

Prevalence of Working Conditions Associated with Adolescent Occupational Injury in the U.S.: A Review of the Literature

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Introduction

For millions of US adolescents work is a part of daily life. In 2011, 1.3 million 16- and 17-year-olds held formal, paying jobs [BLS 2011].

Substantial numbers of young people under the age of 16 also work [DOL 2000; Kruse and Mahoney 2000]. While the large majority of these youth return home safely at the end of each workday, others are not as fortunate. Even though adolescent workers are protected by numerous safety regulations and child labor laws, each year hundreds of thousands of workers under the age of 18 suffer from preventable work-related injuries [NIOSH 2006; NIOSH 2003] and one dies every eight days from an injury sustained on the job [BLS 2010]. And, as reported by NIOSH, an average of 42 deaths among 15-17 year olds were recorded for the period 1998-2007 [CDC 2010].

The literature on the epidemiology of adolescent work-related injury (WRI) is limited in comparison to that of adult workers, yet a solid knowledge base has been formed by over 20 years of research. Much of this work has been descriptive, documenting the nature, severity and sources of these injuries as well as the presence of hazardous working conditions associated with injury (e.g., use of particular equipment, working alone at night, the lack of health and safety training and supervision) [Greenberger and Steinberg 1986; Runyan et al. 2007; Delp et al. 2002; Zierold and Anderson 2006a; Runyan et al. 2006; Rauscher et al. 2011; Rauscher et al. 2012].

Some analytic studies have gone farther identifying both individual and work-based risk factors for adolescent WRI. In addition to characteristics such as age, gender, race and socioeconomic status [Rauscher and Myers 2008; Zierold and Anderson 2006b, 2006c; Belville et al. 1993; Brooks and Davis 1996; Horwitz and McCall 2005; Layne et al. 1994; Miller and Kaufman 1998], several work-based factors have been identified as putting adolescents at increased risk for WRI.

Among these are: working with equipment or tools [Zierold and Anderson 2006b; Frone 1998; Parker et al. 1994; Evensen et al. 2000; Brooks et al 1993; Mardis and Pratt 2003], working at a fast pace [Frone 1998; Evensen et al. 2000; Breslin et al. 2007] and working without proper supervision [Frone 1998]. All have been identified as risk factors for adolescent WRI. In addition, surveillance data have demonstrated that work in particular industries and occupations [Zierold and Anderson 2006b; Belville et al. 1993; Brooks and Davis 1996; Horwitz and McCall 2005; Layne et al. 1994; Miller and Kaufman 1998; Weller et al. 2003; Banco et al. 1992; McCall et al. 2007; Schober et al. 1988] and working without health and safety training [MDPH

2007; Knight et al. 1995] are associated with non-fatal adolescent occupational injuries. Working at night, cash handling and customer interaction have also been shown to be associated with increased risk of crime related assaults and fatalities [NIOSH 2003; Richardson and Windau 2003; Windau and Toscano 1994; Davis 1987; NIOSH 1995], particularly in retail and service settings [Moracco et al. 2000; Loomis et al. 2001; Peek-Asa et al. 2001; Jenkins 1996].

Evidence regarding the prevalence of these work-based risks is sparse, yet what is available indicates that many of today's youth are working under conditions that may put them at risk of injury. Below we outline the evidence for adolescent work-related injury risk factors and report on their prevalence as demonstrated in the literature.

Equipment/Tool Use

Evidence of Association: Several studies have demonstrated that using equipment or tools is associated with increased WRI risk among adolescents even after controlling for hours of work [Parker et al. 1994], and other correlates such as age, gender, personality traits, substance use, and a variety of work-quality related variables [Frone 1998]. Further evidence reveals that working with dangerous equipment and doing hazardous tasks better predicts WRI than does work setting (e.g. grocery, food service). After adjusting for individual characteristics, work schedules and a number of working conditions, Evensen et al. found that the amount of hazardous equipment use continued to predict WRI while work setting was no longer significant among youth working in retail settings [Evensen et al. 2000]. One recent study also showed that motor vehicles were responsible for 43% of all fatalities in North Carolina between 1990 and 2008 [Rauscher et al. 2011].

Prevalence: Despite child labor laws meant to prohibit youth from using dangerous equipment or tools, typical teen work settings contain a wide variety of such hazards. Studies characterizing the adolescent workplace show the following: 19% of young workers report using equipment they feel is dangerous; nearly half report using power equipment/tools; about one-third drive motor vehicles, use ladders or scaffolding, and forklifts; one-quarter use food slicers or fryers; and 17% operate heavy machinery [Runyan et al. 2007; Zakocs et al. 1998; Dunn et al. 1998]. One study of injured adolescent workers found that over one-third were working with equipment that contributed to their injuries--half of which was power-driven machinery [Knight et al. 1995]. More recent studies show that youth continue to be exposed to a variety of dangerous equipment and tools. In a study of young construction workers in North Carolina, upwards of two-thirds reported using sledgehammers, handsaws, box cutters, and power drills [Rauscher et al. 2012].

Fast Paced Work

Evidence of Association: Being required to work at a rushed or fast pace has also been shown to increase young workers' risk of injury [Frone 1998; Evensen et al. 2000; Breslin et al. 2007]. One study in particular showed that work pace remained a strongly significant predictor of WRI after controlling for age, gender, work setting, job tenure, night work, weekly hours, hazard exposures and tasks variability [Evensen et al. 2000]. In interviews with youth with inju-

ries treated in emergency department, 32% of the youths reported they were working quickly at the time of injury [Frone 1998; Breslin et al. 2007].

Prevalence: Few data exist on how many adolescents have jobs where they are required to work at a fast pace, but interviews with teens in the retail industry showed that 39% “always” or “often” felt rushed at work [Zakocs et al. 1998]. Runyan et al.’s (2007) national study of teens working in the retail and service sector showed that 43% of respondents reported that at least once a day they felt rushed to get their work done. Given the widespread employment of youth in food service and grocery stores [DOL 2000; NRC 1998] where fast, efficient customer service is crucial and work tasks are often timed [Garson 1988; Tannock 2001; Leidner 1993], it is reasonable to say that a good number of teens are working under conditions that require them to rush.

This is supported by Greenberger and Steinberg in their seminal work in the 1980’s, When Teenagers Work, in which they reported that most teens work in jobs where they are under “a great deal of time pressure and are expected to repeat a limited number of highly routinized tasks, quickly, efficiently, and without having to think very much about what they are doing” (p. 67) [Greenberger and Steinberg 1986]. In the more recent 2004 Youth Jobs Study conducted by Rauscher et al., where 279 youth residing in Massachusetts were surveyed, 73% of respondents reported that they feel they are required to work “very fast” in their jobs [Rauscher et al. in press].

Lack of Adequate Supervision

Evidence of Association: While evidence is very limited, working without supervision has been shown to be associated with adolescent WRI in at least one study [Frone 1998]. Using survey data from working adolescents, Frone demonstrated that supervisor monitoring and injury were negatively correlated [Frone 1998]. Although data on this relationship is sparse, health and safety experts, academics as well as NIOSH scientists suggest that young worker injuries often occur in the absence of adequate supervision [NIOSH 2003; NRC 1998; Runyan and Zakocs 2000]. Limited surveillance data support this assertion, however, Knight et al. found that among youth with work injuries treated in emergency departments 80% reported there was no supervisor present at the time of injury and 23% said they were working alone when they were injured [Knight et al. 1995]. A recent North Carolina study using medical examiner records showed that 35% of young worker fatalities occurred while the youths were working entirely alone [Rauscher et al. 2011].

Prevalence: Multiple surveys characterizing the youth workplace show a lack of supervision of adolescent workers [Runyan and Zakocs 2000; Runyan, et al. 2007]. Greenberger and Steinberg showed that teenage workers spend about 78% of their time outside “the immediate vicinity of an adult” and only about 12% of their time near a supervisor [Greenberger and Steinberg 1986]. More recent findings indicate lack of supervision is still a major problem in the teen workplace. Results from Rauscher’s Youth Job Study [Rauscher et al. in press], show that over 51% of teenagers reported that they work free from close supervision, while Runyan and colleagues found, in a national study of teens working in retail and service sector jobs, that over one quarter of working youth do so with no adult supervisor present at least one day a week [Runyan et al. 2007].

Runyan et al.'s study also showed that only 25% of working youth have supervisors that check on them once a day to see that they are doing their jobs correctly while 23% have supervisors that check on them at least once a week, but not every day. Likewise, a study of teens working in the construction industry in North Carolina, Runyan, et al. (2006) reported that most of the teens worked in settings with few employees on site; 54% indicating the business had fewer than six employees "usually present" at the worksite. Though most respondents indicated their work was checked more than once a day and that they were "told what to do and how to do it," nearly 20% of the respondents stated that they had worked completely alone, without being in hearing or sight distance of other workers.

Lack of Health and Safety Training

Evidence of Association: Evidence is limited on the effect of not having safety training and its relationship to WRI, yet two studies using surveillance data found that over half of work-injured adolescents did not have any health and safety training [MDPH 2007; Knight et al. 1995].

Prevalence: Research characterizing the work experiences of youth shows that between 33 and 45 percent of young workers have not received health and safety training [Runyan et al. 2007; Delp et al. 2002; Zierold and Anderson 2006a; Zakocs et al. 1998]. Data on the lack of training in one's rights as a worker is much more variable with one survey showing about 75% [Delp 2002] and another showing 28% [Zierold and Anderson 2006a] of young workers having no training on these rights. Though almost all teens working in construction in North Carolina reported receiving some form of training related to safety, 45% indicated they had received fewer than 4 hours of such training [Runyan et al. 2006]. A large majority (84%) of these youth reported having worked on tasks or under conditions that violated at least one state or federal child labor law [Runyan et al. 2006].

A companion study of 50 Latino teens working in construction jobs in North Carolina revealed that a quarter received no safety training at all and approximately a quarter received less than one hour of training [O'Connor et al. 2005]. Language barriers can often present challenges to training workers, and with a growing Latino population in the US, attention to providing language-appropriate training is in even greater need than before.

Several studies report information about training young workers to deal with potentially threatening situations related to workplace violence. Combining similar data collected in the mid-1990s from five sites, Runyan et al., noted that percentages varied widely among teens who reported having been trained to deal with angry customers (35-76%), to deal with a robbery (34-53%) and to deal with sexual harassment (21-33%) [Runyan et al. 2005]. Runyan's national study revealed that 60% had been trained to deal with an angry customer, 41% in what to do in the event of a robbery, and 63% in sexual harassment situations. In addition, approximately 60% reported they had been trained what to do if they were threatened or assaulted [Runyan et al. 2007].

It is important to point out that unless asked specifically about safety training topics, surveyed youth may report that they have indeed received safety training when in fact what they have received is *job* training [Zierold and Anderson 2006a]. Thus, results from youth surveys may underestimate the problem of working without safety training.

Work in Particular Industries and Occupations

Evidence of Association: Working in particular industries increases young workers' injury risk yet it is difficult to say exactly which industries are the most dangerous as industry rankings by injury rates differ depending on the study and its data source [Runyan and Zakocs 2000]. For example, one study using emergency department data ranked retail, manufacturing and construction as the industries with the three highest injury rates [Layne et al. 1994]. Other studies that used workers compensation data showed manufacturing to have either the first [Belville et al. 1993], second [Brooks and Davis 1996; Layne et al. 1994] or third [Horwitz and McCall 2005; Banco et al. 1992] highest injury rate and showed the retail industry to rank either first [Schober et al. 1988] or second [Banco et al. 1992]. In several cases, agriculture had the highest [Schober et al. 1988] or second highest [Belville et al. 1993; Horwitz and McCall 2005] injury rates.

Other studies have pointed to high rates in “personnel supply services” – indicating adolescent involvement as temporary workers in what is likely a wide variety of settings that are not differentiated in the data [Horwitz and McCall 2005; McCall et al. 2007]. In a survey of high school students where establishment type was compared, adjusted odds ratios for WRI showed that those working in restaurants (3.2), construction (3) and factories or offices (2.9) had the highest injury risks compared to those working in informal settings as babysitters (the referent group) [Weller et al. 2003]. Several fatality studies have shown that the majority of deaths among youth occur in construction and agriculture [Dunn and Runyan 1993; Rauscher et al. 2011].

When looking at differences in injury rates within particular occupations, studies reveal the same issues in determining their rankings as exist with trying to rank industries [Belville et al. 1993; Horwitz and McCall 2005; Banco et al. 1992; McCall et al. 2007]. A few consistencies do appear, however, with youth working as unskilled laborers or production workers often having the highest rates of injury [Belville et al. 1993; Horwitz and McCall 2005; McCall et al. 2007] and waiters/food counter workers having the second highest rates [Horwitz and McCall 2005; Banco et al. 1992].

A few cautions about interpreting rates of young worker injury by industry and occupation are in order. First, calculating actual rates per full time equivalent workers, no matter the job or industry, is difficult given that most teen workers do not work full time [DOL 2000]. Second, because teens change jobs more frequently than adults and may hold several different jobs at once, comparing injury rates between the industries and occupations in which youth are injured should be done with some caution [Runyan and Zakocs 2000; Runyan et al. 2005]. Lastly, when analyzing teens' risks of injury, it may be more useful to examine work tasks rather than occupations. This is because adolescents often work in jobs where they do a variety of tasks that do not conform to a neat definition of a particular “occupation.” For example, adolescents often work in fast food restaurants where they may cook food, unload trucks, clean the bathrooms, mow the grass, and work as a cashier [Runyan and Zakocs 2000; Runyan et al. 2005].

Prevalence: Employment in some of these high risk industries and occupations is common among youth. Several reports using government data [NRC 1998] show that the majority of youth under 18, approximately 60%, work in the retail industry where they work mainly in eat-

ing and drinking establishments (30%). Roughly 25% work in the service industry, chiefly in recreation and private households. Other high risk industries such as manufacturing (4%) or construction (3%) are far less frequently populated by young workers. The most common occupational categories in which youth work are service (39%) (e.g., food preparation) and sales (27%) (e.g., cashier) [DOL 2000].

Late Night Work, Cash Handling, and Customer Interaction

Evidence of Association: Little research has examined the risks associated with working late at night, cash handling, and customer interactions in adolescent populations. One recent study showed that 17% of young worker fatalities occurred after dark and two-thirds of homicides were committed in the course of a robbery [Rauscher et al. 2011]. Another showed that among youth who experienced workplace violence in the form of either physical or verbal assaults, customers were responsible for 31 and 55 percent of those assaults, respectively [Rauscher 2008].

Other studies have demonstrated that cash handling, working late at night and with customers and cash, are associated with increased risk of crime related assaults and fatalities among adult workers [NIOSH 2003; Richardson and Windau 2003; Windau and Toscano 1994; Davis 1987; NIOSH 1995], particularly in retail and service settings [Moracco et al. 2000; Loomis et al. 2001; Peek-Asa et al. 2001; Jenkins 1996] so it is likely that there are similar risks to youth who work under these conditions.

Prevalence: Data from studies of adolescent workers indicate that adolescents are employed in these risky conditions, suggesting cause for concern. Teens are overwhelming employed in the retail industry [DOL 2000, NRC 1998], which is a particularly risky industry for workplace violence [Peek-Asa et al. 1999; Janicak 1999]. Young retail workers report high rates of customer aggression [Tucker and Loughlin 2006]. Using survey data collected from workers between ages 14-17 from five sites in the U.S., Runyan et al., found that 10-12% of respondents reported working alone at night, with as many as a third reporting having worked after 10pm (this figure increases with the age of the adolescent) [Runyan et al. 2005]. A survey of NC Teens showed that 65% of respondents had worked between 7pm and 11pm and 14% had worked between 11pm and 7am [Evensen et al. 2000]. Evensen et al. reported that 70% of retail employees had worked after 7pm on a school night and 10% had worked between 11pm and 5am [Evensen et al. 2000]. In more recent work on teens in retail and service settings, Runyan et al. discovered that approximately 52% worked after 9pm and 10% worked after 11pm on a school night [Runyan et al. 2007].

Adolescent WRI Risk Across Industry and Occupations

Limited evidence exists as to how the above WRI risk factors are distributed across the range of industries and occupations in which many teens are employed. Below we present what is known on this topic.

Variations in Equipment Use

In terms of equipment/tool use, one study of young retail workers found that those employed in eating and drinking establishments were more likely than those employed in grocery stores or other retail stores to use equipment that they felt was dangerous [Zakocs et al. 1998]. Compared to grocery store or other retail store workers, food service workers have been shown to have greater exposures to the types of hazards associated with cuts and burns [Evensen et al. 2000]. Grocery store workers, however, have more exposures to fall hazards than workers in food service or other retail stores [Evensen et al. 2000]. A more recent study showed that young retail workers were somewhat more likely than service industry workers to report using power-driven equipment [Rauscher et al. 2008]. Those working in service, however, were somewhat more likely to report driving a motor vehicle and using heavy equipment but far more likely to report using a forklift (52% vs. 20%) than were retail workers [Rauscher et al. 2008].

Variations in Fast Work Pace

Fast paced work was shown in one study to differ between workers in food service, grocery stores and other retail settings [Evensen et al. 2000]. In focus groups with workers in these establishments, being rushed was a common theme discussed by food service and grocery store workers but rarely brought up by youth who worked in other retail settings [Zakocs et al. 1998]. In their earlier work, Greenberger and Steinberg also found that teens employed in food service jobs worked under the greatest degree of time pressure while skilled laborers generally worked under less time pressure than teens in other jobs [Greenberger and Steinberg 1986].

Variations in Supervision

While evidence of differences in supervision by industry is scant, several studies have addressed supervisory conditions in varied settings. One study of the entire population of North Carolina teens permitted to work in construction one summer (n=187), showed that most (54%) reported having worked on construction sites with few employees working on site, with 20% saying they had worked completely alone, without being in sight or hearing distance of other workers [Runyan et al. 2006]. A similar lack of supervision has been found in retail and service industries. Among a national sample of teens working in these two industries, 26% reported that they had worked without an adult supervisor present at least one day a week and 10% worked alone in either the daytime or at night [Runyan et al. 2007].

Variations in Health and Safety Training

Several studies show that receipt of health and safety training varies by industry. Within the retail industry, training on how to avoid injury is most likely to be given to those working in food service followed by those working in grocery stores and then to those in retail stores [Zakocs et al. 1998]. Another study found that training across these settings was fairly similar (restaurants-74%, grocery stores-72%, department stores-77%) yet was much higher than that reported among youth working in other settings including lumber yards (47%), lumber mills (34%), or tree-trimming/cutting operations (49%) [Zierold and Anderson 2006a]. Workers in tree-trimming and manufacturing were the least likely to be given training in worker rights while those in hotels/motels were the most likely to receive this training, followed by those

working in grocery stores and restaurants [Zierold and Anderson 2006a]. While not specific to safety, *per se*, clerical workers and skilled laborers receive eight times the amount of on-the-job training as that received by food service workers, and twice that received by store clerks, according to Greenberger and Steinberg [Greenberger and Steinberg 1986].

Variations in Late Night Work, Cash Handling and Customer Interaction

We have found little research that has investigated how youths' exposure to working late at night, cash handling, and customer interaction vary by industry and occupation. One study of child labor violations did find that the percentages of those who worked beyond the latest hour allowed at night was higher among those working in the service industry (22%) than among those in the retail industry (9%) [Rauscher et al. 2008]. Based on the nature of the business transacted in retail settings, we can expect that youth working in this industry sector are more likely to be exposed to cash handling and customer interaction than in many other jobs, yet many occupations in the service industry also involve customer or client interaction. Clearly, more research is needed in this area so that we may better understand how these risks differ for youth working in different settings.

Discussion

As indicated throughout this paper, the data used to understand adolescent work exposures and risk factors for injuries are sparse. The studies that do exist vary in covering different ages of adolescents and different types of work settings and industries. Definitions of injury and exposure are not uniform. As a result, comparisons of results across studies must be done with caution. Despite these limitations, it is clear that US adolescents are exposed to multiple types of hazards that can lead to work-related injury. These hazards include work practices such as work pace, inadequate supervision and training, as well as equipment use, working late at night, and working in settings where cash handling and customer interaction are common. Adolescents for whose language or cultural norms differ from the mainstream in the US require special attention, but the evidence to guide intervention with this population is even more limited.

There is much room for further investigation of the differences between work environments in which adolescents experience the most injuries and those where injuries are less common. Research should examine both the presence of physical hazards in the work environment and the social factors (e.g., supervision and training practices) that can influence worker safety, as well as the interactions between them.

Future investigations of work hazards and injury risk factors should differentiate the opportunities to enhance policies themselves as well as to improve the implementation and enforcement of existing policies. To the extent possible, investigators should try to anticipate changing work patterns that may accompany shifts in the labor pool and job market. Quality data should be obtained to assess both the benefits and risks of work by young people and compare with the benefits and risks of other activities in which they spend time, keeping in mind the overall goal of facilitating healthy and safe physical and psycho-social development.

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