

Possible Broad Impacts of Long Work Hours^a

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Abstract: The paper summarizes research linking long work hours to a wide range of risks to workers, families, employers, and the community. The risks are theorized to stem from less time to recover from work, longer exposure to workplace hazards, and less time to attend to non-work responsibilities. Risks to workers include sleep deprivation, poor recovery from work, decrements in neuro-cognitive and physiological functioning, illnesses, adverse reproductive outcomes, and injuries. Risks to families include delayed marriages and child bearing, and obesity in children. Risks to employers include reduced productivity and increases in workers errors. Mistakes by fatigued workers have broad reaching impacts to the community: medical errors, automobile crashes with other drivers on the road, and industrial disasters that damage the environment.

Key words: Work hours, Work schedule, Work schedule tolerance, Sleep, Occupational diseases, Occupational exposure, Occupational injuries, Job stress

Introduction

Long work hours are common in the United States. Jacobs and Gerson¹⁾ report 26% of men and 11% of women in the U.S. worked 50 h or more per week in 2000. According to Kuhn and Lozano²⁾, American men, especially high-wage, salaried and well-educated, were more likely to work long hours now than 24 yr ago. The combined work hours for U.S. couples have also increased by the equivalent of 12 wk of full-time work per year between 1970 and 2000, due to more women taking on paid employment over these decades¹⁾. Phipps *et al.*³⁾ report the combined work hours for 25% of U.S. married couples were more than 80 h per week.

The United States has few national regulations limiting work hours. Due to concerns for public safety, work hour limits have been established for transportation workers (www.nts.gov/Publictn/1999/SR9901.pdf page 3 - 4; for revised motor carrier hours of service see www.fmcsa.dot.gov/rules-regulations/topics/hos/hos-2005.htm). The U.S. Fair Labor Standards Act of 1938 dictates an increase in pay to

time and a half for hours worked over 40 per week for certain types of workers (www.dol.gov/esa/whd/flsa/). There are few other national regulations.

Incentives for long work hours influence both workers and employers. Incentives for U.S. workers include rewards of higher pay and prospects for advancement, as well as increasing the chances of keeping the current job by conforming to employer requests to work overtime²⁾. Employers' incentives include the need to meet demand for skilled workers where the supply of these workers is limited, to accelerate production schedule, to reduce the costs of hiring new employees during temporary surges in workloads, and to minimize the cost of employee benefits by working current employees long hours instead of hiring additional personnel^{4,5)}. A growing number of studies, however, raise concern because of possible links between long work hours and worker health and safety risks, as well as possible negative impacts for families, the employer, and the community.

Research indicates the effects of long work hours may be more complex than a simple direct relationship between a certain high number of work hours and risks. Effects of long work hours appear to be influenced by a variety of factors including characteristics of the worker and the job, worker control, pay, non-work responsibilities, and other

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characteristics of the work schedule such as time of work^{6,7}. Additional research is needed to determine more clearly the point at which the number of work hours becomes too long for various types of job demands and worker characteristics.

Caruso *et al.*⁸) theorize the risks of long work hours are triggered by several factors: less time to sleep and recover from work, longer exposure to workplace hazards and demands, and less time to attend to the family and other non-work responsibilities. These factors could lead to sleep disturbances, fatigue, stress, negative mood, discomfort, pain, and decrements in functioning. In addition, workers may have less time to exercise, and prepare and consume a nutritious diet. High stress may increase negative behaviors such as tobacco and alcohol use. Further, the aforementioned effects could increase the worker's risk for illnesses and injuries. Decrements in functioning and less time for family could negatively impact marriages and child rearing. Decrements in functioning could also negatively impact the employer through increased production costs and reduced quality of goods and services. Lastly, the community could be negatively impacted when fatigued workers make mistakes that damage other people and the environment such as medical errors, automobile crashes on the commute home, and industrial disasters. The purpose of this paper is to give a concise summary of the wide range of possible negative impacts of long work hours that have been reported in the literature.

Worker Health and Safety

Less sleep

An association between long work hours and shorter length of sleep or sleep disturbances has been a fairly consistent finding by many studies⁹⁻¹⁴) although not all studies¹⁵). Researchers theorize that restricting the length of sleep and disturbing sleep have detrimental effects to the endocrine system, immune system, and metabolism¹⁶). As a result, sleep deprivation resulting from long work hours could have broad-reaching negative effects on human functioning and health.

Fatigue, poor mood, poor recovery from work

Increased general fatigue has often been associated with long work hours^{9, 11, 13, 14, 17}). A laboratory study by Rosa *et al.*¹⁸) of a simulated manual assembly task reported increases in upper extremity fatigue with increasing time on shift. Van der Hulst *et al.*¹⁹) indicate workers with high demands and low control may be particularly vulnerable to feeling worn out and to feeling they are not getting sufficient time to recover from work. Long work hours have also been

associated with depression and confusion²⁰).

Decrements in neuro-cognitive and physiological functioning

Proctor *et al.*²⁰) reported auto workers working overtime had poorer performance on tests of cognitive function and executive function (the ability to prioritize and plan tasks). Karita *et al.*²¹) report decrements on tests of postural sway. Studies of medical residents working 24-h shifts or longer report declines in alertness, concentration, and attention^{22, 23}). Medical residents working 80 h per week showed impairments on tests of sustained attention, vigilance, and simulated driving that were comparable to functioning with blood alcohol levels of 0.04% to 0.05%, and, importantly, the residents did not recognize the extent of their impaired functioning²⁴).

Studies of 12-h shifts also report decrements in functioning, although not all studies report significant findings²⁵⁻²⁸). Macdonald and Bendak's²⁹) laboratory study found that a 12-h shift was associated with deterioration in grammatical reasoning and alertness compared to an 8-h shift. In a field study, Fischer *et al.*³⁰) report Brazilian petrochemical plant workers showed significant decline in subjective alertness at the 10th hour of work for both day and night shifts. Mitchell and Williamson³¹) also reported more vigilance task errors occurred at the end of 12-h day and night shifts when compared to the beginning of the shifts in Australian power plant workers, while no effect was reported for an 8-h schedule.

Health behaviors

Nakamura *et al.*³²) and Shields³³) reported long work hours were associated with increased odds for unhealthy weight gain. Shields³³) and Trinkoff and Storr³⁴) reported long working hours raised the odds for smoking and higher alcohol use, but not all studies found a significant relationship^{32, 35-36}). Mizoue *et al.*³⁶) found a significant decrease in the percentage of workers who participated in regular sports activity as overtime hours increased, but Shields³³) and Kageyama *et al.*¹⁰) reported no significant relationship.

Illnesses

Long work hours were associated with poorer perceived general health in three³⁷⁻³⁹) of four studies⁴⁰), and increased mortality in one study⁴¹). Two case-control studies of Japanese workers reported overtime during the previous month was associated with an increased risk for acute myocardial infarction^{42, 43}). Hayashi *et al.*⁹) and Iwasaki *et al.*¹⁷) reported significant increases in blood pressure, but some studies did

not report a significant adverse relationship^{35, 44}. One⁴⁵ of two⁴⁶ studies reported increased risk for development of diabetes mellitus. Overtime increased neck or musculoskeletal discomfort in two studies^{47, 48}, and 12-h shifts were associated with increased risk for back disorders⁴⁹.

Reproduction

A possible negative impact of long work hours on reproduction is subfecundity (defined by the study: time of 7.8 months or longer to pregnancy for couples who plan a pregnancy)⁵⁰. Meta-analysis of six high-quality studies by Mozurkewich *et al.*⁵¹ suggested a weak relationship between long working hours in pregnant women and preterm birth (Odd Ratio = 1.24 with a 95% Confidence Interval of 1.04 to 1.48).

Injuries

Folkard and Lombardi⁵² pooled findings from four studies examining risk for incidents across 1 to 12 h on duty. They estimate that 10-h shifts increased risk of injury by 13%, and 12-h shifts increased risk by 28%. Dembe *et al.*⁵³ report similar findings in a large, nationally-representative U.S. sample. Studies examining long work hours over many months or a year reported higher on-the-job injury rates in construction workers^{54, 55} and health care workers⁵⁶.

Impacts on Families

Jacobs' study⁵⁷ of U.S. college faculty reports their long work hours and intense competition to achieve tenure push many to delay marriage and childbearing. He found the majority of faculty remained assistant professors until their early 40's, an age associated with reduced fertility and probability of successfully becoming pregnant. Several studies report work/family conflict increases as work hours increase⁵⁸⁻⁶⁰. Phipps *et al.*³ report longer work hours for mothers increased the probability their children would be obese. The authors theorize several possible causes which could also be relevant to other aspects of child rearing. Parents may be less able to help children participate in physical activities and may rely on commercially prepared foods with higher fat and sugar content. Also, parents arriving home tired and fatigued may give in more quickly to the child's demands for desserts and junk food. Another impact of long work hours on family life that could be examined, according to Caruso *et al.*⁸, is the worker's relationship with his/her parents and grandparents: do workers have time to help aging family members?

Impacts on Employers

Research raises concerns about reduced productivity and worker errors when workers work long hours. For construction projects, Thomas and Raynar⁶¹ reported decreases in efficiencies of 10–15% for 50- and 60-h work weeks were due to inability to speed the supply of materials, lack of tools or equipment, congestion, mistakes and unintended events, changes, and rework. Hanna *et al.*⁶² discuss other negative aspects of long work hours for employers including higher pay rates at time and a half, increased absenteeism, and low morale. Also, workers on longer shifts may work slower to pace themselves^{62, 63}. Landrigan *et al.*⁶⁴ report increases in serious medical errors by interns working frequent 24-hour shifts, and Rogers *et al.*⁶⁵ report increases in patient errors by nurses working long hours.

Impacts on the Community

Links between long work hours and patient errors by medical residents, graduate physicians, and nurses⁶⁴⁻⁶⁶ raise concerns about patient safety. Due to these concerns, the Accreditation Council for Graduate Medical Education in 2003 limited work hours for U.S. medical residency training programs to 80 h per week. Debate continues whether these limits are adequate⁶⁷. Also, the Institute of Medicine in the United States⁶⁸ recommended work hours for nurses be limited to 60 h per 7-d period and 12 h per day. As of December 2005, public concern about long work hours of nurses prompted 12 U.S. states to enact legislation/regulations to prohibit employers from mandating nurses to work overtime and an additional 19 states have introduced similar bills (www.nursingworld.org/gova/state/2005/mandatory.htm).

Another public safety concern is fatigued workers making other types of errors that damage other people and the environment. Doctors, nurses, and other healthcare providers working long hours were found to be at higher risk for automobile crashes and as a result could be a danger to other drivers on the road⁶⁹⁻⁷¹. Sleepiness in commercial car and truck drivers is a significant public safety concern. Philip⁷² found that a high percentage of professional drivers were working very long periods without adequate sleep which means they are spending many hours driving while sleepy, putting them at risk for crashing their vehicles. Researchers also point out disasters such as oil spills and incidents at nuclear reactors have been attributed at least partially to fatigue from demanding work schedules^{52, 73}.

U.S. police officers work large amounts of overtime to

make off-duty court appearances, late arrests, write reports, and to work at special events. Tired police officers may be less able to deal with difficult and emotionally charged situations and people. Poor judgment in the execution of their jobs could pose a risk to society^{74, 75}).

Another negative impact on society is the loss of workers with critical public safety skills who quit their jobs and professions because of demanding work schedules. One example is the U.S. nursing workforce which is experiencing a critical shortage that is expected to accelerate by 2010 and after⁷⁶). According to Peter D. Hart Research Associates⁷⁷), long work hours are a top reason given by nurses for leaving their jobs.

Caruso *et al.*⁸) also suggests research examine other possible impacts on the community, such as reduced participation in civic organizations, voting, and church attendance. If long work hours lead to early disability as reported by Krause *et al.*⁷⁸), higher costs to the community could result from increased use of public assistance and higher health insurance rates.

Summary

Research evidence is mounting that link long work hours to a wide range of risks to workers, families, employers, and the community. The relationship between long work hours and risks appear to be complex and influenced by characteristics of the worker and demands of the job. Caruso *et al.*⁸) theorizes the risks stem from longer exposure to work hazards, less time to recover from work, and less time to tend to non-work responsibilities. Continued study of a broad range of possible impacts of long work hours will help clarify the point at which working long hours become a serious risk to workers, families, employers, and the community.

Disclaimer: The conclusions of this report are those of the author and do not necessarily represent the views of the National Institute for Occupational Safety and Health.

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