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Health-risk behaviors among a sample of US pre- adolescents: Types, frequency, and predictive factors

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Abstract

Background—Children as young as 10 years old report curiosity and participation in health-risk behaviors, yet most studies focus upon adolescent samples.

Objective—To document the types and frequencies of health risk behavior among pre-adolescents and to examine the child, family, and environment factors that predict them.

Method—A sample of 297 pre-adolescents (mean age = 10.5, $SD = 0.6$) from two Midwestern US cities and their parents (child-parent dyads) provided data about demographic characteristics, health risk behavior participation, child self-esteem, child pubertal development, child and adult perception of their neighborhood, and parent monitoring. Their participation was at intake to a 5-year clustered randomized controlled trial.

Results—Pre-adolescents participated in an average of 3.7 health-risk behaviors ($SD = 2.0$), primarily those that lead to unintentional (helmet and seatbelt use) and intentional (feeling unsafe, having something stolen, and physical fighting) injury. Factors predictive of unintentional injury risk behavior were self-esteem, pubertal development, parent monitoring, and parent perception of the neighborhood environment. Boys were 1.8 times less likely than girls to use helmets and seatbelts. Pre-adolescents whose parents were not partnered were 2.8 times more likely than pre-adolescents whose parents were partnered to report intentional risk behavior.

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Recommendations—These data demonstrate trends that cannot be ignored. We recommend, focused specifically upon boys and non-partnered families, that (a) developmentally-appropriate, appealing prevention messages be developed and delivered for parents and pre-adolescents and community interventions targeting both parent and pre-adolescent together be provided to help them establish and monitor behavioral expectations and (b) organized nursing endorse policy in the US and globally that assures adequate family environments for children.

According to the World Health Organization, an alarming number of children and adolescents engage in health-risk behaviors (Currie et al., 2004). Health-risk behaviors include: (a) those that contribute to unintentional and intentional injuries and violence; (b) tobacco use; (c) alcohol and other drug use; (d) sexual behaviors; and (e) poor health practices (Eaton et al., 2010). Prior research has documented that health-risk behaviors contribute to the leading causes of morbidity and mortality among youth (Centers for Disease Control and Prevention, 2006; Currie, et al., 2004), are often established during childhood and adolescence, extend into adulthood (Chowdhury et al., 2010), and are preventable. Despite evidence that pre-adolescents (children aged 9 to 11) are curious about and may engage in these behaviors (Donovan, 2007; Dowdell, 2006; Riesch, Jacobson, Sawdey, Anderson, & Henriques, 2008), most studies focus upon adolescents. In this paper, our first aim is to describe the types and frequency of health risk behaviors reported by pre-adolescents at intake to a 5-year clustered randomized controlled trial.

Based on the adolescent literature, predictors of health-risk behavior engagement include child, family, and environment factors. Child factors refer to the psychosocial, biological, and cognitive developmental processes such as self-esteem and number of friends, pubertal development and gender, and school performance. Family factors include aspects of family socialization and parent characteristics exemplified in parent monitoring and partner status. Environment factors include characteristics of the family's neighborhood. Our conceptualization of the direct relationship of the predictors and behaviors is illustrated in Figure 1 (Riesch, Anderson, & Krueger, 2006). Thus, our second aim is to examine the extent to which (a) the child factors of self-esteem, pubertal development, gender, number of friends, and school performance; (b) the family factors of parent monitoring and partner status; and (c) the environment factors of adult and child perception of neighborhood predict pre-adolescent participation in health-risk behaviors at intake to a 5 year clustered randomized controlled trial.

Background and Literature Review

Health-risk Behavior

To determine prevalence of behavior, the US Centers for Disease Control and Prevention (CDC) conducts national, representative, biennial surveys of health-risk behavior involvement among high school samples and twice conducted a similar survey among selected middle school samples. The Health Behavior in School-aged Children (HBSC) survey is conducted in 43 countries in the WHO regions of the Americas and Europe. It targets youth aged 11 to 15 and their responses to items about tobacco use, alcohol use, cannabis use, sexual behavior, fighting, bullying, physical activity, eating habits, body image, oral health (<http://www.cdc.gov/healthyouth/yrbs/factsheets/index.htm>, <http://www.hbsc.org/> accessed 8-October, 2012).

Trends in behavior from both surveys are similar across the Americas and Europe. Overall findings from the CDC reveal that most teens use seatbelts, most do not regularly wear helmets, about one-third report physical fighting, nearly all feel safe at school, nearly half had tried cigarette smoking, almost three-fourths reported at least one drink of alcohol during their life, and over 10% had sniffed, breathed, or inhaled household substances (e.g.,

paint, glue) to get high. Almost half reported having had sexual intercourse. Over 10% tried to lose weight quickly and less than a third reported exercising daily (Eaton et al., 2012). Overall findings from the HBSC indicated a quarter of teens initiated smoking before age 13, 5% reported weekly drinking at 11 years old and exceeding 15% by age 15, except in countries where perceived availability is high report modest cannabis use, highly variable reports of sexual activity among cultures and countries, and one-quarter of respondents reported fighting with higher prevalence among boys and decreasing prevalence with age (Currie et al., 2012). These surveys document that, other than fighting, health risk behaviors increase markedly from young to middle adolescence. Invoking a prevention perspective, it is logical and important to document predictors of health-risk behavior and develop efficacious interventions prior to participation.

National surveys of younger age groups also are conducted in the US regularly by a private survey organization called PRIDE. PRIDE (an acronym for Parents Resource Institute for Drug Education) makes survey instruments and data analysis and reporting services available for interested schools (Pitcock, 2010). PRIDE surveys are not intended to be nationally representative but demonstrate that pre-adolescents are curious about health-risk behavior at a young age particularly in terms of alcohol, tobacco and other drugs.

Child Factors

As depicted in Figure 1, child factors include self-esteem, friends, pubertal development, gender, and school performance. Self-esteem is a subjective appraisal of oneself as worthy and capable developed through interactions with others (Rosenberg, 1979). Doswell (2002) provided compelling evidence that self-esteem is fragile, changing, and on the low end during the pubertal period, particularly among girls. Self-esteem issues have been reported as frequent among late maturing boys (Brooks-Gunn, Peterson, & Eichorn, 1997).

Friends are a central social context for pre-adolescents. The positive and negative aspects of child friendships or lack thereof have been documented. Isolation from peers or social networks is associated with internalizing problem behaviors such as suicide ideation (Bearman & Moody, 2004; Tani, Chavez, & Deffenbacher, 2001) while being considered popular may predict greater involvement in externalizing behaviors such as tobacco use (Allen, Porter, McFarland, Marsh, & McElhaney, 2005). Children and adolescents were observed to wear bicycle helmets if their friends did (Finnoff, Laskowski, Altman, & Diehl, 2001) and were found to be highly influenced in this practice by peer groups (Forjuoh, Fiesinger, Schuchman, & Mason, 2002).

Timing of puberty is an important factor related to health-risk behavior; early maturation is associated with alcohol experimentation (Costello, Sung, Worthman, & Angold, 2007). The HBSC reported that age was the single strongest predictor of helmet use consistently in 26 countries, with use decreasing as age increased (Klein, Thompson, Scheidt, Overpeck, & Gross, 2005).

Many studies document gender identification as an important task in young adolescence. Wu and colleagues (2006) showed that males were more likely to be involved in fights, to initiate alcohol use, and to participate in physical activity; whereas females were more likely to try to lose weight using unhealthy practices, such as fasting and laxatives. School performance is another potential predictor of health-risk behavior. For example, doing well in school is associated with delayed smoking initiation (Atkins, Oman, Vesely, Aspy, & McLeroy, 2002; Wu, et al., 2006). No studies were found linking school performance with intentional or unintentional injury risk behavior.

Family Factors

Family factors include parent's partner status and the monitoring provided.

The literature on parent partner status is complex. Typically children from two-parent families participate in fewer health risk behaviors than those from single parent or blended families (Wang, Hsu, Lin, Cheng, & Lee, 2009). Change in partner status (Hayatbakhsh, Najman, Bor, O'Callaghan, & Williams, 2009) and harmony in the relationship also constitute important predictors (Anderson, Storfer-Isser, Taylor, Rosen, & Redline, 2009). Youth from single parent families were less likely to own bicycle helmets than those from two parent families (Bernstein, Harper, Pardi, & Christopher, 2003).

Parent monitoring, meaning involvement, regulation (Blum et al., 2000), and supervision at key times (before and after school and at bedtime) (Resnick et al., 1997) is associated with low health-risk behavior participation. Typically, regular social activities with parents (Bearman & Moody, 2004), satisfactory communication and reasonable explanations (Guilamos-Ramos, Jaccard, Turrisi, & Johansson, 2005), and conveyance of parent values regarding health-risk behavior is crucial to monitoring and is associated with less teen involvement in sexual and drinking behavior (Cottrell et al., 2007). Having rules set and monitored by parents about seatbelt (Durbin, Smith, Kallan, Elliot, & Winston, 2007) and helmet use (Van Houten, Van Houten, & Malenfant, 2007) was associated with consistent use.

Environment Factors

Neighborhood constituted the environment factor. Neighborhood organization, safety, and interaction among households and informal supervision and monitoring by neighbors are factors that serve as protective processes (Gabriel, Hopson, Haskins, & Powell, 1996). A neighborhood that demonstrates tolerance and valuing of children by providing opportunities for social gathering, employment, and volunteerism (Leventhal & Brooks-Gunn, 2000) is associated with less participation in health-risk behavior in studies of older youth.

In summary, the literature demonstrates that pre-adolescents are curious and engaging in health risk behaviors previously found among older children aged 14 to 18, leading to the first research question, what are the types and frequency of health risk behaviors assessed at baseline in a clustered randomized controlled trial with pre-adolescents? The factors that are associated with participation have been documented among older youth and form the bases for three additional questions. First, to what extent do self-esteem, friends, gender, pubertal development, and school performance predict pre-adolescent participation in health-risk behavior? Second, to what extent does parent monitoring and partner status predict pre-adolescent participation in health-risk behavior? Third, to what extent does the parent and child perception of neighborhood characteristics predict pre-adolescent participation in health-risk behaviors?

Methods

All study procedures were reviewed and approved by the Institutional Review Boards for the collaborating universities and the research review committees for each school district. Pre-adolescent-parent dyads were recruited as part of a five-year, clustered, randomized controlled trial to assess the efficacy of a communication skills building intervention to prevent or delay child health risk behavior participation.

Sample

The population from which the sample was drawn is all pre-adolescents who were in the last year of elementary school, which is fifth grade (ages 9 to 11), in two US cities. Sample inclusion criteria were that the parents and pre-adolescents were English-speaking. Exclusion criteria were severe mental or physical illness that precluded involvement in data collection procedures and family plans to move from the metropolitan areas prior to study completion.

Variables and their measurement

Puberty—The pre-adolescents completed the Pubertal Development Scale (PDS) (Peterson, Crockett, Richards, & Boxer, 1988) to assess pubertal development. The PDS is a 3-item, gender-specific scale on which pre-adolescents rate themselves. Classification into one of the four PDS categories (pre-, beginning, advanced, and post pubertal) is relevant for each gender. Boys were asked about pubic hair, voice change, and facial hair growth. Girls were asked about pubic hair, menarche, and breast development. Response options were: (a) not yet begun, (b) barely started, (c) under way, (d) or completed. The higher the score, the more advanced the pubertal development. The responses coincide with the Tanner Stages 1 to 5 and compare to physician ratings with correlations of $r = 0.61$ to 0.67 (Brooks-Gunn, Warren, Rosso, & Gargiulo, 1987). In the current study, there was limited variability in the PDS for boys likely due to their later development than girls (Ellison et al., 2012). For example, no boys reported facial hair. This lack of variability may have accounted for the low internal reliability of the PDS for boys.

Perception of neighborhood—Both parents and pre-adolescents completed the Springer and Phillips 7-item Neighborhood Environment Index (NEI) (Springer & Phillips, 1992), two questions from the Dane County Youth Commission (DCYC, 2000), and three ideas from Leventhal and Brooks-Gunn (2000) to assess perception of the neighborhood. Springer and Phillips (1992) reported an alpha reliability co-efficient for the NEI of 0.81 with a sample of 642 youths aged 10 to 16 and items correlated with social bonding, personal competence, and social competence. The Springer and Phillips items addressed social aspects of the neighborhood (i. e., talking with neighbors). The Dane County Youth Commission items addressed feeling safe. Ideas from Leventhal and Brooks-Gunn included opportunities for youth employment, hanging out, and volunteering. Pre-adolescents and parents responded on a scale from ‘1’ All the Time, ‘2’ Often, ‘3’ Not Very Often, and ‘4’ Never. The higher the score, the more positive the perception of the neighborhood.

Self-esteem was measured with 4 items from the Substance Abuse and Mental Health Services Administration initiative to examine family strengthening and mentoring strategies to reduce alcohol, tobacco, and other drugs involvement (CSAP, 1995). The items followed Hart’s and Fegley’s (1995) conceptualization emphasizing the child’s construction of a theory about self. The concepts are normative physical or social standards (“how good” the self is compared to others) and self-understanding in regard to social acceptance and integration (“fitting in” and “being liked”). An example of an item is, “I have a number of good qualities.” Only the pre-adolescents completed this measure and chose from the responses of ‘5’ Agree Strongly, ‘4’ Agree, ‘3’ Neither Agree or Disagree, ‘2’ Disagree, or ‘1’ Disagree Strongly. The CSAP Family Strengthening and Mentoring manual for Cohort III reported an alpha co-efficient of 0.89 (CSAP, 1995). The higher the score, the greater the perceived self-esteem.

Child participation in health-risk behavior was measured among the pre-adolescents who completed the 21-item Children’s Health-risk Behavior Scale (Riesch et al., 2006). This instrument, based on the conceptual categories of the CDC survey, assesses potential for

unintentional and intentional injury or violence, tobacco use, alcohol and other drug use, sexual curiosity, and health practices.

The first 3 items assess *potential for unintentional injuries*, that is, riding a bicycle or skateboard without a helmet, riding in a car without a seat belt, and riding with a driver who has been drinking. The second set of 6 items assess *potential for intentional injury*, and include carrying a gun or knife, feeling unsafe at school, having something stolen, stealing something, being in a physical fight, and thoughts about killing oneself. The third set of 2 items assesses *tobacco use* and includes smoking cigarettes and chewing. The fourth set of 4 items assesses *alcohol and other drug use* and includes using inhalants, alcohol, illegal drugs, and marijuana. The fifth set of items assesses *sexual activity* and includes 3 items: going out with a boy or girl; holding hands; and kissing a girl or boy friend. Finally, 3 items assess health practices: trying to lose weight quickly; exercise; and sleep. Test-retest reliability co-efficient was reported as 0.958 and 0.977 in separate samples.

Parent monitoring (PM) was measured among the pre-adolescents. They completed questions adapted from the Ad Health data Wave II, The Adolescent In-Home Codebook -- Relations with Parents (<http://www.cpc.unc.edu/projects/addhealth/codebooks/wave2>, accessed 15-September, 2010). The items addressed telling parents with whom and where the child is going, parents knowing the child's friends, where the child is after school, and how the child's money is spent. Pre-adolescents chose from the responses of '1' Never, '2' Rarely, '3' Sometimes, '4' A Lot of the time, and '5' Always. The higher the score, the greater the perceived parent monitoring.

Procedures

Recruitment—The larger study was a clustered randomized controlled trial with two conditions, conducted in two cities, a large urban area and mid-sized city, both in the Midwest of the US. The project originated in the mid-sized city (population: 300,000) but to enroll adequate numbers of dyads a large metropolitan area (population: 2.6 million) in close proximity to the mid-sized city was added.

Public elementary schools in both cities were stratified for race and then assigned randomly to intervention or comparison conditions. Twenty-six of 28 schools in the mid-sized city and five of 17 schools in the large city agreed to participate. We calculated that 31 schools would yield approximately 51 clusters (groups of 6 to 8 dyads per school) over a three-year recruitment period. To maintain power at $1 - \beta = .80$, with $\alpha = .05$, for $\rho = .10$, with 51 clusters, would require the recruitment of 150 individual/dyads per treatment arm, or a total of approximately 300 dyads for the cluster randomized controlled trial (Raudenbush, Spybrook, Liu, & Congdon, 2006).

With the permission of the school principals, invitations to participate were sent to 4,711 fifth grade children (aged 9 to 11) and their parents. Parents responded directly to the study offices by telephone or email in each city. Project staff screened for eligibility and enrolled pre-adolescent-parent dyads in the study. Of the 485 families who responded, 361 met eligibility criteria, and 302 were consented.

Data collection—After obtaining adult consent and pre-adolescent assent, data were collected during in-home interviews by students of nursing, social work, human development, and school psychology. The pre-adolescents used Personal Data Assistants and the adults used laptop computers (Bobula et al., 2004). Upon completion of the interview, parent and pre-adolescent each received \$20 USD cash.

Five data collectors between the two cities were trained by the principal investigator (PI) and research manager (RM) in a two-day session. The data collectors shadowed the PI or RM until they demonstrated ability to manage the consent process, equipment, and data collection procedures independently, following which a random 10% of visits were evaluated by the PI or RM. Minimal feedback was required to ensure veracity of data collection procedures. All data were reviewed for accuracy and completeness before being “synched” to the database that resided on the secure server at each university.

Data analysis—For the descriptive analysis, data were reviewed for missingness. Little’s (1988) test for Missing Completely at Random (MCAR) was run on each scaled item predictor, PDS, PM, NEI, and Self-Esteem. MCAR is an assumption of ignorable missing data. Scale scores were then averaged if there was no more than 25% missing data per individual. To examine the direct predictors of health-risk behavior, a Probit regression model (Finney, 1952) was used to model the bivariate dichotomous outcomes for the unintentional and intentional risk items. The probit specification is based on the Cumulative Normal Distribution, which assumes there exists a theoretical index $Z(i)$ which is not observed or measured, but is linked to an explanatory variable $X(i)$ on which we have collected data. Probit coefficients were transformed to approximate logits and odds ratios using $\text{logit} \sim \pi/\sqrt{3} * \text{probit}$, with odds ratio $\sim e^{\text{logit}}$ (Cramer, 2003).

Results

Description of the sample

In Tables 1 and 2, we display the sample characteristics. Data were complete and analyzed for 297 of the 302 consented pre-adolescent-parent dyads. Most parents were white, partnered (includes the designation of otherwise partnered and married), and employed mothers with an average age of 42 years ($SD = 6.2$). Seventy-five percent were educated at the college level and above. Most pre-adolescents were white, first- or second-born, who reported having many friends, and perceived they were good students. The pre-adolescent’s mean age was 10.6 ($SD = 0.6$).

Individual and Environment Scaled Factors

In Table 3, we display the samples’ mean, standard deviation, minimum, and maximum scores and the percent missing values, MCAR, and alpha co-efficient for the PDS, PM, NEI, and Self-Esteem measures.

Boys, as expected (Ellison, et al., 2012), showed less pubertal development than girls. Adult and pre-adolescent scores on the NEI indicated they perceived the neighborhood positively. Self-esteem scores and reports of parental monitoring tended toward the high point.

Health-risk Behavior Prevalence

Research Question 1: Types and frequency of health risk behaviors. In Table 4, we display frequency statistics for girls’ and boys’ participation in the health-risk behaviors. The mean number of health-risk behaviors reported was 3.7 ($SD = 2.0$) and was similar among boys ($M = 3.8$, $SD = 2.1$) and girls ($M = 3.6$, $SD = 1.9$).

Based on the frequency data, we found few reports of alcohol and other drugs, tobacco, sexual, or health practices risk behavior. Therefore, we limit our further analysis of predictors to the injury risk categories. Two measures of risk were established – unintentional and intentional injury risk. Unintentional injury risk was a composite of the helmet and seatbelt items. The item, driving with a drinker, was not included in the composite because of the low occurrence. Intentional injury risk was a composite of the

feeling unsafe, having something stolen, and physical fights items. The items, weapon carrying, stealing, and suicide thoughts were not included in the composite because of the low occurrence. The composited items of unintentional and intentional risk behaviors were mildly correlated at $r = 0.324$, meaning a number of pre-adolescents engaged in both unintentional and intentional injury risk behavior.

Predictors of child health-risk behavior

All the relationships described below are depicted in Figure 2.

Research Question 2: Child factors and participation in unintentional and intentional injury risk behavior. There was a significant relationship between self-esteem and unintentional injury. Lower reports of self-esteem were associated with higher unintentional injury behavior ($p = 0.003$). There was a significant relationship between pubertal development and unintentional injury. Higher reports of pubertal development were associated with higher unintentional injury behavior ($p = 0.040$). Boys were 1.8 times less likely to use their helmets and seatbelts as girls. The data in support of these findings are summarized in Table 5.

Research Question 3: Parent monitoring and partner status and participation in unintentional and intentional injury risk behavior. As depicted in Table 5, pre-adolescents who perceived their parents monitored them were significantly less likely to engage in unintentional ($p = 0.025$) and intentional ($p = 0.034$) risk behavior. In other words, pre-adolescents were more likely to use seatbelts and helmets and less likely to feel unsafe, have something stolen, or physically fight with increasing perception of parent monitoring.

Pre-adolescents whose parents were not partnered were 1.73 times more likely to engage in unintentional injury behavior (not use helmets and seatbelts) and 2.68 times more likely to engage in intentional injury behavior (feel unsafe at school, have something stolen, and get in physical fights) than pre-adolescents whose parents were partnered.

Research Question 4: Parent and child perception of the neighborhood and predictions of participation in unintentional and intentional injury risk behavior. There was a significant relationship between parent's perception about the safety and quality of the neighborhood and unintentional risk behavior. Higher reports of parent's positive perception of the neighborhood were associated with lower unintentional injury behavior ($p = 0.035$). On the other hand, among the pre-adolescents, for each unit of change of positive neighborhood perception, they were 1.4 times more likely to engage in unintentional injury behavior (not use their helmet or seatbelt) relative to pre-adolescents who did not perceive their neighborhood positively.

Discussion

The aims of this paper were to describe the type and frequency of CDC-defined health risk behaviors and test selected child, family, and environment factors for predictive ability among a sample of 297 pre-adolescent-parent dyads. The pre-adolescents reported an average of 3.7 ($SD=2.0$) health risk behaviors, with the most frequently reported being unintentional (helmet and seatbelt use) and intentional injury risk behavior (feeling unsafe at school, having something stolen, and getting in physical fights). Boys were 1.8 times less likely than girls to wear helmets and seatbelts. Low reports of self-esteem and high reports of pubertal development were significantly associated with unintentional injury behavior. High reports of parent monitoring were significantly associated with lower unintentional and intentional injury behavior. Non-partnered parent status was associated with a 2.8 time likelihood of intentional injury behavior. Higher quality neighborhood perception among

parents predicted lower reports of unintentional injury behavior while among pre-adolescents it predicted higher reports of unintentional injury.

The data reported in this paper signal trends among pre-adolescents that should not be ignored. The number of reports of unintentional injury behaviors in both boys and girls is alarming and the potential predictors provide some guidance for prevention and intervention. A contributing factor to the trend may be the decreasing age of puberty (Ellison, et al., 2012).

Unintentional Injury Risk Behavior

More than half the boys (62%) and girls (50%) reported riding bicycles and skateboards without using a helmet, a rate that was better than the CDC and HBSC surveys. About a quarter of boys (27%) and girls (25%) reported riding in vehicles without using seatbelts, a rate that far exceeds the CDC and HBSC survey rates of 10%.

According to the literature, bicycle-related head injuries and automobile crashes with unbelted children lead to serious injury and death. Over a 16-year period, the US National Electronic Injury Surveillance System (NEISS) estimated 14,700 children each year required hospitalization after being seen in emergency departments for bicycle-related injuries, 34% of whom sustained head injuries. Children with head injuries were more than 3 times as likely to require hospitalization and almost 6 times more likely to have their injuries result in death than children with injuries to other parts of the body (Mehan, Gardner, Smith, & McKenzie, 2009). Head injuries account for more than 40 percent of bicycle related deaths, more than one-third of bicycle-related hospital admissions, and about one-third of hospital emergency room visits (Mehan, et al., 2009). The importance of seatbelt use is demonstrated by the finding that the most common cause of death for children aged birth to 19 years is motor vehicle crashes (CDC, 2012).

Consistent with the vicarious learning concept in Bandura's Social Cognitive Theory (Bandura, 2004), the literature reveals that parent role modeling is essential to children's unintentional injury behavior. Morrongiello, Corbett, and Bellissimo (2008) reported that parent teaching about helmets and seatbelts influenced practice among 7 to 12 year olds, but in predicting how children intended to behave as an adult, parent example emerged as the significant predictor of behavior. Ehrlich and colleagues (2001) reported that although parents were often unaware of their child's injury prevention actions, the pre-adolescents were acutely aware of their parent's expectations for safety practices. If a parent puts on a bicycle helmet or seatbelt when riding it is likely youth will.

We found the more advanced the pre-adolescent's pubertal development, the less likely he or she was to use their helmet and seatbelt. It is well documented that with increasing pubertal development increasing desire for independence follows. According to Berg and Westerling (2001), helmet use serves as an exemplar. Pre-adolescents might be waiting until they are old enough to be rid of their helmets and seatbelts thereby following the behavior of their parent(s).

Studies have demonstrated that when governments mandated seatbelt use for children and adolescents, use increased by an average of 7.2%. A number of programs have demonstrated an increase in helmet use, for example, helmet giveaways (Logan et al., 1998), education (Abularrage, DeLuca, & Abularrage, 1997), and police enforcement that included bicycle impoundment for non-helmet riding (Gilchrist, Schieber, Leadbetter, & Davidson, 2000). Though some may object to the infringement of personal freedoms or the use of public expenditures for monitoring these behaviors, results such as Australia's change from 31% to 75% use of helmets after one year is compelling (CDC, 1993).

We found the lower the self-esteem score, the less likely the pre-adolescents reported use of helmets and seatbelts. This finding is consistent with that of Juszczak and Sadler (1999) that high self-esteem was inversely related to health-risk behavior participation among youth. Other investigators have documented that older adolescents with low self-esteem report greater number of health-risk behaviors (Wang, et al., 2009). Pre-adolescents with low self-esteem may experiment with behaviors to fit in, maintain their status with a peer group, or try to stand out with their lack of seatbelt or helmet use (Chen, Thompson, & Morrison-Beedy, 2010; Whitaker & Miller, 2000).

We found that if parents perceived a positive neighborhood environment, pre-adolescents were likely to use their helmets and seatbelts. If pre-adolescents, on the other hand, perceived a positive neighborhood their helmet and seatbelt use decreased. There is some evidence that parents in safe neighborhoods may have fewer rules and be more flexible about enforcing them than those in less safe, quality neighborhoods (Guerra, Graham, & Tolan, 2011). Perhaps the youth did not know the parents' expectation or did not think they would be enforced (Bernstein, et al., 2003).

Intentional Injury Risk Behavior

Thirty-eight percent of boys and 32% of girls reported feeling unsafe at school; 34% of boys and 42% of girls reported having something stolen, and 31% of boys and 12% of girls reported physical fighting. This prevalence mirrors the CDC and HBSC findings with the exception of feeling unsafe at school which is higher in this study, most likely because our sample is young.

The finding that pre-adolescents with non-partnered parents were 2.68 times more likely to participate in intentional risk behavior is of concern. In the US, 34% of children live in single parent households (<http://datacenter.kidscount.org/> accessed 3-October, 2012). The literature confirms increased adolescent tobacco use (C. Berg, Choi, Kaur, Nollen, & Ahluwalia, 2009; DiNapoli, 2009), marijuana use (Hayatbakhsh, et al., 2009), unprotected sex, suicidal thoughts, and involvement in violence (Wang, et al., 2009) in single parent families. It is logical that non-partnered parents may not be in a position to vigilantly monitor their pre-adolescents that, in turn, may contribute to their feeling unsafe, not protecting personal items from theft, and fighting. The role of parent partner status in pre-adolescent health risk behavior merits further investigation.

Parent Monitoring

The pre-adolescent's perception of parent monitoring was the only factor predictive of both unintentional and intentional risk behavior. The literature reviewed linked parent monitoring to behavior such as alcohol, sexual (Manlove, Logan, Moore, & Ikramullah, 2008), and suicide (Bearman & Moody, 2004) risk among middle and older adolescents and seatbelt (Durbin, et al., 2007) and helmet use (Van Houten, et al., 2007) among young adolescents. The mechanism of parent monitoring --parent availability, communicating expectations, rule setting and enforcement, and knowledge of the youth whereabouts -- for alcohol, sexual, and suicide risk behaviors may apply to intentional injury behavior, but requires further inquiry.

Conceptual Model

Of the nine hypothesized factors, all but two demonstrated predictive ability. Despite evidence among older adolescents, number of friends (Forjuoh, et al., 2002) and school performance (Atkins, et al., 2002) were not significant predictors of unintentional or intentional injury among this sample of pre-adolescents. Because of the importance of social networks and academic achievement to typical development, these factors should continue to be included in future research.

Strengths and Limitations

The strengths of this study included a large random sample recruited from two settings, reliable and valid instruments, and little missing data. The use of a PDA and laptop computer contributed to complete data on most instruments. There is evidence that children in particular feel the privacy of their responses is enhanced with computer assisted survey interviews over paper and pencil surveys (Aquilino, Wright, & Supple, 2000). Therefore, we feel confident that the pre-adolescent's responses to the items were truthful and not under or over reported.

Several limitations are acknowledged. In the case of helmet and seatbelt use, youth are likely to have lapses in their behavior. If youth answered the items, 'Have you ridden a bicycle or used a skateboard, scooter or skates without a helmet' or 'Ridden in a car without a seat belt' honestly, even rare lapses could have inflated the percentage who reported this injury risk behavior.

All reports in this study are self-reports. The incorporation of behavioral observations would strengthen measurement.

The results are generalizable to white, partnered, employed, and educated Americans with a relatively high income. A more diverse sample would strengthen generalizability.

Recommendations

Based upon the findings from this study, several recommendations are offered.

First, parents in developed countries worldwide could be coached through healthcare providers or public health messaging that their behavior serves as a crucial example for pre-adolescents. Including parents in the development and delivery of such messaging may improve success. Likewise, messages that are appealing and compelling to youth need development. In the violence prevention literature, "street smart, savvy" digitally animated pre-adolescent characters based on stories from the pre-adolescents' personal experiences has been successful using social media (Vaughn et al., 2012).

The second recommendation is that the worldwide nursing community work toward public policy requiring regulations about helmet and seatbelt use, helmet giveaway programs, education, and sanctions for non-use. Helmet and seatbelt use by parents and pre-adolescents is a modifiable behavior with far-reaching implications for injury prevention.

The third recommendation is that the many universal, evidence-based, psycho-educational, self-esteem promoting, interventions be reviewed, adapted, and implemented among nurses who work with pre-adolescents and parents. Continued attention to the physical, emotional, and cognitive changes associated with puberty merit attention so that youth are educated and supported through this period.

Risk factors are offset by assets. High aspirations for the future, good health practices, and satisfactory parent youth communication (Oman et al., 2004), and having parents who are in a harmonious partnered relationship (Anderson, et al., 2009) are worthy factors for nurses to promote. The fourth recommendation, then, is that evidence-based programs to strengthen families be implemented by nurses in community settings. Promoting discussion among adults about topics of injury prevention and parent monitoring are warranted. Because non-partnered parents may not be able to afford parent monitoring strategies (i.e., child care, after school programs, camps), policies that result in economic opportunity for all should be supported by nursing organizations and individuals at all levels of society worldwide.

Finally, programs that target both parents and their pre-adolescent together have been successful to establish family climate, expectations, and rules that both child and parent have negotiated and made a commitment to implement (Forgatch, Patterson, Degarmo, & Beldavs, 2009). Assuming a bi-directional stance that includes both parties responsible for and affected by the behavior and its consequences promotes communication and problem solving (Riesch et al., 1993).

Conclusion

Pre-adolescents reported limited helmet and seatbelt use, feeling unsafe at school, having something stolen, and getting in physical fights. Pre-adolescents could be in harm's way if they and their families do not engage in practices to prevent unintentional and intentional injury risk. We documented self-esteem, parent monitoring, and neighborhood quality as modifiable, predictive factors to potentially target for intervention. The non-modifiable factors, pubertal status and parent partner status, could have less serious influences if society demonstrated perspective and political will.

Pre-adolescent engagement in health risk behaviors could be prevented. In the US and globally, public health messages to promote and policy to mandate and enforce helmet and seatbelt use are needed and we call upon organized nursing societies (American Nurses Association and International Council of Nursing) to endorse such policy. We call upon society in general to provide adequate and safe living environments for all families to prevent illness, injury, or death that could result from unintentional and intentional injury risk behavior.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Youth, Family, and
Environment Factors

Health-Risk Behavior
Participation

Figure 1.

Conceptual Model for Predicting Health-risk Behaviors in Late Childhood

*Reflect the Centers for Disease Control and Prevention categorization

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Figure 2.
The Probit Statistical Model for Predicting Health-risk Behaviors in Late Childhood

Table 1

Sample characteristics of parents.

Characteristic	N	%
Gender (n= 297)		
Male	36	12.1
Female	261	87.9
Race (n = 283)		
American Indian/Alaska Native	1	.30
Native Hawaiian or Other Pacific Islander	6	2.0
Black or African American	20	6.70
White	247	83.2
More Than One Race	9	3.0
Partner Status (n = 292)		
Single	17	5.7
Married	227	76.4
Otherwise partnered	13	4.4
Separated	9	3.0
Divorced	26	8.8
Educational Level (n = 293)		
Less than high school	8	2.7
High school graduate	13	4.4
Some college/Associate degree	50	16.8
College graduate	73	24.6
Some graduate education	36	12.1
Graduate/Professional degree	113	38.0
Missing	4	1.3
Employment Status (n = 293)		
Unemployed	42	14.1
Employed Part-time	91	30.6
Employed Full-time	152	51.2
Disabled, retired, not employed	8	2.7
Income (n = 288)		
\$9,999 or less	12	4.0
\$10,000 to \$19,999	12	4.0
\$20,000 to \$29,000	17	5.7
\$30,000 to \$39,000	13	4.4
\$40,000 to \$49,999	37	12.5
\$50,000 to \$74,999	67	22.2
\$75,000 to \$99,999	54	18.2
>\$100,000	76	25.6

Characteristic	N	%
Age of Mother		
Mean	41.90	
Standard deviation	6.16	
Minimum	25	
Maximum	67	
Age of Father		
Mean	45.29	
Standard deviation	6.96	
Minimum	35	
Maximum	59	

Table 2

Sample characteristics of the pre-adolescents.

Characteristic	N	%
Gender (n = 297)		
Male	146	49.2
Female	151	50.8
Race (n = 286)		
American Indian/Alaska Native	1	.3
Native Hawaiian or Other Pacific Islander	13	4.4
Black or African American	23	7.7
White	227	76.4
More Than One Race	22	7.4
Birth Order (n = 292)		
1st	160	53.9
2nd	83	27.9
3rd +	48	16.2
Youth Report of Type of Student (n = 288)		
Near the bottom	2	.7
In the middle	67	22.6
Above the middle	99	33.3
One of the best	120	40.4
Age (n = 297)		
Mean	10.55	
Standard deviation	0.57	
Minimum	9	
Maximum	13	
Number of Friends^a (n = 297)		
Mean	10	
Standard deviation	14	
Minimum	0	
Maximum	86	

^aReport of number of friends by youth was Winsorized by replacing extremely large numbers of friends with the 98th percentile value (Dixon & Tukey, 1968)

Table 3

Psychometric data for scales used to measure predictor factors.

Scale	# of Items	Mean (Standard Deviation)	Potential Minimum Maximum	Actual Minimum Maximum	% Missing Values	Little's MCAR ^a Test	Cronbach α
Boys PDS ^b	3	3.87 (1.03)	3 12	3 7	0%	-	0.37
Girls PDS	3	5.34 (1.70)	3 12	3 11	0%	-	0.63
Adult NEI ^c	12	40.15 (4.32)	15 60	27 51	5%	$\chi^2 = 113.6$, df = 94, p = 0.082	0.66
Youth NEI	12	37.00 (4.15)	15 60	25 46	25%	$\chi^2 = 252.5$, df = 290, p = 0.945	0.59
Youth Self-esteem	4	18.17 (2.18)	4 20	9 20	3%	$\chi^2 = 13.56$, df = 8, p = 0.094	0.79
Monitoring	7	32.41 (3.73)	7 35	14 35	2%	$\chi^2 = 84.6$, df = 68, p = 0.084	0.80

^aMissing Completely At Random.

^bPubertal Development Scale.

^cNeighborhood Environment Index.

Table 4

Prevalence of health-risk behavior by gender

Behavior	Boys			Girls		
	Missing ^a	Yes	%	Missing ^a	Yes	%
Unintentional Injury						
Without Helmet	4	91	61.5	5	69	46.3
Without Seatbelt	5	39	26.7	3	37	24.9
Drinking Driver	8	7	4.8	9	8	5.3
Intentional Injury^b						
Carry Weapon	6	3	2.0	5	2	1.3
Feel Unsafe	11	56	37.8	12	48	31.8
Stolen from	7	50	33.8	8	63	41.7
Stealing	9	14	9.5	13	9	6.0
Fight	11	45	30.4	10	18	11.9
Thoughts of kill self	10	7	4.7	13	11	7.3
Alcohol, Tobacco and Other Drugs						
Smoking	5	1	0.7	4	1	0.7
Cigarette—Puff	0	0	0.0	0	0	0.0
Cigarette—Whole	3	0	0.0	4	0	0.0
Chewing						
Alcohol	6	1	0.7	5	1	0.7
Marijuana	5	0	0.0	4	0	0.0
Inhalants	6	1	0.7	7	0	0.0
Street drugs	5	0	0.0	4	1	0.7
Sexual Curiosity						
Gone out	5	19	13.0	6	15	9.9
Held hands	8	20	13.5	6	21	13.9
Kissed	7	9	6.1	6	9	6.0
Health Practices						
Exercise	6	131	89.7	5	141	93.4
Lose Weight Quick	31	10	6.8	33	13	8.6

Behavior	Boys			Girls		
	Missing ^a	Yes	%	Missing ^a	Yes	%
Sleep in Hours						
Mean	8	9.9		7	9.8	
Standard Deviation		0.9			0.8	
Minimum		6.75			7.75	
Maximum		13.45			12.02	

^aMissing means pre-adolescent did not answer question.

^bThe original version of this instrument included swimming without a lifeguard. This behavior is no longer monitored by the CDC

Probit Co-efficients, standard error, and 95% Confidence Intervals for factors predictive of youth unintentional (composite of lack of seatbelt and helmet use items) and intentional injury behavior (composite of feeling unsafe, having something stolen, and physical fighting items)

Table 5

Variable	Unintentional Injury Probit Co-efficient, SE, (95% CI)	Odds Ratio	p	Intentional Injury Probit Co-efficient, SE, (95% CI)	Odds Ratio	P
School Performance	-0.103, (0.104) (-0.306, 0.100)	0.83	0.319	0.082, (0.108) (-0.131, 0.295)	1.16	0.449
Number of Close Friends	-0.003, (0.004) (-0.010, 0.005)	1.00	0.482	0.000, -0.288 (-0.002, 0.001)	1.00	0.773
Self-Esteem	-0.120, (0.041) (-0.201, -0.040)	0.81	0.003 *	-0.052, 0.048 (-0.148, 0.041)	0.91	0.268
Pubertal Development	0.118, (0.058) (0.006, 0.231)	1.24	0.040 *	0.051, (0.055) (-0.058, 0.159)	1.10	0.360
Youth Gender	0.325, (0.181) (-0.746, 0.140)	1.80	0.072	0.009, 0.051 (-0.326, 0.344)	1.02	0.959
Parent Monitoring	-0.044, (0.020) (-0.079, 0.000)	0.92	0.025 *	-0.050, (0.023) -0.096, -0.004	0.91	0.034 *
Parent Non-Partnered	0.303, (0.226) (-0.083, -0.005)	1.73	0.180	0.544, (0.234) -1.003, -0.085)	2.68	0.020 *
Youth Perception of Neighborhood	0.022, (0.023) (-0.023, 0.067)	1.40	0.344	-0.029, (0.023) (-0.074, 0.015)	0.95	0.200
Adult Perception of Neighborhood	-0.045, (0.021) (-0.086, -0.003)	0.92	0.035 *	-0.013, (0.021) (-0.055, 0.029)	0.98	0.555

SE is Standard Error; CI is Confidence Interval

* p < 0.05