade 5: 5th grade 6: 6th grade	Grade	0: 4th grade 1: 5th grade 2: 6th grade

Other variables explored

Parental limitation on a child's screen time was another covariate in OESHBS

2004-05 that could affect the association between TV viewing hours and physical bully.

Literature review showed that parental limiting media use was associated with watching

less TV.[32] A related variable in OESHBS is parental limit screen time which was derived

from a question which reads as: Do your parents or guardian limit the amount of TV,

computer, videos or video games that you can watch or play? The possible response was

No/Yes.

Statistical Approach

SPSS

Data management and analysis were conducted using SPSS versions 14.0 (Graduate

Student Package) and 15.0 (OHSU license) for Windows.

Sample description

Frequencies and cross-tabulations were used to describe the variables. Frequency

counts and percentages were reported. Pearson's chi-square test of independence was

used to assess association between TV viewing hours, bullying variables, and socio-

demographic variables (school, grade and gender). Level of significance was set at 0.05 for all tests.

Specific aim 1: Unadjusted and school-adjusted associations

Each bullying variable or covariate was entered separately into a simple logistic regression model containing TV viewing hours as the dependent variable. Unadjusted odds ratios (OR) with 95% confidence intervals (CI) and Wald test p-value were computed. Variables with Wald test p-value < 0.05 were considered to be independently associated with TV viewing hours. School is a structural confounder due to survey implementation procedure; therefore, school was adjusted for to account for the differences in school location. Multiple logistic regression analysis was used to compute school-adjusted odds ratios.

Specific aim 2: Stratified associations

Gender was used as a stratifying variable in the cross-tabulations between TV viewing hours and each of the four bullying variables to obtain gender-specific odds ratios. Observed cell counts less than 5 were assessed. Potential effect modification by gender was evaluated using Breslow-Day test; a p-value of > 0.05 was considered nonsignificant difference between male- and female-specific odds ratios and the Mantel-Haenszel gender-adjusted (pooled) odds ratio with CI was computed.

Specific aim 3: Adjusted associations with adjustment to school, grade and gender

Multivariate logistic regression model was built to confirm the associations investigated in aims 1 and 2, while adjusting for other variables (school, grade, and gender), and thus partially follows model building procedures in Hosmer and Lemeshow.[57] For example, a multivariable model containing the explanatory variables

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school and physical bully was used to start building models because it was found in aim 1 that physical bully remained significantly associated with TV viewing hours after adjusting for school. Using forward stepwise selection, multivariable models were built by entering variables from simple logistic regression as described below.

Significant variables ($p < 0.05$) from simple logistic regression were first entered individually with TV viewing outcome variable in a model, followed by variables that did not meet statistical standards ($p < 0.25$). The participants are from five schools so regardless of the significance of school variable in the model building process school was kept in the model. Grade (a structural confounder due to implementation procedure) and school were both kept in the model. Gender has empirical importance so it was kept in the model regardless of its statistical significance. Parental limit screen time was entered last into a model.

Potential confounding by school, grade, and gender was assessed by comparing the unadjusted odds ratio with the adjusted odds ratio of a model with the potential confounding variable. The change in odds ratio of a model without the variable and with the variable of 10% or more was considered confounded by the variable.

After determining the main effects model, selected interaction was assessed using Wald test $p < 0.05$. In addition to the interaction between gender and physical victim found in aim 2, interactions between physical victim and physical bully with grade and school were also explored. The Hosmer and Lemeshow test used for model building with logistic regression was used to assess the goodness-of-fit of the final model.[51] A model with a Hosmer and Lemeshow chi-square test value that is big and level of significance approaching 1 was chosen as the final model.

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Power Analysis

With a total sample size of 554, the power (probability of rejecting a false null hypothesis) to detect a minimal effect of 2 (unadjusted odds ratio) was 72% at a significance level of 0.05, of which 36% of the sample has the outcome category of interest (2 or more hours of TV hours) and 11% of the sample has the independent category of interest (physical bullying characteristic). The power to detect an effect of 3 (crude odds ratio) was 98%. For subgroup analysis, for a sample size of 270 males, the power to detect a minimal effect of 2.0 (adjusted odds ratio) was 48%; to detect a minimal effect of 3 was 86%. For a detectable effect of 2 by female gender (n = 284) was 25%, and for a detectable effect of 3 was 51%. The detectable effects by gender were computed with a significance level of 0.05, and R square of 0.20. In short, a sample of 554 provided adequate power to detect an effect of 3 (in unadjusted OR). The male sample size provided adequate power to detect an effect of 3, but not the female sample size. Power analysis was conducted using PASS (Power Analysis and Sample Size, version 2008, available at: http://www.ncss.com/pass.html).

RESULTS

Sample Characteristics

The data for this analysis came from 554 students who completed the OESHBS during SY 2004-05. **Table 4a and 4b** shows the student profile by school, gender, grade, TV viewing hours, bullying behaviors and parental limitation of child's screen time. The initial subcategories (" None; I did not watch TV yesterday, 1 hour or less, 2 hours, 3 or more hours") of TV viewing hours are also listed in **Table 4a** to illustrate the frequency count and percent before it was recoded into a binary variable. Of the 554 students surveyed, 51.3% (n = 284) were girls and 48.7% (n = 270) were boys. A total of 51.8% of students were 4th graders, 28.5% were 5th graders, and 19.7% were 6th graders. The distribution of respondents by school was: 38.3% (school A), 22.9% (school C), 19.1% (school D), 10.3% (school E), and 9.4% (school B). Less than half of students in this sample had watched 2 or more hours of TV or video movie on the previous day (36.2%); were perpetrators of physical bully (11.8%) or victims of physical bully (35.0%) on the previous month; were rumor perpetrators (5.9%) or victims of rumor (28.9%) in the previous month. For the composite physical bullying, less than thirty percent of participants were only victims (27.2%), both bullies and victims (7.7%), only perpetrators (4.0%). For the composite non-physical bullying, less than thirty percent of participants also reported being only victims (26.5%), only perpetrators (3.0%), and both bullies and victims (2.8%). More than half of students reported having parental limit screen time at home (52.2%).

Table 4a. Frequency distribution of student characteristic, OESHBS, SY 2004-05

Characteristic, N = 554		n	%	Total (n)*
Gender	Male	270	48.7	554
	Female	284	51.3	
Grade	4th	287	51.8	554
	5th	158	28.5	
	6th	109	19.7	
School	A	212	38.3	554
	B	52	9.4	
	C	127	22.9	
	D	106	19.1	
	E	57	10.3	
TV hours	None or zero hours	151	27.5	549
	≤1 hours	199	36.2	
	2 hours	102	18.6	
	≥3 hours	97	17.7	
TV hours	<2 hours	350	63.5	549
	≥2 hours	199	36.2	
Parental limit screen time	No	257	47.5	541
	Yes	284	52.5	
Physical bully	No	486	88.2	551
	Yes	65	11.8	
Physical victim	No	358	65.0	551
	Yes	193	35.0	
Rumor perpetrator	No	515	94.1	547
	Yes	32	5.9	
Rumor victim	No	389	71.1	547
	Yes	158	28.9	

*Missing computed by subtracting n from N

Table 4b. Frequency distribution of student characteristic, OESHBS, SY 2004-05

Characteristic, N = 554		n	%	Total (n)
Physical bully	Non-involved	335	61.0%	544
	Bully	22	4.0%	
	Victim	150	27.2%	
	Both bully and victim	42	7.7%	
Non-physical bully	Non-involved	36	67.7%	536
	Bully	16	3.0%	
	Victim	142	26.5%	
	Both bully and victim	15	2.8%	

School

Figure 1 shows the distribution of schools surveyed in SY 2004-05. More than 30% of the students were from school A (38.3%, n = 212). The student compositions from schools B, C, D, and E were: 52 (9.4%), 127 (22.9%), 106 (19.1%), and 57 (10.3%) respectively (**Table 4a**). School A seems to be an outlier, and the higher response is due to school A having more students.

Figure 1. School distribution, OESHBS, SY 2004-05
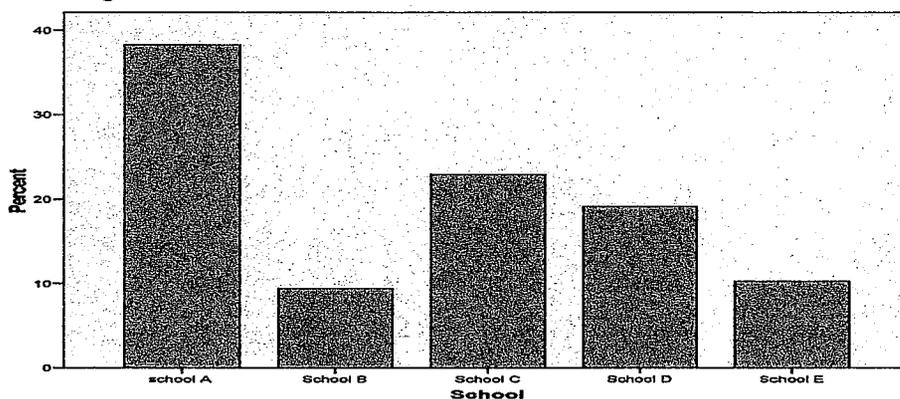
Grade

Figure 2 shows the distribution of grades for all 554 elementary school students surveyed. As a trichotomous variable, there were 287 (51.8%) 4th graders, 158 (28.5%) 5th graders, and 109 (19.7%) 6th graders (Table 5).

Figure 2. Elementary school students, OESHBS, SY 2004-05: Grade distribution
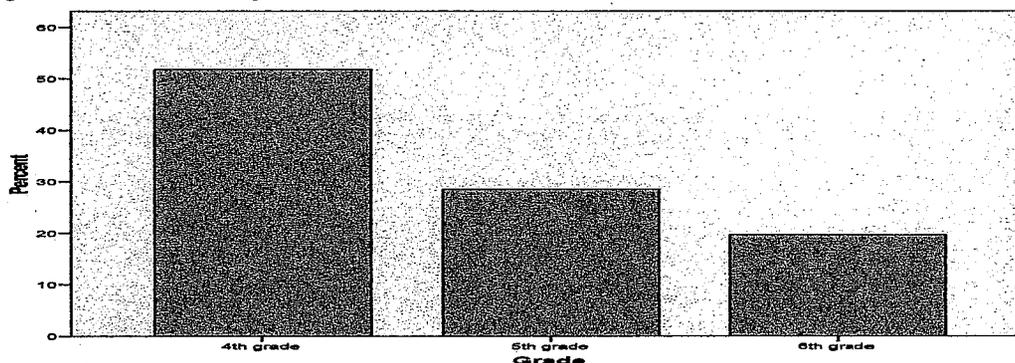
Student composition by grade and school

Table 5 shows the crosstabulations of grade by school. Not all five schools had grades 4 to 6. All 5 schools had 4th grade participants (51.8%), 3 had 5th grade participants (28.5%), and 2 had 6th grade participants (19.7%). Specifically, only school A had all three grades and schools B and C had 4th and 5th grades.

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Table 5. Distribution of students by grade and school, OESHBS, SY 2004-05

School	Student n (%)	4th grade n = 287 (51.8%)	5th grade n = 158 (28.5%)	6th grade n = 109 (19.7%)
A	212 (38.3%)	Yes	Yes	Yes
B	52 (9.4%)	Yes	Yes	No
C	127 (22.9%)	Yes	Yes	No
D	106 (19.1%)	Yes	No	No
E	57 (10.3%)	Yes	No	Yes
Total, N	554 (100%)			

Note: "Yes" means school has the grade level, and "No" means school does not have the grade level

Distribution of TV viewing by school, gender, and grade

Table 6 shows the distribution of school, gender, and grade characteristics by TV viewing hours as a dichotomized variable. There was a difference in TV viewing by school (Chi-square = 35.22, p-value < 0.0001); this suggests that school location might be a proxy for factors that have an impact on TV viewing behaviors. Because of the unequal distribution of grades by school, there is possibility that grade was being tested rather than school; however, the relationship between school and TV viewing was confirmed by stratifying by 4th grade, and I found that school was tested correctly and not grade. The result showed that there was still a difference in TV viewing by school (Chi-square = 26.20 p < 0.0001).

Boys (36.5%) and girls (36.0%) reported equally to have watched 2 or more hours of TV on the previous day (Chi-square = 0.011, p-value = 0.92). All grades reported equally to have watched 2 or more hours of TV on the previous day (Chi-square = 4.56, p-value = 0.10); this is marginally significant, and might be different with a larger sample size. Participants seemed to be watching more TV as they got older (36.0% of 4th graders, 31.2% 5th graders, 44.0% 6th graders) but the trend was not significant (p = 0.30).

Table 6. Description of demographic variables by TV viewing hours, OESHBS, SY 2004-05

Characteristic, N=554		TV Viewing Hours					Test (p-value)*
		Overall (n)	< 2 hours	% < 2 hours	≥ 2 hours	% >= 2 hours	
School	A	211	166	78.8%	45	21.3%	0.0001
	B	50	28	56.0%	22	44.0%	
	C	127	74	58.3%	53	41.7%	
	D	104	55	52.9%	49	47.1%	
	E	57	27	47.4%	30	52.6%	
Gender	Male	266	169	63.5%	97	36.5%	0.918
	Female	283	181	64.0%	102	36.0%	
Grade[A]	4th	283	181	64.0%	102	36.0%	0.101
	5th	157	108	68.8%	49	31.2%	
	6th	109	61	56.0%	48	44.0%	

* Based on chi-square test of independence
[A] Indicates chi-square trend test p-value = 0.304

Distribution of bullying behaviors by gender

Table 7a shows the percent of bullying behaviors by gender. Twelve percent (11.8%) of students reported having physically bullied someone else in the previous month, and boys were significantly more likely to report being perpetrators of physical bully (17.9% vs. 6.0%, Chi-square test $p < 0.0001$) and victims of physical bully compared to girls (41.8% vs. 28.6%, Chi-square test $p = 0.001$). Conversely, significantly more females than males reported being victims of rumor or lies (32.7% vs. 24.8%, Chi-square test $p = 0.041$). This suggests that boys may be involved in physical bullying behavior while girls use non-physical forms of bullying. Only 5.9% of both males and females reported being perpetrators of rumors or lies; the low reporting might be due to underreporting.

Table 7a. Percentage of student reporting bullying behaviors by gender, OESHBS, SY 2004-05

N = 554		Males (%)	Females (%)	Total (%)	P-value*
Physical bully (n = 551)	No	220 (82.1)	266 (94.0)	486 (88.2)	< 0.0001
	Yes	48 (17.9)	17 (6.0)	65 **(11.8)**	
Physical victim (n = 551)	No	156 (58.2)	202 (71.4)	358 (65.0)	0.001
	Yes	112 (41.8)	81 (28.6)	193 **(35.0)**	
Rumor perpetrator (n = 547)	No	254 (95.8)	261 (92.6)	515 (94.1)	0.101
	Yes	11 (4.2)	21 (7.4)	32 **(5.9)**	
Rumor victim (n = 547)	No	200 (72.5)	189 (67.3)	389 (71.1)	0.041
	Yes	66 (24.8)	92 (32.7)	158 (28.9)	

*`Chi-square test of independence

Distribution of Bullying Behaviors by Grade and School

The cross-tabulations of grade and school variables by bullying variables show the percent of students in each grade and each school who report each bullying behaviors (**Table 7b**). Due to the confounding by school and grade from OESHBS implementation procedure, these data are presented for descriptive purpose and their interpretations are to be with caution. A total of 16.5% of 6th graders reported physically bullying, compared to 10.9% of 4th graders and 10.1% of 5th graders. Younger children were more likely to report being physically victimized, (41.8% of 4th graders vs. 29.7% of 5th graders and 25.0% of 6th graders, p< 0.05). Equal percentages of 4th, 5th, and 6th graders reported spreading rumors or lies about someone (6.4%, 4.5%, and 6.3%, p > 0.05). Being a rumor victims varied by grade, with 32.7% of 5th graders, 27.8% of 4th graders, and 26.2% of 6th graders reporting being a rumor victim.

Across school, there was a significant difference in prevalence of bullying (all p-values < 0.05); furthermore, the most prevalent form of bullying was physical victimization (35.0%), followed by rumor victim (28.9%), physical bully (11.8%), and rumor perpetrator (5.9%). The highest percentage of rumor victim reporting was in school A, and physical victim reporting was highest in school B (56.8%). Due to

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structural confounding by school and grade, these data are presented for descriptive

purpose and should be interpreted with caution.

Table 7b. Percentage of student reporting bullying behaviors by grade and school, OESHBS, SY 2004-05

N= 554	Physical bully	Physical victim*	Rumor perpetrator	Rumor victim
Grade	n (%)	n (%)	n (%)	n (%)
4th	31 (10.9)	119 (41.8%)	18 (6.4%)	79 (27.8%)
5th	16 (10.1%)	47 (29.7%)	7 (4.5%)	51 (32.7%)
6th	18 (16.5%)	27 (25.0%)	7 (6.3)	28 (26.2%)
Total	65 (11.8%)	193 (35.0%)	32 (5.9%)	158 (28.9%)
School	Physical bully*	Physical victim*	Rumor perpetrator*	Rumor victim**
A	22 (10.4)	59 (28.0)	10 (4.8)	67 (32.1)
B	15 (28.9)	28 (53.8)	8 (15.7)	21 (41.2)
C	4 (3.2)	34 (26.8)	2 (1.6)	21 (16.8)
D	17 (16.3)	49 (47.1)	11 (10.6)	32 (30.5)
E	7 (12.3)	23 (40.4)	1 (1.8)	17 (29.8)
Total	65 (11.8)	193 (35.0)	32 (5.9)	158 8.9)

* Indicates significantly ($p < 0.05$) difference between grades in proportion of participants who reported being victims of physical bullying.
** Indicates significantly ($p < 0.001$) difference between schools in proportion of participants who reported being perpetrators or victims of physical bully, and perpetrators or victims of rumor or lies.

Specific Aim 1: Unadjusted and school-adjusted associations

Table 8a summarizes the number and percentage of students who watched less

than 2 hours, and 2 or more hours of TV on the previous day in each category, unadjusted

odds ratio (OR) and 95% confidence interval (CI) for the associations between TV

viewing hours and each characteristic, and the Wald test statistic p-value for each

association. The total sample and missing values are included in the chart to give a

complete description of each variable.

As presented in **Table 8a** and **8b,** school, parental limit screen time, physical

bully, and physical victim were independently associated with TV viewing hours. Of the

two significant bullying variables, physical bully had the strongest association with

watching 2 or more hours of TV (OR = 3.04, CI = 1.79–5.17 vs. 1.58, CI = 1.10–2.27),

and with watching 2 hours of TV (OR = 5.08, CI = 2.06-12.53) and 3 or more hours of

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TV (OR = 5.01, CI = 2.02-12.53). Compared with students who were not perpetrators of physical bully, students who were perpetrators of physical bully in the previous month had 3 times greater odds of watching 2 or more hours of TV on the previous day. The odds of watching 2 or more hours of TV on the previous day for students who were physically victimized in the previous month was 1.58 times compared to those who were not physically victimized. Children with parental limit screen time were significantly less likely to watch 2 or more hours of TV on the previous day (OR = 0.53, CI = 0.53–0.75).

Gender (OR = 1.02, CI = 0.72–1.44) and grade (OR for 5th grade = 0.81, CI = 0.53–1.22; OR for 6th grade = 1.40, CI = 0.89–2.19) were not independently associated with TV viewing hours (both p values > 0.05). Rumor perpetrator (OR = 1.05, CI = 0.50-2.21) and rumor victim (OR = 1.01, CI=0.69-1.48) were not independently associated with TV viewing hours.

Table 8a. Unadjusted Associations between TV Hours and each Characteristic, OESHBS, SY 2004-05

Characteristic, N =554		N	≥2 TV hours	% ≥2 TV hours	Unadjusted OR (CI)	P-value
School	A	211	45	21.3%	Referent	< 0.0001[A]
	B	50	22	44.0%	**2.90 (1.52-5.54)***	
	C	127	53	41.7%	**2.64 (1.63-4.28)***	
	D	104	49	47.1%	**3.29 (1.98-5.46)***	
	E	57	30	52.6%	**4.10 (2.22-7.59)***	
Gender	Male	266	97	36.5%	1.02 (0.72-1.44)	
	Female	283	102	36.0%	Referent	0.918
Grade	4th	283	102	36.0%	Referent	
	5th	157	49	31.2%	0.81 (0.53-1.22)	
	6th	109	48	44.0%	1.40 (0.89-2.19)	0.102
Parental limit screen time	No	256	110	43.0%	Referent	< 0.0001[A]
	Yes	282	80	28.4%	**0.53 (0.37- 0.75)***	
Physical bully	No	481	159	33.1%	Referent	< 0.0001[A]
	Yes	65	39	60.0%	**3.04 (1. 79-5.17)***	
Physical victim	No	355	116	32.7%	Referent	0.013[A]
	Yes	191	83	43.5%	**1.58 (1.10-2.27)***	
Rumor perpetrator	No	510	185	36.3%	Referent	0.889
	Yes	32	12	37.5%	1.05 (0.50-2.21)	
Rumor victim	No	385	139	36.1%	Referent	0.965
	Yes	157	57	36.3%	1.01 (0.69-1.48)	

Note: Except for grade and parental limit screen time, lowest percentage of ≥ 2 hrs of TV used as reference category
A bolded odds ratio with an asterisk "" indicates a significant unadjusted odds ratio with CI not containing null value (1)
[A]Indicates a significant variable based on Wald test (p < 0.05) in simple logistic regression.

Table 8b. Association between TV Hours (0 hours, ≤ 1 hour, 2 hours, ≥ 3 hours) and reports of Physical Bully, OESHBS, SY 2004-05

Physical bully	None or zero TV hour	≤ 1 TV hour	2 TV hours	≥ 3 TV hours
% (n)	9.6% (n=7)	9.6% (n=19)	19.8% (n=20)	19.6% (19)
Unadjusted OR	Referent	2.20 (0.90-5.37)	**5.08 (2.06-12.53)**	**5.01 (2.02-12.44)**

Table 8c summarizes number of students for the subsequent category (no/yes) of

the bullying behavior, the school-adjusted odds ratios and 95% confidence intervals for

the association between TV viewing hours and each bullying behavior in the previous

month. The unadjusted odds ratio is presented to ease comparison with adjusted odds

ratio. Based on the school-adjusted odds ratio, TV viewing hours remained significantly

associated with physical bully (adjusted odds ratio (aOR) = 3.21, CI = 1.82-5.66), but

was no longer significantly associated with physical victim (aOR = 1.41, CI = 0.97-2.07).

After adjusting for school, TV viewing hours was not significantly associated

with rumor perpetrator (aOR= 0.96, CI = 0.44-2.09) or rumor victim (aOR = 1.05, CI =

0.70-1.58). The cross-tabulations for TV viewing hours and rumor perpetrator with

regard to the effect of school showed observed cell values of less than 5. Contingency

table analysis showed that students in 4 schools who reported having 2 or more hours of

TV on the previous day, the frequencies of having been and not having been rumor

victims were similar. The nonsignificant findings with rumor perpetrator and rumor

victims might be due to bias as note in the discussion section.

Table 8c. Unadjusted and School-Adjusted Associations between TV Hours and Bullying Behaviors, OESHBS, SY 2004-05

Characteristic, N = 554		n	Unadjusted OR (CI)	School-adjusted OR (CI)
Physical bully	No	481	Referent	Referent
	Yes	65	**3.04 (1.79-5.17)***	**3.21 (1.82-5.66) * [A]**
Physical victim	No	355	Referent	Referent
	Yes	191	**1.58 (1.10-2.27)***	1.41 (0.97-2.07)
Rumor	No	510	Referent	Referent
	Yes	32	1.05 (0.50-2.21)	0.96 (0.44-2.09) [B]
Rumor victim	No	385	Referent	Referent
	Yes	157	1.01 (0.69-1.48)	1.05 (0.70 -1.58)

* A bolded odds ratio with an asterisk "*" indicates a significant unadjusted or school-adjusted odds ratio with CI not containing null value (1)

[A] Indicates having expected cell counts < 5

[B] Indicates having expected cell counts with zero. Adjusted OR presented so unnecessary to perform exact or continuity correction test to amend numeric issue.

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Specific Aim 2: Stratified Associations

Table 9 summarizes the gender-specific and gender-adjusted associations between TV viewing hours and bullying variables (physical bully, physical victim, rumor perpetrator and rumor victim). There was a significant association between TV watching and being a physical bully among both males (stratified OR= 2.98, CI=1.57-5.66) and females (stratified OR= 3.57, CI = 1.28-9.95). Compared to males who did not report being physical bully, those who reported being physical bullies in the previous month had approximately 3 times the odds of watching 2 or more hours of TV on the previous day. Females who reported being physical bullies in the previous month had 3.6 times greater odds of watching 2 or more hours of TV on the previous day compared to those who did not report being physical bullies. However, the male-specific OR is not far from the female-specific OR and their confidence intervals overlap. The gender-specific odds ratios appeared to be different but they were not statistically significant (Breslow-Day test p-value > 0.05). Gender does not seem to be an effect modifier on the association between TV viewing hours and physical bully. Therefore, the overall gender-adjusted odds ratio (3.14, CI = 1.82-5.40) is also reported in **Table 9.**

There was a significant association between TV viewing hours and physical victim among males (male-gender OR = 2.42, CI = 1.45-4.05). Males who reported being physical victims had 2 times greater odds of watching 2 or more hours of TV, compared to those who did not reported being physical victims. Male gender appears to be an effect modifier on the association between TV viewing and physical victim (Breslow-Day test p < 0.05). Among females, the association between TV viewing hours and physical victim was not significant (female-specific OR = 1.01, CI = 0.59 – 1.72).

Among females who reported having watched 2 or more hours of TV on the previous day, the proportions of having been and not having been physically victimized were similar (36.3 % vs. 36.1 %).

With regard to effect of gender, there was no significant association between TV viewing hours and rumor perpetrator among males (male-specific OR = 0.98, CI = 0.28 - 3.44) and females (female-specific OR = 1.11, CI = 0.44-2.77). Also, the association between TV viewing and rumor victim was insignificant among males (male-specific OR = 1.10, CI = 0.62-1.95) and females (female-specific OR = 0.94, CI = 0.57-1.59).

Table 9. Associations between TV viewing hours and bullying behaviors, stratified by gender, OESHBS, SY 2004-05

Gender	Bullying behavior	Total (%)	Gender-specific OR (CI)	Gender-adjusted (pooled) OR [B] (CI)
Male	Physical bully, No	216 (100%)	Referent	3.14 (1.82-5.40)*
	Physical bully, Yes	48 (100%)	**2.98 (1.57-5.66)***	
Female	Physical bully, No	264 (100%)	Referent	
	Physical bully, Yes	282 (100%)	**3.57 (1.28-9.95)***	
Male	Physical victim, No	153 (100%)	Referent	Not computed [C]
	Physical victim , Yes	111 (100%)	**2.42 (1.45-4.05)*[A]**	
Female	Physical victim , No	202 (100%)	Referent	
	Physical victim , Yes	80 (100%)	1.01 (0.59-1.72)[A]	
Male	Rumor perpetrator, No	250 (100%)	Referent	1.06 (0.51-2.22)
	Rumor perpetrator, , Yes	11 (100%)	0.98 (0.28-3.44)	
Female	Rumor perpetrator, No	260 (100%)	Referent	
	Rumor perpetrator, Yes	21 (100%)	1.11 (0.44-2.77)	
Male	Rumor victim, No	196 (100%)	Referent	1.01 (0.69-1.49)
	Rumor victim, Yes	66 (100%)	1.10 (0.62-1.95)	
Female	Rumor victim, No	189 (100%)	Referent	
	Rumor victim, Yes	91 (100%)	0.94 (0.57-1.59)	

* Asterisk and bold indicate significant odds ratios with CI not including null value (1.0)
[A] CMH- Breslow Day test p-value <= 05 (meaning there is significant difference between stratum-specific OR) so only gender-specific odds ratio is reported
[B] CMH-Breslow-Day statistics p-value > 0.05 (no significant difference between stratum-specific ORs so Mantel-Haenszel gender-adjusted estimate of odds ratio with CI is also reported.
[C] Not computed because gender-specific ORs are significantly different (CMH- Breslow Day test p-value <= 0.05)

Specific Aim 3: Adjusted Associations with regards to School, Grade and Gender

Findings from the multiple logistic model building process support the findings in aims 1 and 2: TV viewing hours was significantly associated with reports of being physical bully perpetrators, and male gender modified the association between TV viewing hours and reports of being victims of physical bully. Regardless which variables were entered into the model, physical bully was significantly associated with TV viewing hours (Wald p-values ≤ 0.002). For physical bully variable, the unadjusted OR and adjusted ORs and their CIs remained relatively stable throughout the model building process. The change in odds ratio for physical bully was 4% from the unadjusted OR (3.04) to the adjusted OR (2.92) of a model with school, grade, gender, and physical victim (main effects model), and 7% from the unadjusted OR to the adjusted OR (2.84) of the final model. For physical victim variable, the unadjusted OR and adjusted OR attenuated modestly (probably due to the interaction with gender) but remained relatively consistent. **Table 10** summaries the unadjusted and adjusted odds ratios from the model building process. **Appendix D** (on page 84) shows the complete results of the model building procedure as described below.

Of the three covariates (school, grade, and gender), only school and grade were significantly associated ($p < 0.05$) with TV viewing hours. Despite its insignificance, gender was kept in the model due to its empirical importance, and effect on physical victim according to findings in aim 2. Physical victim was independently associated with TV viewing hours ($p = 0.013$) and it was significant ($p < 0.25$) in a model containing school, gender, grade, physical bully. Rumor perpetrator and rumor victim were insignificant in simple logistic regression and throughout the model building process so

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they were removed from the model. Therefore, the main effects model contains school, grade, gender, physical bully and physical victim.

Table 10. Summary of unadjusted and adjusted odds ratios in main effects and final multivariate models, OESHBS, SY 2004-05

Variable		Unadjusted OR (CI)	Main effects model (aOR, CI)	Final model [A] (aOR, CI) [†]
-2 Log Likelihood		--	646.164	642.101
HL Goodness of Fit (p-value)		n/a	5.282 (0.727)	7.374 (p = 0.497)
School	A	Referent	Referent	Referent
	B	**2.90 (1.52-5.54)**	**3.34 (1.60 – 6.91)**	**3.36 (1.61-7.03)**
	C	**2.64 (1.63-4.28)**	**4.50 (2.55 – 7.95)**	**4.49 (2.54-7.94)**
	D	**3.29 (1.98-5.46)**	**5.01 (2.63 – 9.53)**	**4.89 (2.56-9.33)**
	E	**4.10 (2.22-7.59)**	**2.88 (1.46 – 5.69)**	**2.90 (1.47-5.72)**
Gender	Male	1.02 (0.72-1.44)	0.84 (0.57 – 1.23)	0.62 (0.38-1.01)
	Female	Referent	Referent	Referent
Grade	4th	Referent	Referent	Referent
	5th	0.81 (0.53-1.22)	1.19 (0.72 1.97)	1.16 (0.70-1.92)
	6th	1.40 (0.89-2.19)	**3.07 (1.59 – 5.91)**	**3.00 (1.56-5.78)**
Parental limit screen time	No	Referent	--	--
	Yes	0.53 (0.37-0.75)	--	--
Physical bully	No	Referent	Referent	Referent
	Yes	**3.04 (1.79-5.17)**	**2.92 (1.60 – 5.32)**	**2.84 (1.56-5.18)**
Physical victim	No	Referent	Referent	Referent
	Yes	**1.58 (1.10-2.27)**	1.35 (0.90 2.03)	n/a
Rumor perpetrator	No	Referent	--	--
	Yes	1.05 (0.50-2.21)	--	--
Rumor victim	No	Referent	--	--
	Yes	1.01 (.69-1.48)	--	--
Physical victim[B]				
Male		--	--	**1.99 (1.14- 3.49)**
Female		--	--	0.88 (0.49-1.59)

Note: n/a = not applicable; CI = 95% Confidence Intervals; " -- "Indicates "Not Computed;" Bolded odds ratio indicates a significant odds ratio not containing null value (1)
[†] Final multivariable model with school, gender, grade, physical bully, physical victim, and interaction term.
[A] Odds ratios from multiple logistic regression model
[B] Interaction term "physical victim x gender" in final model. Interaction was significant (p = 0.045).

Assessment of interactions with gender, grade and school resulted in one significant interaction between gender and physical victim (p = 0.045) which confirms with results in aim 2. Compared to males who were not physically victimized, males who were physically victimized in the previous month had 2 times greater odds of watching 2 or more hours of TV on the previous day (male-specific OR=1.99, CI = 1.14 - 3.49). The association between TV viewing hours and physical victim was different and not significant among females (female-specific OR = 0.88, CI = 0.49-1.59). Compared to females who were not physically victimized, females who were physically victimized in the previous month were less likely to watch 2 or more hours of TV on the previous day.

The forward model building process resulted in a model containing school, grade, gender, physical bully, and a significant interaction between physical victim and gender (p = 0.045); the Hosmer and Lemeshow goodness-of-fit statistics showed that the model adequately fits the data (HL Wald = 7.374 , p = 0.497). The significant interaction contributes important information about male gender modifying the association between TV viewing hours and physical victim. Application of the backward automated procedure derived the same model but with gender being significant (p = 0.04); the adjusted OR and CI for physical bully was relatively stable compared to the final model derived from the forward model building procedure.

In a multivariate model containing parental limit screen time (HL Wald = 8.19, p = 0.004), the interaction between gender and physical victim was not significant (p = 0.12), and the association between TV viewing hours and physical bully persisted (aOR = 2.59, CI = 1.41-4.77) indicating that parental limiting screen limit is not a confounder; therefore, the model without parental limit screen time was chose as the final model.

Assessment of confounding on the association between TV viewing hours and physical bully showed that the change in odds ratios between the unadjusted odds ratios and school-, gender-, and grade-adjusted odds ratios were only 2% to 6%.

After adjusting for other variables (school, grade and gender), males and females who were perpetrators of physical bullying in the previous month had approximately 3 times greater odds of watching 2 or more hours of TV on the previous day (aOR = 2.84, CI = 1.56 – 5.18); and, the association between TV viewing hours and physical victim was significant only among boys (aOR = 1.99, CI = 1.14–3.49). Compared to students who attend school A, students from school D had 5 times greater odds (aOR = 4.89, CI = 2.56–9.33) of watching 2 or more hours of TV on the previous day; students from school C had 4 times greater odds (aOR = 4.49, CI = 2.54-7.94) of watching 2 or more hours of TV on the previous day; students from school B and E had 3 times greater odds of watching 2 or more hours of TV on the previous day (aOR = 3.36, CI = 1.61 – 7.03 and 2.90, CI = 1.47 – 5.72) after controlling for grade, gender, physical bully and physical victim. After controlling for school, gender, physical bully and physical victim, the odds of watching 2 or more hours of TV on the previous day was 3 times greater for 6th graders compared to 4th graders and 5th graders. (The aOR with 4th graders as reference was 3.00, CI = 1.56–5.78, and 2.6 with 5th graders as reference, CI = 1.32 – 5.11). There was a significant trend in watching more TV as children got older (p = 0.001) after controlling for school, gender, physical bully and physical victim. Compared to females, the odds of watching 2 or more hours of TV on the previous day among males was less than 1 (aOR = 0.62, CI = 0.38–1.01) after controlling for school, grade, physical bully, and physical victim.

In summary, the model explaining the relationship between TV viewing and physical bully contains school, grade, gender, physical bully, physical victim, and interaction between gender and physical victim. The odds of watching 2 or more hours of TV on the previous day was 2- 4 times greater among boys and girls who were perpetrators of physical bully in the previous month, among boys who were victims of physical bully in the previous month, and among older children (grade = 6), and among children attending certain schools (schools C and D). (The school information is presented for hypothesis generating as the focus of this thesis study was not to illustrate that certain school is friendlier or less safe.)

DISCUSSION

Main Findings

Based on weekday TV viewing hours, prevalence for watching TV for 2 or more was 36.2% among the sample of students surveyed. Children watched more TV as they got older; this trend was significant only after adjusting for school, grade, gender, physical bully and physical victim variables. The OESHBS 2004-05 was administered between Tuesday and Friday. TV viewing during the weekend is usually high because children have less or no school obligation, so they tend to watch more TV compared to weekday TV viewing.[14] Weekend and weekday TV viewing hours are included in national TV viewing prevalence; therefore, this prevalence is considered high compared to national prevalence for TV viewing hours. According to AAP, children (age 2 to 21 years) should not watch more than 2 hours of TV a day.

Television viewing hours was significantly associated with being perpetrators of physical bullying among both boys and girls. Males who reported being victimized physically reported watching more TV than those who were not victims. These findings support public health action to decrease television viewing among children.

Gender was not an effect modifier on the association between TV viewing and being a perpetrator of physical bullying. This finding is inconsistent with the study by Johnson et al;[30] in that study, males with high TV viewing hours at mean age 14 were 2 times (aOR = 1.92, CI = 1.28–2.88) more likely to act aggressively toward another person at mean age 16 or 22. However, the association was not significant among girls (aOR = 1.25, CI = 0.70–2.22).

Male gender had an effect on the association between TV viewing and being a victim of physical bullying; however, comparison with other studies is currently not possible. Although the concepts of bullying perpetration and bullying victimization have been studied extensively [29,43,44,51,52] the literature reviewed indicates that no research studies have been conducted to assess the association between TV viewing and being a victim of physical bullying, aggression or violent behavior.

Association between TV Viewing Hours and Physical Bullying: Comparison with Published Data

Seven studies show a mixed finding of the association with TV viewing hours. The significant association found in this report is consistent with research studies that found an association between TV viewing hours and being perpetrator of physical violence or bullying behaviors both in unadjusted and adjusted analyses. Singer and colleagues[26] found that increased TV viewing hours was significantly associated with being a perpetrator of violent behaviors (including slapping, hitting, punching, or attacking someone with a sharp object) among a sample of students in grades 3 to 8. The age of children in this study and this thesis study are similar.

According to Johnson and colleagues,[30] increased TV viewing hours was significantly associated with being a perpetrator of subsequent aggressive behavior among a sample of youth in New York. Subsequent aggression was assessed at the average age of 13 and 16. The age where the bullying behavior was assessed is similar among children with mean age 13 in this study and 6th graders in the OESHBS 2004-05. According to Zimmerman and colleagues, average TV hours per day at age 4 was significantly associated with being a perpetrator of subsequent bullying behavior at age 6

and 11 among a sample of U. S. children.[12] The age of children in this study and this

thesis study are similar. Furthermore, the studies by Johnson and colleagues and

Zimmerman and colleagues are longitudinal, which is unlike this study using OESHBS

2004-05 data.

Additional published studies report an association between TV viewing and

physical bullying in the unadjusted analysis but not in the adjusted analysis. Kuntsche[17]

found that excessive TV viewing hours was not associated with being a perpetrator of

physical bullying ("hitting others") among Swiss adolescent girls and boys in 7th and 8th

grade, after controlling for gender, grade, and other forms of bullying ("feeling unsafe,

bullying others, fighting with others"). Kuntsche and colleagues[14] found similar results.

These two studies found TV viewing hours significantly associated with non-physical

type of bullying in both unadjusted and adjusted analyses. Ozmert and colleagues[1]

conducted a study in Turkey among 2nd and 3rd graders and found that TV viewing of 2

hours or more was highly correlated with aggression, but only "social problem" was

significantly associated with TV viewing hours in the adjusted association. The children

in this study are younger than those surveyed in OESHBS 2004-05. A concern for this

study is that various behavioral problems were assessed and aggression might be part of

the social problem.

Increased TV viewing was not significantly associated with aggressive behaviors

among children aged 4 to 16 of predominantly of Hispanic origin with low-literacy and

low-income parents.[13] Instead, a significant association was found between aggression

and having single mothers and unemployment. The covariates controlled for were child

age, parental monitoring of TV viewing, education, ethnicity, race, job, and marital status of parents.

In summary, the OESHBS 2004-05 data support the findings of published studies that found a significant association between TV viewing hours and physical bullying behaviors. Two common characteristics between this thesis study and the three published studies that found similar association are that they were all conducted in the U.S., and of the three studies, two used samples of elementary to middle school students grade 3 to 8, and approximately grade 1 (age 6) and 6 (age 11).

The studies that did not found an association between TV viewing hours and physical bullying were conducted in Europe among older kids in 7th and 8th grade. Although the study by Kuntsche and colleagues included a sample of U.S. elementary school aged children to high school youths, majority of the sample were from 7 European countries. The study by Ozmert and colleagues was conducted among very young children in Turkey. The study by Gupta and colleagues used a sample of low-income, Hispanic children in the U.S.A. However, considering the studies conducted in the U.S. using diverse samples of children, there is consistency of the association between excessive TV viewing hours and being perpetrators of physical bullying.

Why there is an Association between High TV-Viewing and Physical Bullying

The relationship between television and physical bullying is complex because it involves interrelated factors. Considering both directions of the associations and other factors, the association between high TV-viewing and physical bullying could also be cyclical where each of the factors is feeding each other. Although not an exhaustive list, **Figure 3** provides a framework for understanding the association, planning future studies using OESHBS data, adding data points to OESHBS, and planning educational and prevention programs.

Figure 3. Conceptual Framework of the Relationship between High TV-Viewing and Physical Bullying
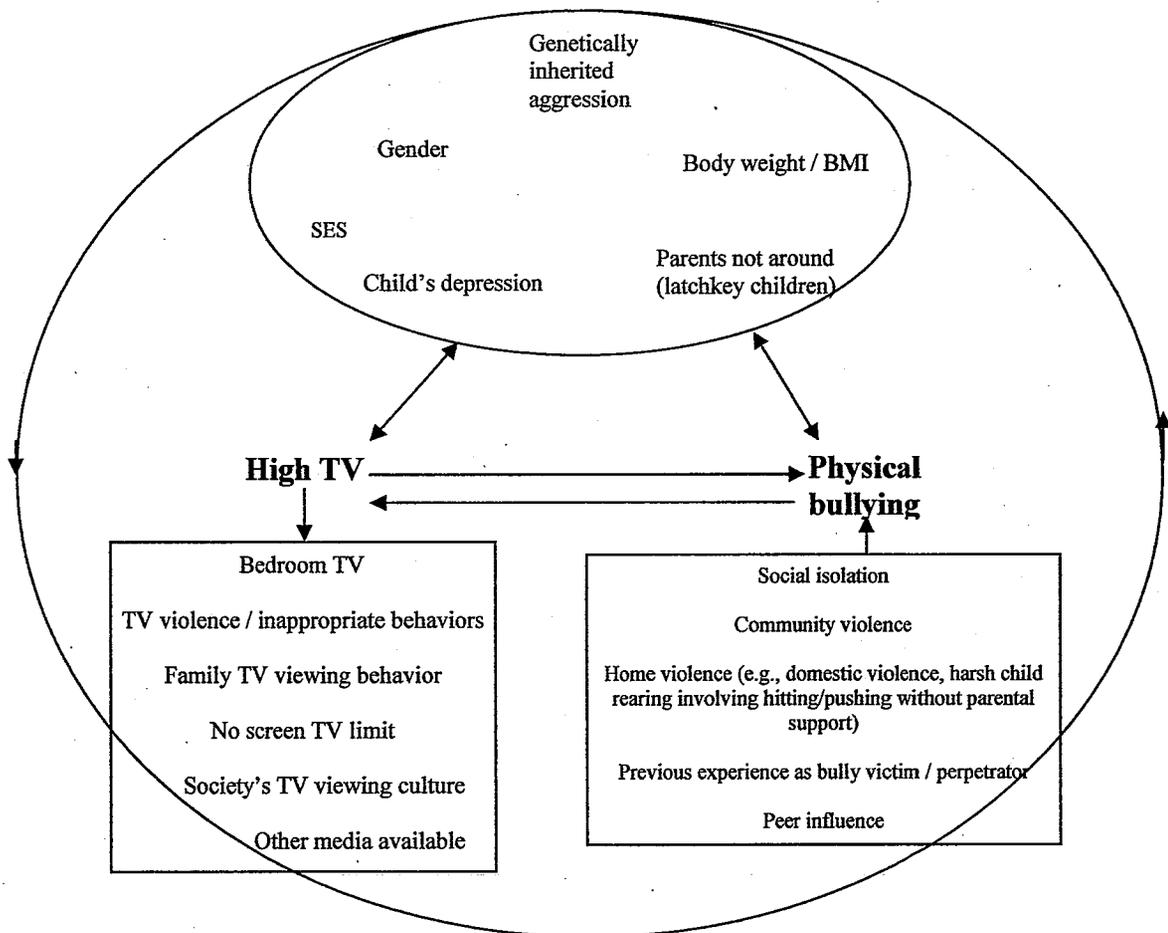
Literatures reviewed suggest three possible reasons why there is a relationship between high TV viewing and physical bullying. The first reason is based on theories that children learn from observing; the second reason is based on the concept of social isolation; the third reason is related to confounding issue. The first two reasons have been used to understand the effects of media and violent behavior. The third reason is in relation to individual factors, social and environmental factors, and has been used to understand youth violence.

Reason 1: Children learn from observing

Based on social science theories that children learn from observing, children imitate what they see on television programs. Excessive TV viewing increases the chance of being exposed to violent or inappropriate TV programs; therefore, children's physical bullying behavior might be an imitation of behaviors seen on TV. Exposure to TV violence has been shown to generate or increases aggressive behavior.[12,30,35,39] According to Kuntsche et al, by being repeatedly exposed to televised violence, children tend hit or push instead of spreading rumors or lies.[14] Among elementary aged children, it's important to acknowledge that the physical bullying behavior might be intentional or unintentional based on the idea that not all kids do things to be mean. Some children might push or hit someone because they could just be imitating their favorite TV characters and do not realize that their behavior might be considered offensive or harm the target person. In addition to violent TV programming, excessive TV viewing increases the chance of being exposed inappropriate behaviors which children might internalize as normal. For example, if TV programs depict how someone behaves when he or she is angry (such as pushing someone), the child observer might also do the same

thing when he or she is angry. According to Strasburger, children learn "scripts" from watching TV that they later use to solve real life problems.[11]

Unfortunately, the 2004-05 OESHBS data does not collect information about the content of the TV program; collecting information on content of TV program in future OESHBS questionnaires would elucidate what children are watching on TV. Some ideas for structuring the additional questions about content of TV program would be to use preference for type of TV program as an indicator for TV content. A more direct approach would be to ask about the type of TV program participants watched on the previous day (*e.g.*, funny, education, action and fighting, family oriented, fantasy, news, and music) as used by Singer and colleagues.[26] Such information would enhance policy effort for decreasing TV viewing among children. Above are some reasons why children who push or hit someone else tend to watch a lot of TV. Below are reasons why bully victims with high TV-viewing tend to be specific among boys.

Reason 2: Concept of social isolation

The association between TV viewing hours and physical victimization among boys supports the idea that being bullied leads to social isolation, and indulgence in TV viewing might be one form of social isolation[35] to escape the feeling of sadness, loneliness, anger or pain affiliated with being bullied – at least among boys. First, this might have something to do with gender difference in dealing with anger, pain, or loneliness. For example, girls who are bullied might prefer to spend time with friends, talk with other people, or do other things instead of watching TV. Second, it is generally acknowledged that boys are more physically aggressive[47] so they might get hit or pushed after hitting or pushing someone. In a recent study in Seattle, WA, exposure to TV

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violence was associated with aggression, but only among boys.[34] The authors suggested that boys are biologically aggressive, and the insignificance among girls is probably due to gender expectation of girls not to be physically aggressive, or that girls are not frequent viewers of violent TV. Underlying aggression has been shown to be associated with preference for watching violent TV program and subsequent bullying behavior.[11] Having a preference for violent TV program has been shown to be associated with violent behavior among boys but not girls.[26] Boys who prefer to watch action or violent TV program might have a greater exposure to TV violence, so they tend to act out those behavior. For instance, children who reinforces aggression from others[51] – by imitating the violent behavior or saying inappropriate words to someone – have a higher chance of getting hit or push in return, especially when the target person is also aggressive. It has been shown that by bullying someone else one is likely to be bullied.[14] When one pushes or hits someone and gets push or hit in return, it is considered that the person is both a bully and victim (bully-victim).[51] A portion of children from OESHBS 2004-05 who reported watching a lot of TV and being victims of physical bullying might also be perpetrators physical bullying. Bully-victim has been shown to have higher deviant behavior compared to someone who is just a victim or someone who is neither a bully nor victim.[43] Findings from 2004-05 OESHBS data using the composite variable physical bully showed that the odds of watching 2 or more hours of TV on the previous day was 4 times (school-adjusted OR = 3.89, CI = 1.92 – 7.91) for children who were both perpetrators and victims of physical bully compared to those who were uninvolved (Appendix C). Compared to children who are only victims, children who were both bully and victim have more behavior problems.[51] The association between high TV viewing

and being both a victim and perpetrator of physical bullying emphasize the importance of public health intervention to increase awareness about the risk factor for and adverse health effect of bullying behavior.

The idea that having a preference for violent TV is supported by the hypothesis that watching media violence is an enjoyment among those with a predisposition to aggressive behavior, and that watching televised violence enable them to escape loneliness because watching TV enable them to psychologically be with people who are like them.[10] Due to the secondary nature of this thesis study, confounding by baseline bullying was not possible to assess because such information was not collected in 2004-05 OESHBS. Collecting baseline bullying information in future OESHBS questionnaire would better explain the association between high TV-viewing and physical bullying behavior.

In the association between high TV-viewing and physical bullying, it is important to note that some children might be bully victims due to lack of social skills. For example, they might be less likely to be assertive with the perpetrator,[51] and tend to have less friends because others are afraid to be with them because they fear being bullied themselves. Not knowing how to be assertive or appearing to be friendless might have something to do with age. This thesis study found that victims of physical bullying tend to be younger (4th grade), while perpetrators tend to be older (6th grade). In some elementary schools, being a fourth grader means moving into a new building because the school has a separate building for 4th to 6th grade; therefore, some 4th grader might have difficulty adjusting in the new school. Appearing lonely and school maladjustment have been found to be risk factors for being bully victims.[47] Due to their age, students who are

physically victimized might be isolated and less likely to know how to defuse the bullying situation, thus increasing their risk of being repeatedly bullied. Therefore, anti-bullying prevention program need to begin in the early years, and facilitate understanding of bullying behavior among school staff in order to better intervene in the situation. To optimize intervention and better understanding of the association between high TV-viewing and physical bully, other factors need to be considered.

<u>Reason 3: Other factors</u>

Is someone else or other factors (such as social and environmental factors) responsible for the association between TV viewing hours and physical type of bullying behavior? The association between TV viewing hours and physical bully might be due to a "third variable."[15] As a first example: exposure to other type of media. Children are using other type of media (such as computer and video games). Computers are used for communicating, video games, movies (via CDs or downloading from the Internet), and music. The computer is a popular media among children as young as 8 year old and teenagers; according to Strasburger, soon the TV set will be replaced by the computer.[11] The computer provides easy access to inappropriate social behaviors via watching movies, music videos, and browsing the Internet. Furthermore, video games provides another method to be exposed to inappropriate behaviors. There is one question in OESHBS that asks about the use of other media, and the question reads as: "**Yesterday, how many hours did you spend on the computer or play video games like Nintendo®, Sega®, Xbox®, or arcade games?**" However, this question is broad and does not specify if the computer is use for educational purpose or for playing video games. Future OESHBS could improve this question by specifying type of video game (for instance,

educational, fighting/battle field games), and if the computer is used to play video games or for educational purpose such as doing homework or practicing typing. Having information about type of video game children play and purpose for use of the computer would provide information about exposure to violence from other media.

In addition to exposure to other media, home-environmental factors might confound the association. As a second example: being home alone. The child might be alone at home due to neglect or because both parents are working. In today's society, most (93%) children have access to TV.[11] Lack of parental supervision has been thought to be a risk factor for watching violent TV shows and aggression.[26] Also, being home alone increases risky behaviors that involve gang-related activities that could increase one's aggression. Being neglected is affiliate with depression and loneliness especially among elementary children who depend a lot on adults. Depression is related to social isolation, thus increasing the chance of isolating oneself from humans and watching a lot of TV. According to Miles, "child...neglect [underlies] every major social problem the nation faces."[54(p130)] A third example would be depression in children. A child might be unhappy even if he or she has a nurturing environment. Some children deal with anxiety and unhappiness by behaving in certain ways to get attention. For example, children might participate in mischievous behavior such as fighting with others or hitting or pushing a sibling or classmate to get attention.

A fourth example would be violence in the home and community. Other violence exposure factors include: child abuse; harsh childrearing that involves an adult kicking, severe hitting and slapping the child; adult relationship in the home which involves hitting or slapping;[55] violent acts in the home or community as noted by Singer *et al*

which include threats, gun shooting, sexual abuse;[26] previous experience being physically victimized. Exposure to violence in the home and community has been shown to be associated with aggressive behavior and high TV viewing.[26] Experiencing child abuse is related to various psychological symptoms, including social isolation. Being victimize has been shown to be associated to being a perpetrator of violence towards other.[34] Future OESHBS could collect information to learn about other violence exposure factors; however some of these examples involve domestic violence and child abuse so obtaining consent for data collection might be difficult.

Socio-economic status (SES) is a fifth factor to consider. Social conditions such as living in high crime area, poor housing condition, being a minority youth (in racial or ethnic background) have been acknowledged by scholars as reasons for youth violence.[5] Living in high crime area increases the risk of being victimized and exposure to violence. Low SES (measured by using income level and parents education) has been shown to be associated with child's excessive TV viewing and bullying behavior.[30] In a certain percent of low-income or minority children, due to language barrier, parents or caregivers or both do not know what is being said on the TV so they are unable to monitor the type of TV program children watch. If children are watching TV programs that are related to violence, they would be copying behaviors that would put them at risk of being a perpetrator or victim of physical bullying.

In some homes, low SES might be a protective factor. Results from OESHBS data showed that low-income was not related to TV viewing hours and physical bully. Using school free or reduced lunch data as proxy for income or social status, one of the five schools (school C) had the lowest percent of free or reduced lunch but that school

had the second highest point estimate for watching 2 or more hours of TV. Compared to the reference school (A), children from school C had 4.5 times the odds of watching 2 or more hours of TV (CI = 2.55 – 7.95); this finding is inconsistent with that found by Johnson et al, [30] and contradict with existing knowledge that low-SES is a risk factor for bullying behavior and high TV viewing. This finding supports the idea that having multiple forms of media (possibly in higher income families) contributes to high TV viewing. Whereas for low income families, children might not have access to other media[13] so they might spend more time playing outside; also, parents might be less busy and are able to be with their kids more often. However, free or reduce lunch program might not be a good indicator for low SES. Having additional demographic questions in future OESHBS about parent's education and language the child speaks at home could help to better understand the association.

Study Limitations and Strengths

This analysis using 2004-05 OESHBS data has several limitations. First, as mentioned previously, this study is limited by its cross-sectional nature and is unable to address causality.[30] Associations were only demonstrated and we cannot be certain that physical bullying behavior causes students to watch a lot of TV. The direction of the association might be either way, or cyclical.

Second, no data were available in the present study addressing confounding factors such as race, TV program content, actual hours of TV watched, SES (parent's income, employment status, highest education level completed by parents), baseline bullying, and other forms of violence that participants might have been exposed to. SES

has been known to influence both TV viewing and parenting style.[12] Therefore, assessment of these potential confounders was not possible in this analysis.

Third, due to the convenience sampling of surveying only students from the five school, the findings lacks external validity in terms of generalizing the information to all 4th to 6th graders in OR. The students surveyed were not representative of the general population of grades 4 to 6. Using a random sampling method could achieve a representative sample of 4th to 6th graders will make generalization possible.

Fourth, another limitation related to the OESHBS survey design is the way the two rumor or lies questions were asked, resulting in bias due to non-response (underreporting). The rumor questions refer to behavior that occurred only at school. According to refutable online resources on cyberbullying from ChildNet[59] and Schuylerville Central School District,[60] being a perpetrator or victim of rumor or lies does not only occur at school, but also in the home, on the computer (*e.g.,* emails, chat line such as MySpace) and on the phone. Also, in a technological era, children have access to communication devices. If more participants spread rumors or lies, or were victims of rumors or lies at home or other places than school, reports for rumor perpetrator and rumor victim would be underreported. This would result in differential-misclassification bias that would underestimate the associations between TV viewing and rumor perpetrator and rumor victim; there was no significant associations between TV viewing and rumor perpetrator or rumor victim, so this type of bias is a concern.

Another bias due to non-response would be that not all students could take the survey because they might have been absent on the day of the survey. Such students might be those who were recently involved in a bullying situation so they don't want to

go to school due to fear of the consequences. If those students were absent due to bullying behaviors, this would result in differential-misclassification bias that would underestimate the association; however, this scenario is not plausible. There are various reasons for being absent on the day the survey was administered, so it is unlikely that those students who were absent were those with bullying behaviors. Therefore, bias due to non-response would not be a concern.

Another bias due to non-response is related to how the survey was administered. The question about being a perpetrator or victim of rumor or lies is considered sensitive. The survey was administered in a way that the participants might not feel a sense of confidentiality when answering the question. Due to difference in literacy level, the survey was read orally by a staff during class so students might not be willing to answer the questions or provide accurate and truthful response. If underreporting occurred equally among all participants, this would result in non-differential bias, thus producing null associations between TV viewing and rumor perpetrator or rumor victim. In this study, bias due to non-response is likely because of the non-significant associations found between TV viewing hours and rumor perpetrator and rumor victim.

Non-response can also arrive from how the survey question was constructed. In the current OESHBS, the question about being a rumor perpetrator is asked before the rumor victim question. People are generally more willing to tell what others have done to them than what they have done to someone. Recommendation for future OESHBS would be to switch the order of the question by putting the rumor victim question before the rumor perpetrator question. In the movie "Mean Girls," the counselor asked who had

been hurt by someone saying false or mean things about them, then she proceeded by asking what each person had said or done to another person.

Another suggestion to improve reporting for rumor victim and rumor perpetrator items is to ask 6th graders if they ever passed rumors about someone when they were in 5th grade, ask 5th graders about their rumor behavior when they were in 4th grade, and ask 4th grade about their rumor behavior when they were in 3rd grade. This might make the question less sensitive because it is referring to one year ago; however, the disadvantage is that such question is subject to recall bias (to be discussed in further detailed below). Therefore, the insignificant associations between TV viewing hours and rumor perpetrator and rumor victim are probably due to bias resulting from survey data collection methods.

Another bias to consider would be recall bias. All the bullying questions asked about bullying behaviors from the past month. For instance, if students who bullied someone physically were less likely to remember bullying someone, this would decrease the reporting for each of the four bullying behaviors, leading to an underestimation of the associations between TV viewing and the bullying variablse. However, this wasn't the case because a significant association was found between TV viewing and physical bullying. Recall bias would be a concern if we consider that the hurtful feeling associated with being a victim of bullying behavior is more memorable compared to being a perpetrator of bullying behaviors. Based on frequency percents, more students reported being victims of "rumors or lies" and physical form of bullying (28.9% - 35.0%) than being perpetrators of "rumors or lies" and physical form of bullying (5.9% - 11.8%). The low reporting of being perpetrators might be that participants do not consider

themselves being bullies, are ashamed or not comfortable reporting that they engage in bullying behaviors. If more participants remember being victims of physical bully, or rumor and lies, the reporting for physical victim and rumor victim would increase. The high reporting would lead to an over-estimation of the associations between TV viewing and physical victim and rumor victim; however, this wasn't the case because null associations were found between TV viewing and physical victim and rumor victim.

The nonsignificant associations between TV viewing and rumor perpetrator and rumor victim are due to bias more so than power. Crosstabulations of TV and rumor perpetrator and rumor victim had small (< 5) observed cell sizes so 95% confidence intervals are wide (between $0.50 - 2.00$). To illustrate the bias issue: from the unadjusted to the school-adjusted association, the odds ratio attenuated (**Table 8c**); therefore, increasing the sample size would not change the odds ratio from 1 to 1.5. To have an effect of 1.5 requires improving survey administration procedure and restructuring the two rumor questions to increase the likelihood of accurate reporting. Conversely, the nonsignificant association between TV viewing and physical victim might be more of a power (sample size) issue. The unadjusted and school-adjusted odds ratios were 1.58 and 1.41. The CI was not wide because there were no small cell values. If the overall sample size (N=554) were increased, the school-adjusted association might become significant.

Despite the limitations, this analysis of OESHBS 2004-05 data has several advantages. This study provides school-based, state-level data on prevalence of screen TV hours and bullying behaviors among a sample of elementary students in grades 4 to 6. Precision of independent variable in regards to type of bullying and dependent variable in regards to amount of TV viewed support an association between TV viewing hours and

physical bullying behavior. The bullying independent variables are specific with time of the bullying behaviors (in the **past month),** and the bullying outcome variable is specific to TV watching from **yesterday.** The time sequence in the TV and bullying questions strengthen the rationale for using TV as dependent variable and bullying behaviors as independent variables. Nevertheless, the question on TV viewing hours could be made more specific by not mentioning "video movies." Future OESHBS could be revised to include a question focusing only on TV viewing hours, and another question about videos movie and specify if video movies are played on TV, the computer, or both.

In addition to providing prevalence about TV use and bullying behavior, and precision of the outcome and independent variables, this study has internal and external validity in finding consistency of the association. There was internal consistency, because the association between TV and being perpetrator of physical bully remained stable from simple logistic regression analysis throughout multivariate model-building; even when parental limit screen time variable was imputed, the association remained significant. There was external consistency because the association found in this study is consistent with results of other published studies that found an association between TV viewing hours and physical bullying behaviors, aggression or violent behaviors. Even with the use of different measurement for physical bullying and TV viewing hours throughout the literature, the association is still observed.

Strength of the association was strong. The unadjusted and adjusted odds ratios for physical bully remained at 3 regardless which variables were entered in the model. Strong statistical association suggests that the observed association is not due to chance. A dose-response is plausible. The proportion of physical bullying increased with each

subsequent categories of TV viewing when TV viewing hours (with response categories as no TV, 1 or less hour, 2 hours, and 3 or more hours) was cross-tabulated with physical bully (see **Table 8b** on page 39). The proportion of physical bullying with 1 or less hour of TV was slightly elevated compared to those with no TV viewing hours. The magnitude of the unadjusted and adjusted association (with adjustment to school, grade and gender) of the "2 hour of TV" and "3 or more hours of TV" were virtually the same, so there is a threshold of effect at 2 hours of TV viewing. A dose- response provide support for the observed association between TV viewing and physical bullying, and reinforces the importance of decreasing daily TV viewing hours among elementary school children.

Public Health Implications and Future Directions

<u>Health risks of children</u>

The association between TV viewing and physical bullying provides intriguing insights that the health risks of elementary children surveyed include harassment (in the form of physical bullying) and high TV-viewing. Decreasing TV viewing hours among elementary school aged children must be promoted, along with public health interventions to raise awareness about the negative effects of excessive TV viewing and bullying behaviors. This study is unable to conclude if physical bullying causes high TV viewing or high TV viewing causes physical bullying due to its cross-sectional design. From the public health perspective, both directions of the association need to be considered as well as other factors that might affect the association.

If TV Viewing Causes Physical Bullying

This would imply that TV viewing of 2 or more hours is a risk factor for physical bullying behaviors. Such risk factors would call for promoting AAP's guideline to decrease TV viewing among pre-school and elementary school aged children, encourage families to seek alternative quality time, and conduct public health campaigns to increase awareness about the negative health effects of TV among children, parents, caregivers, schools and other stakeholders. A randomized controlled study by Robinson and colleagues showed that reducing exposure to TV, video tape and video games decreases aggression in elementary school students.[61] Potential barriers to reducing TV hours include parental perception of TV as a quality family activity in today's society.[62]

A longitudinal study, with a random sample of students and with measurement of baseline bullying behavior and other potential confounders would provide prospective data on TV viewing hours and subsequent bullying behavior. Compared to a randomized controlled study, a longitudinal study would be more appropriate due to lower perceived risk of exposure. In longitudinal design, children would not be assigned to a lower or higher TV exposure group as would be required in randomized controlled study.

If Physical Bullying causes High TV Viewing

If physical bullying is a risk factor for high TV viewing, this would imply that social isolation or depression leads to heavy TV watching among elementary level children. This type of causal direction would call for public health action to increase awareness of the negative impact of bullying behaviors, and promote anti-bullying program that involves defusing bullying situation, better reprimanding methods to prevent kids from being home alone, and awareness of state bullying laws. Anti-bullying

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program needs to be available to children at an early age and be "universal" by following CDC guideline for injury prevention.

If Someone Else or Other Factors Cause the Association

If other factors (such as other people, other social or environmental factors) cause the association, this would call for public health programs using school-based mentorship program to give children who have been involved in bullying situation (as bully or victim) positive role models. The program should include an assessment of risk factors that would have predisposed the student to bullying behavior and watching a lot of TV. Positive and caring role models have the ability to improve the critical thinking of children so they could be less likely to be influenced by risky behaviors or negative peer influence, especially among children who lack social support at home, have weak family connection, or children of low-SES background. Another intervention would be school-based or community parent support program to provide resources and child rearing techniques to help adults understand barriers to children's learning.

SUMMARY AND CONCLUSIONS

Children in 4th, 5th, and 6th graders are at risk for being perpetrators and victims of physical bullying and watching a lot of TV each day. Elementary children are vulnerable to the negative effects of TV because they learn and imitate what they see and hear. Despite existing strategies to reduce children's TV watching, this study finds that elementary children surveyed in Oregon continue to exceed AAP daily TV recommendation in their TV viewing hours. The factors associated with excessive TV viewing include being boy and girl perpetrators of physical bullying behavior, being boys who were physically victimized, age, and school location. This study found that victims of physical bullying appear to be younger, while perpetrator of physical bullying are older. Bullying behavior is associated social isolation, sadness and anger, physical injury, loss of trust in people, decreased self confidence, adulthood criminal activities and victimization of others.

Due to the adverse effects of TV or physical bullying or both on the health of children, no matter what the direction of the association, students would benefit from both a "reduce screen TV time" intervention and bullying awareness program. The findings from this study call for improving children, families, caregivers, schools, clinicians and community's awareness of the adverse effects of TV and bullying behavior. Knowledge is power as the TV set is a commodity owned and enjoyed in almost every home, and is used without much realization about its subtle, silent harmful effects. Acting upon these results stands to promote the health of children and their families, and academic performance of elementary school children in Oregon.

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Here are questions about who you are.

1. Are you a girl or boy?
   - ❑ Girl
   - ❑ Boy

2. What grade are you in?
   - ❑ 4th grade
   - ❑ 5th grade
   - ❑ 6th grade

Here are questions about what you ate and drank yesterday.

3. **Yesterday**, did you drink any kind of milk? Milk includes chocolate or other flavored milk, milk on cereal, or drinks made with milk.
   - ❑ No, I did not drink any milk yesterday
   - ❑ Yes, I drank milk **1 time** yesterday
   - ❑ Yes, I drank milk **2 times** yesterday
   - ❑ Yes, I drank milk **3 or more times** yesterday

4. **Yesterday**, did you eat yogurt, cottage cheese, cheese, or drink a yogurt drink?
   Count cheese on pizza or in mixed dishes like tacos, sandwiches, cheeseburgers, or macaroni and cheese.
   Do not count frozen yogurt.
   - ❑ No, I did not eat any of these foods yesterday
   - ❑ Yes, I ate these foods **1 time** yesterday
   - ❑ Yes, I ate these foods **2 times** yesterday
   - ❑ Yes, I ate these foods **3 or more times** yesterday

5. **Yesterday**, did you eat French fries or chips?
   Chips are potato chips, tortilla chips, Cheetos®, corn chips, or other snack chips.
   - ❑ No, I did not eat any French fries or chips yesterday
   - ❑ Yes, I ate French fries or chips **1 time** yesterday
   - ❑ Yes, I ate French fries or chips **2 times** yesterday
   - ❑ Yes, I ate French fries or chips **3 or more times** yesterday

6. **Yesterday**, did you eat any vegetables?
   Vegetables are all cooked and uncooked vegetables; salads; and boiled, baked and mashed potatoes.

   Do not count French fries or chips.

   - ❑ No, I did not eat any vegetables yesterday
   - ❑ Yes, I ate vegetables **1 time** yesterday
   - ❑ Yes, I ate vegetables **2 times** yesterday
   - ❑ Yes, I ate vegetables **3 or more times** yesterday

7. **Yesterday**, did you eat fruit?
   Do not count fruit juice.

   - ❑ No, I did not eat any fruit yesterday
   - ❑ Yes, I ate fruit **1 time** yesterday
   - ❑ Yes, I ate fruit **2 times** yesterday
   - ❑ Yes, I ate fruit **3 or more times** yesterday

8. **Yesterday**, did you drink fruit juice?
   Fruit juice is a drink, which is 100% fruit juice, like orange juice, apple juice, or grape juice.
   Do not count punch, Kool-Aid®, Capri Sun®, sports drinks like Gatorade®, or other fruit-flavored drinks.

   - ❑ No, I did not drink any fruit juice yesterday
   - ❑ Yes, I drank fruit juice **1 time** yesterday
   - ❑ Yes, I drank fruit juice **2 times** yesterday
   - ❑ Yes, I drank fruit juice **3 or more** times yesterday

9. **Yesterday**, did you drink any punch, Kool-Aid®, Capri Sun®, sports drinks like Gatorade®, or other fruit-flavored drinks?

   Do not count 100% fruit juice.

   - ❑ No, I did not drink any of these drinks yesterday
   - ❑ Yes, I drank one of these drinks **1 time** yesterday
   - ❑ Yes, I drank one of these drinks **2 times** yesterday
   - ❑ Yes, I drank one of these drinks **3 or more times** yesterday

10. **Yesterday**, did you drink any sodas or soft drinks?
    - ❑ No, I did not drink any sodas or soft drinks yesterday
    - ❑ Yes, I drank sodas or soft drinks **1 time** yesterday
    - ❑ Yes, I drank sodas or soft drinks **2 times** yesterday
    - ❑ Yes, I drank sodas or soft drinks **3 or more times** yesterday

11. **Yesterday**, did you eat breakfast?
    - ❑ No
    - ❑ Yes

12. **Yesterday**, how many meals did you eat?
    Meals can include breakfast, lunch, and dinner or supper.
    - ❑ I did not have any meals yesterday
    - ❑ I had **1 meal** yesterday
    - ❑ I had **2 meals** yesterday
    - ❑ I had **3 or more meals** yesterday

13. **Yesterday**, did you eat any meals with your family?
- ❑ No
- ❑ Yes

These questions are about how much physical activity you do.

14. **Yesterday**, did you do any exercise that made your heart beat fast and made you breathe hard for at least 20 minutes? (For example: basketball, running or jogging, dancing, swimming, skating, bicycling, jumping rope, soccer, or other similar aerobic activities.)
- ❑ No
- ❑ Yes

15. **Yesterday**, did you do any exercise that did not make your heart beat fast and did not make you breathe hard for at least 30 minutes? (For example: walking, kickball, baseball, working in the yard, or chores around the house like mopping floors.)
- ❑ No
- ❑ Yes

16. **Yesterday**, how many hours did you watch TV or video movies?
- ❑ None; I did not watch TV yesterday
- ❑ 1 hour or less
- ❑ 2 hours
- ❑ 3 or more hours

17. Do you currently take part in any organized sports or take lessons?
- *Sports teams* can include soccer, basketball, baseball, softball, swimming, cheerleading, wrestling, track, football, and volleyball teams
- *Classes* can include martial arts, dance, gymnastics, and tennis

Do not include PE classes.
- ❑ No
- ❑ Yes

18. **Yesterday**, how many hours did you spend on the computer or play video games like Nintendo®, Sega®, Xbox®, or arcade games?
- ❑ None; I did not play video games or use the computer
- ❑ 1 hour or less
- ❑ 2 hours
- ❑ 3 or more hours

19. Do your parents or guardian limit the amount of TV, computer, videos or video games that you can watch or play?
- ❑ No
- ❑ Yes

These questions are about the lunches at your school.

20. Do you eat school lunches?
- ❑ Almost never or never
- ❑ Sometimes
- ❑ Almost always or always

21. I think the lunch served in my school cafeteria is healthy for my body.
- ❑ Almost never or never
- ❑ Sometimes
- ❑ Almost always or always

22. I like to eat the school lunch served in my cafeteria.
- ❑ Almost never or never
- ❑ Sometimes
- ❑ Almost always or always

Here are questions about safety and things that happen at school.

23. When you ride in a car do you wear a seat belt?
- ❑ No, never
- ❑ Yes, **some of the time**
- ❑ Yes, **most of the time**
- ❑ Yes, **all of the time**
- ❑ I do not ride in a car

24. When you ride a bicycle do you wear a helmet?
- ❑ No, never
- ❑ Yes, **some of the time**
- ❑ Yes, **most of the time**
- ❑ Yes, **all of the time**
- ❑ I do not ride a bicycle

25. Are you home alone after school?
- ❑ No, never
- ❑ Yes, **some of the time**
- ❑ Yes, **most of the time**
- ❑ Yes, **all of the time**

26. During the **past month**, have **you** hit or pushed other kids at school when you were not playing around?
- ❑ No
- ❑ Yes

27. During the **past month**, did **other kids** hit or push you at school when they are not just playing around?
- ❑ No
- ❑ Yes

28. During the **past month**, have **you** spread mean rumors or lies about other kids at school?
- ❑ No
- ❑ Yes

29. During the **past month**, did **other kids** at school spread mean rumors or lies about you?
- ❑ No
- ❑ Yes

30. Do you feel safe on school property?
- ❏ No, Never
- ❏ Yes, **some of the time**
- ❏ Yes, **most of the time**
- ❏ Yes, **all of the time**

31. Do you feel safe away from school?
- ❏ No, Never
- ❏ Yes, **some of the time**
- ❏ Yes, **most of the time**
- ❏ Yes, **all of the time**

The next questions are about cigarettes, alcohol, and other drugs.

32. Have you ever smoked a cigarette?
- ❏ No
- ❏ Yes, I smoked part of a cigarette, like one or two puffs
- ❏ Yes, I smoked a whole cigarette

33. Did you ever drink beer, wine, or other alcohol?
- ❏ No, I have never tried a drink
- ❏ Yes, I drank one or two sips
- ❏ Yes, I drank a full glass

34. Have you ever sniffed something through your nose to get high?
- ❏ No
- ❏ Yes
- ❏ I don't know what this is

35. Have you ever smoked marijuana (pot, grass, weed)?
- ❏ No
- ❏ Yes
- ❏ I don't know what marijuana is

These questions below are about your health and things you might do.

36. Have you ever tried to lose weight?
- ❏ No
- ❏ Yes

37. Have other kids **at school** ever teased you about what your body looks like?
- ❏ No
- ❏ Yes

38. Compared to other students in your grade who are as tall as you, do you think you weigh:

- ❏ The right amount
- ❏ Too much
- ❏ Too little (or not enough)

39. When not exercising, do you ever have trouble breathing (for example, shortness-of-breath, wheezing, or a sense of tightness in your chest)?
- ❑ No
- ❑ Yes

40. Has a parent or some other adult ever told you that you have asthma?
- ❑ No
- ❑ Yes

41. How many of the questions on this survey did you understand?
- ❑ None of them
- ❑ Some of them
- ❑ Most of them
- ❑ All of them

Thank you for taking this survey!

Table 13. Variable List for 2004-05 OESHBS Dataset

Survey question #	Identification code	Code/values (1001-5050)	Variable ID/name	Variable# in OESHBS dataset
n/a	Code for school	1000	Idschl	2
		2000		
		3000		
		4000		
		5000		
1	Gender	1=girl	gender	3
		2=boy		
2	Grade	4=4th	Grade	4
		5=5th		
		6=6th		
3	Drank milk yesterday?	1=No	Milk2	5
		2=Yes		
4	Consumed yogurt/cheese yesterday?	1=No	Yogurt2	6
		2=yes		
5	Consumed French fries/chip yesterday?	1=No	Ffchip2	7
		2=yes		
6	Consumed any vegetables yesterday?	1=No	Veggie2	8
		2=Yes		
7	Consumed fruit yesterday?	1=No	Fruit2	9
		2=Yes		
8	Consumed 100% fruit juice yesterday?	1=No	fruitjc2	10
		2=Yes		
9	Consumed punch/sportd drinks yesterday?	1=No	punch2	11
		2=Yes		
10	Consumed sodas/soft drinks yesterday?	1=No	soda2	12
		2=Yes		

Survey question #	Identification code	Code/values (1001-5050)	Variable ID/name	Variable# in OESHBS dataset
11	Consumed breakfast yesterday?	1=No	breakfst	13
		2=yes		
12	Consumed how many meals yesterday?	1=no meal	meals2	14
		2=Yes, 1 or more meals		
13	Ate meals w/family yesterday?	1=No	mealfam	15
		2=yes		
14	Exercise that raised heart rate >=20 min yesterday?	1= No	ex20fst	16
		2=Yes		
15	Exercise that raised heart rate <=30 min yesterday?	1=No	ex30nfst	17
		2=Yes		
16	# hrs watched TV/video moview yesterday	1=none, no TV yesterday	TV hours	18
		2= 1 hr or less		
		3 = 2 hrs		
		4= 3 or more hrs		
17	Currently taking organized sports/lessons (xclude PE)?	1=No	sports	19
		2=Yes		
18	# hrs spent on computer/video games yesterday	1=No, none	compvd2	20
		2= one or more hrs		
19	Parents limit TV/computer/vidos/video games?	1=NO	Screen limit	21
		2=Yes		
20	Eat school lunch?	1=Almost neve	schlunch	22
		2=Sometimes		
		3=Almost always		
21	Think school lunch healthy?	1=Almost neve	schluhea	23
		2=Sometimes		
		3=Almost always		
22	Like school lunch?	1=Almost neve	schlulik	24
		2=Sometimes		
		3=Almost always		
23	Wear car seatbelt?	1=No, never	seatbt3	25
		2=Yes		
		3=Don't ride		

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Survey question #	Identification code	Code/values (1001-5050)	Variable ID/name	Variable# in OESHBS dataset
24	Wear bicycle helmet?	1=No, never	helmet3	26
		2=Yes		
		3=Don't ride		
25	Home alone after school?	1=No, never	halone2	27
		2=Yes		
26	Past month, you hit/pushed?	1=No	Physical Bully	28
		2=Yes		
27	Past month, Other hit/push u?	1=No	Physical Victim	29
		2=Yes		
28	Past month, U spread rumor?	1=No	Rumor Perpetrator	30
		2=yes		
29	Past month, Other spread mean rumors about u?	1=No	Rumor Victim	31
		2=Yes		
30	Feel safe at school?	1=No, never	safesc2	32
		2=Yes		
31	Feel safe away from school?		safensc2	33
32	Ever smoked sigarette?	1=No	smoke2	34
		2=Yes		
33	Ever drink beer, wine, other alcohol?	1=No	alcohol2	35
		2=Yes		
34	Ever sniffed through nose to get high?	1=No	sniffed	36
		2=yes		
		3=Don't Know		
35	Ever smoked marijuana?	1=No	marijuana	37
		2=Yes		
		3=Don't Know		
36	Ever tried to lose weight?	1=No	LOSEWT	38
		2=yes		
37	Ever been teased about your body?	1=No	teased	39
		2=Yes		

Survey question #	Identification code	Code/values (1001-5050)	Variable ID/name	Variable# in OESHBS dataset
38	Compared to other students, what you think of your weight?	1=Right amount	weight	40
		2=Too much		
		3=To little		
39	When not excercising, ever have trouble breathing?	1=No	brethnox	41
		2=yes		
40	Have an adult ever told you have asthma?	1=No	asthma	42
		2=Yes		
41	How many survey questions did you understand?	1=None	underst	43
		2=Some		
		3=Most		
		4=All		

Note: Variables in bold are those selected for this thesis study.

Table 11a. Elementary school students, OESHBS, SY 2004-05: Summary of the crude ORs and adjusted ORs for bullying variables

Total sample size. N=554	Label	Crude OR (CI)	School-adjusted OR (CI)
Physical bully	No	Referent	Referent
	Yes	**3.04 (1.79-5.17)**	**3.21 (1.82-5.66)**
Physical victim	No	Referent	Referent
	yes	**1.58 (1.10-2.27)**	1.41 (0.96-2.07)
Composite physical bully	Not involved	referent	referent
	Perpetrator only	**2.63 (1.10-6.28)**	**2.84 (1.12-7.17)**
	Victim only	1.30 (0.86-1.95)	1.17 (0.77-1.79)
	Both perpetrator and victim	**3.95 (2.01-7.73)**	**3. 89 (1.92-7.91)**
Rumor perpetrator	No	Referent	Referent
	Yes	1.05 (0.50-2.21)	0.96 (0.44-2.09)
Rumor victim	No	Referent	Referent
	Yes	1.01 (0.69-1.48)	1.05 (0.70 -1.58)
Composite non-physical bully	Not involved	Referent	Referent
	Perpetrator only	2.36 (0.86-6.49)	2.31 (0.81-6.63)
	Victim only	1.13 (0.75-1.68)	1.21 (0.79-1.84)
	Both perpetrator and victim	0.46 (0.13-1.66)	0.39 (0.10-1.47)

Table 14a. Summary of unadjusted association and multivariate logistic regression models, OESHBS, SY 2004-05

Variable		Unadjusted OR (CI)	School-adjusted OR (CI)	Grade entered into previous MM, Adjusted OR (CI)	Gender entered into previous MM, Adjusted OR (CI)
Wald p-value for variable entered		n/a	< 0.0001	0.006	0.47
Wald p-value for **Physical bully**		n/a	< 0.0001	< 0.0001	< 0.0001
-2 Log likelihood		n/a	661.94	651.52	650.99
Nagelkerke R-square		n/a	0.13	0.15	0.15
HL Goodness of Fit (p value)		n/a	2.71 (0.61)	8.50 (0.29)	6.58 (0.47)
School	A	Referent	Referent	Referent	Referent
	B	**2.90 (1.52-5.54)**	**2.37 (1.21-4.65)**	**3.56 (1.71-7.41)**	**3.50 (1.68-7.29)**
	C	**2.64 (1.63-4.28)**	**3.02 (1.84-4.94)**	**4.36 (2.48-7.67)**	**4.41 (2.50-7.76)**
	D	**3.29 (1.98-5.46)**	**3.17 (1.89-5.34)**	**5.03 (2.65-9.54)**	**5.01 (2.64-9.50)**
	E	**4.10 (2.22-7.59)**	**4.20 (2.25 -7.86)**	**3.06(1.56-6.00)**	**3.10 (1.58-6.09)**
Gender	Female	Referent	--	--	Referent
	Male	1.02 (0.72 - 1.44)	--	--	1.15 (0.79-1.69)
Grade	4th	Referent	--	Referent	Referent
	5th	0.81 (0.53 - 1.22)	--	1.18 (0.72-1.94)	1.17 (0.71-1.93)
	6th	1.40 (0.89 - 2.19)	--	**2.84 (1.49-5.40)**	**2.80 (1.47-5.33)**
Physical bully	No	referent	Referent	Referent	Referent
	Yes	**3.04 (1.79-5.17)**	**3.21 (1.82-5.66)**	**2.93 (1.66-5.17)**	**3.07 (1.71-5.50)**
Physical victim	No	referent	--	--	--
	yes	1.58 (1.10 - 2.27)	--	--	--
Rumor perpetrator	No	referent	--	--	--
	Yes	1.05 (0.50-2.21)	--	--	--
Rumor victim	No	referent	--	--	--
	Yes	1.01 (0.69-1.48)	--	--	--
20. Parental limit screen time	No	referent	--	--	--
	Yes	**0.53 (0.37- 0.75)**	--	--	--

Note: CI = 95% confidence intervals; MM = Multivariable logistic regression model; HL = Hosmer and Lemeshow Goodness of Fit test.

Table 14b. Summary of multivariate logistic regression models, OESHBS, SY 2004-05

Variable		Physical victim entered into MM, Adjusted OR (CI) (Main effects model)	Rumor perpetrator entered into MM Adjusted OR (CI)	Rumor victim entered into MM Adjusted OR (CI)
Variable entered and Wald p-value		Physical victim, p = 0.15	Rumor perpetrator, p = 0.30	Rumor victim, p = 0.73
Wald p-value for **Physical Bully**		< 0.0001	< 0.0001	0.001
-2 Log Likelihood		646.16	636.94	639.02
Nagelkerke R-square		0.16	0.16	0.16
HL Goodness of Fit (p value)		5.28 (0.73)	3.88 (0.87)	11.37 (0.18)
School	A	Referent	Referent	Referent
	B	**3.34 (1.60-6.91)**	**3.83 (1.81- 8.07)**	**3.17 (1.52– 6.65)**
	C	**4.50 (2.55-7.95)**	**4.69 (2.64-8.33)**	**4.22 (2.38-7.50)**
	D	**5.01 (2.63-9.53)**	**5.26 (2.73-10.12)**	**4.87 (2.56-9.28)**
	E	**2.88 (1.46-5.69)**	**2.82 (1.42-5.60)**	**2.74 (1.38-5.44)**
Gender	Female	Referent	Referent	Referent
	Male	0.84 (0.57-1.23)	0.84 (0.57 -1.24)	0.81 (0.55-1.20)
Grade	4th	Referent	Referent	Referent
	5th	1.19 (0.72- 1.97)	1.23 (0.74-2.03)	1.18 (0.71-1.95)
	6th	**3.07 (1.59 – 5.91)**	**3.32 (1.71-6.44)**	**3.17 (1.64-6.11)**
Physical bully	No	Referent	Referent	Referent
	Yes	**2.92 (1.60- 5.32)**	**3.07 (1.64-5.75)**	**2.82 (1.54-5.15)**
Physical victim	No	Referent	Referent	Referent
	yes	1.35 (0.90 -2.03)	1.35 (0.89-2.04)	1.45 (0.94-2.23)
Rumor perpetrator	No	--	Referent	--
	Yes	--	0.64 (0.28-1.48)	--
Rumor victim	No	--	--	Referent
	Yes	--	--	0.93 (0.59 -1.44)
21. Parental limit screen time	No	--	--	--
	Yes	--	--	--

Note: MM = Multivariable logistic regression model; HL = Hosmer and Lemeshow Goodness of Fit test; R-squared is based on Negelkerke R square; -- Indicates not applicable;

Table 14c. Summary of multivariate logistic regression models, OESHBS, SY 2004-05

Model		Parental limit screen time entered, Adjusted OR (CI)[A]	Interaction entered into MM, Adjusted OR (CI)*[B]	Adjusted OR (CI)[C] (Final model)
Wald p-value for variable entered		0.003	0.004 (P-value = 0.120 for interaction term)	0.045
Wald p-value for **Physical Bully**		0.002	0.002	0.001
-2 Log Likelihood		620.23	617.79	642.10
HL Goodness of Fit		5.90 (0.66)	2.87 (0.94)	7.37 (0.50)
Nagelkerke R-squared		0.18	0.18	0.17
School	A	Referent	Referent	Referent
	B	3.57 (1.70-7.50)	3.57 (1.69-7.54)	3.36 (1.61 – 7.03)
	C	4.60 (2.55-8.30)	4.54 (2.54 – 8.28)	4.49 (2.54 – 7.94)
	D	4.83 (2.51-9.30)	4.73 (2.45 – 9.11)	4.89 (2.56 – 9.33)
	E	2.97 (1.50-5.89)	2.99 (1.51 – 5.91)	2.90 (1.47 -5.72)
Gender	Female	Referent	Referent	Referent
	Male	0.81 (0.54-1.20)	0.64 (0.39-1.05)	0.62 (0.38 – 1.01)
Grade	4th	Referent	Referent	referent
	5th	1.15 (0.68-1.93)	1.12 (0.67-1.89)	1.16 (0.70 – 1.92)
	6th	2.81 (1.45-5.45)	2.78(1.43-5.38)	3.00 (1.56 – 5.78)
Physical bully	No	Referent	Referent	Referent
	Yes	2.64 (1.43-4.85)	2.59 (1.41-4.77)	2.84 (1.56 – 5.18)
Physical victim	No	Referent	Referent	Referent
	yes	1.27 (0.83-1.94)	n/a	n/a
Rumor perpetrator	No	--	--	--
	Yes	--	--	---
Rumor victim	No	--	--	--
	Yes	--	--	--
Physical victim **Male**		--	1.74 (0.98-3.09)	1.99 (1.14 – 3.49)
Female		--	0.91 (0.50 – 1.66)	0.88 (0.49 – 1.59)
Parental limit screen time	No	Referent	Referent	--
	Yes	0.56 (0.38-0.82)	0.570.38-0.84)	--

Note: MM = Multivariable logistic regression model; HL = Hosmer and Lemesho Goodness of Fit test; -- Indicates not applicable

[A] Multivariable model with school, gender, grade, physical bully, physical victim, and screen limit

[B] Multivariable model with school, gender, grade, physical bully, physical victim, screen limit and interaction term physical victim*gender

[C] Final multivariable model with school, gender, grade, physical bully, physical victim, and interaction term physical victim*gender