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# **Effective Design of Total Worker Health™ Interventions for Lone Workers Examples and Implications for the Irish Context**

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## **Abstract**

Workplace safety does not exist in a vacuum. Individuals come to work with a variety of advantages and disadvantages derived from their off-work activities. Extra-workplace behaviors and attitudes are likely to have greater impact for lone workers because such workers typically operate under less formal and informal oversight and receive less workplace support. The Total Worker Health™ (TWH) approach, advocated by the National Institute for Occupational Safety and Health (NIOSH) in the USA, integrates traditional safety and health protection within a broader health promotion focus that acknowledges interactions between health and well-being and workplace injuries. The current paper outlines features of the TWH approach and summarizes TWH interventions recently developed for truck drivers and home care workers. With this background, opportunities for the development of TWH interventions for Irish lone workers are considered.

## **Introduction**

Since 2004, the National Institute for Occupational Safety and Health (NIOSH) in the USA has sought to bring together the diverse range of expertise in occupational safety and health and worksite health promotion with a view to producing comprehensive solutions to workplace health and safety. This initiative culminated with the development of the Total Worker Health™ (TWH) approach: a research, practice, and policy agenda related to integrated worker health protection and health promotion (Pronk, 2013). TWH interventions are multidisciplinary and operate at multiple levels of the workplace, including the personal, group, organizational, and environmental level. Typical aims at the personal and group levels include education of individual workers in an attempt to build social norms supportive of worker health, for example through educational classes or one-on-one training programs. Interventions at the environmental/organizational level of influence aim to modify the work environment or organization in support of worker health outcomes (National Institute for Occupational Safety

and Health [NIOSH], 2012). The integration of interventions across these levels is intended to allow mutual facilitation of worker health and safety through positive feedback and support.

Lone workers have diminished exposure to social and organizational factors that promote healthy lifestyle behaviors, such as supportive supervision, organizational training, and peer social modeling, support, and reinforcement. Moreover, the structure of lone working is such that hazards are more likely and, when they occur, they are more dangerous. Risky hazards are more likely because lone workers typically receive minimal occupational safety support and, while their attention is focused on work tasks, they do not have a second pair of eyes that might identify imminent hazards. Hazardous outcomes are more dangerous because, for example, threats to health that might be mitigated by the presence of another (e.g., the effects of falls, inhaling noxious gases) may be enhanced through the incapacitation of the lone worker.

As mentioned above, lone workers are at increased risk to workplace hazards. Partially, this is due to characteristics of the jobs that lone workers do, but partially it is due to the limited support provided to lone workers on the job. TWH interventions are explicitly designed to address safety risks at both the personal and organisational levels and so seem particularly suitable for lone workers. The current paper outlines two recent TWH interventions for lone workers developed in the USA. The first intervention, SHIFT, was designed for truck drivers, a predominantly male group, with a high proportion of sedentary activity. The second intervention, COMPASS, engaged home healthcare workers, a largely female group with more variable job requirements. Following description of these interventions, the application of TWH interventions in the Irish context is considered.

## **Study 1: Safety & Health Involvement for Truckers (SHIFT)**

### *Background*

Truck drivers experience unacceptably high levels of fatalities, injuries, and lifestyle-related health problems relative to other occupational groups. In the USA, truck drivers account for 15% of all work-place fatalities and consistently rank among the top three occupations in total nonfatal injuries and illnesses (Bureau of Labor Statistics, 2007, 2008). In Ireland, the Transportation and Storage sector had the highest rate of injuries (51 per 1000) in 2011-2012 and accounted for 12.3% of all workplace injuries and illnesses (Health and Safety Authority, 2013). Injury rates have been consistently high in recent years and there were fatalities in the sector every year from 2008 to 2012.

The organization of the haulage industry exposes truck drivers to increased health and safety risks. In the USA, long-haul drivers may spend up to 11 hours of driving and 14 hours on-duty per day, and up to 70 total driving hours in an 8-day period (Federal Motor Carrier Safety Administration, 2005). Spending so long driving limits opportunities for exercise, and limited roadside food options (e.g., Truck Stops) encourage diets high in saturated fat and calories and low in fruits and vegetables. Long-haul truck drivers sleep approximately two hours less than typical adults (Mitler, Miller, Lipsitz, Walsh, & Wylie, 1997), due to long work days, sleeping away from home in sleeper berths that can be noisy and hot/cold, and variable schedules that can disrupt circadian rhythms. Moreover, sleep deficiencies interact with lifestyle factors. Sedentary lifestyle is associated with increased risk of sleep disorders, and in laboratory studies, sleep restriction to four hours resulted in a 20% increase in calorie consumption on the following days. With these factors in play, truck drivers have an obesity

rate that is more than twice that of the general population in the US (Sieber et al, 2014). Obesity and associated conditions such as diabetes and sleep apnea increase crash risk (Laberge-Nadeau et al, 1996; Stoohs et al, 1995; 1994), likely through causal pathways associated with fatigue and attentional lapses during long work periods.

Despite the foregoing personal costs to truck drivers and consequent financial costs to haulage companies, effective health and safety interventions for truck drivers are scarce. Education-based health promotion interventions for truck drivers have been limited in effectiveness (Holmes et al, 1996; Roberts and York, 1999). In the main, such interventions have relied upon passive training and have not provided significant motivational support. And while some more engaging approaches such as health counseling can produce better health outcomes for drivers (Kukkonen-Harjula et al, 2013), we are not aware of any interventions that integrate injury and crash prevention with health promotion for truck drivers. To address these research gaps, Olson and colleagues developed and evaluated the SHIFT (Safety and Health Involvement For Truckers) program through a pilot study (partially funded by NIOSH grant #5 T42 OH008433-02) and now a randomized controlled trial (ongoing, funded by NHLBI grant #1R01HL105495)

### *Participants and Setting*

In the SHIFT pilot study (Olson et al, 2009) truck drivers (N=29) were recruited from four trucking carriers based in the Pacific Northwest region of the United States. Participants had a mean age of 48.4 (SD = 10.1), a mean BMI of 38.9 (SD = 7.1), and were predominantly White (n = 28) men (n = 23).

### *Intervention*

The SHIFT project incorporated several proven intervention tactics that are well suited for isolated workers, but that had not been adapted for or evaluated with truck drivers. These included weight loss and safe driving competition, computer-based training (in eating, safety [including sleep], and exercise), behavioral self-monitoring (BSM), and motivational interviewing (MI).

### *Results*

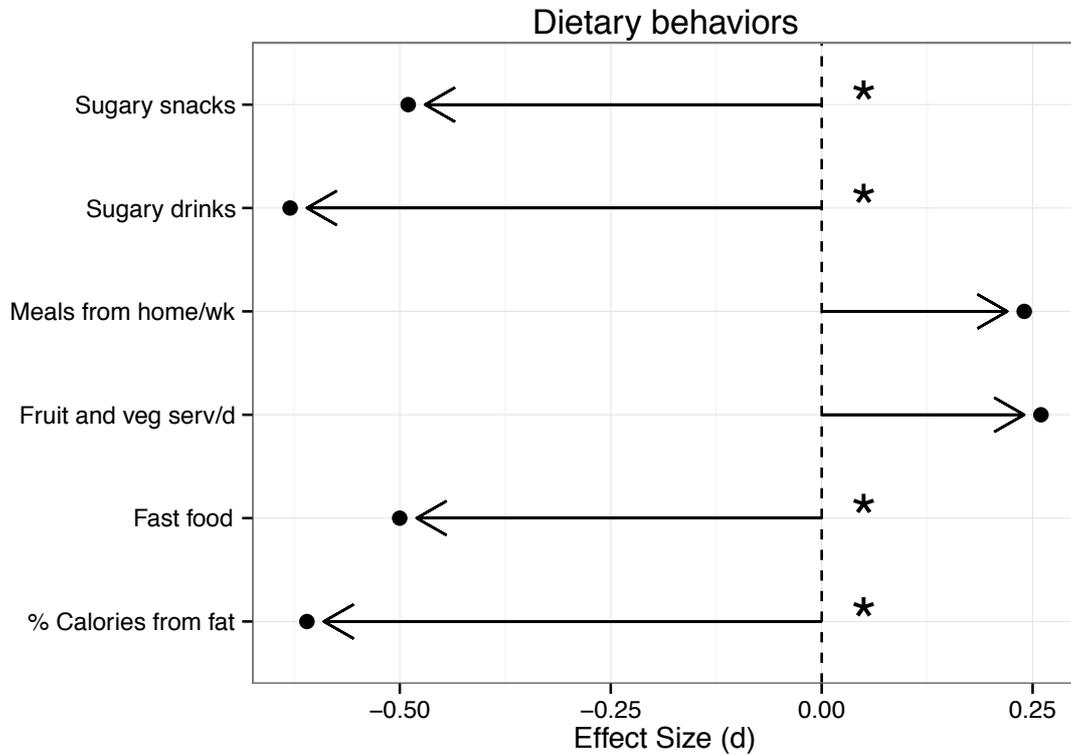
Attrition was relatively low with 75% of the sample completing the post-intervention health assessment (22 of 29). Pre and post scores on a series of health indicators are provided in the Table 1. Mean weight loss ( $t_{22} = 3.17, p = 0.005, d = 0.68$ ) and reduction in BMI ( $t_{22} = 3.01, p = 0.005, d = 0.61$ ) were statistically significant. Effect sizes were large and reductions were clinically significant, with drivers losing an average of about one unit of body mass index. Ninety percent of participants lost weight, with 55% losing 5 or more lbs during the intervention. Moreover, in a follow-up study 30 months post intervention the majority of drivers reported further weight loss post intervention (Wipfli et al, 2013).

**Table 1 Body Measurements Pre and Post SHIFT Intervention**

Measure	Pre	Post
Body weight (lbs)	271.25	263.46*
Body mass index	38.85	37.89*
Waist-to-hip ratio	0.94	0.92
Waist circumference (cm)	118.55	115.14*
Neck circumference (cm)	47.09	41.71

\* Asterisk denotes significant difference between pre and post ( $p < .05$ )

These health improvements stemmed mainly from changes in dietary behaviours (see Figure 1). For example, the frequency of drinking sugary drink dropped from “5 or 6 times a week” to “1 or 2 times a week” ( $p = 0.01$ ,  $d = 0.50$ ); eating sugary snacks dropped from “1 or 2 times a week” to “1 to 3 times in the past 4 weeks” ( $p = 0.03$ ,  $d = 0.60$ ); and eating fast food dropped from “1 or 2 times a week” to “1 to 3 times in the past four weeks” ( $p = 0.03$ ,  $d = 0.47$ ).



**Figure 1. Dietary behaviours post-intervention as a percentage of baseline pre-intervention levels**

\* Asterisk denotes significant difference between pre and post ( $p < .05$ )

A number of elements of safe driving were targeted in training and the competition aspect of the intervention. Two of the companies provided safe driving indices from prior to the intervention. From these values, z scores were calculated (Baseline = 0). Hard brakes per 10,000 miles driven reduced from 0.00 to -0.61 ( $t_9 = 2.78$ ,  $p = 0.02$ ,  $d = 0.88$ ). Drivers’ percent time overspeed reduced from 0.00 to -0.92 ( $t_{10} = 1.65$ ,  $p = 0.13$ ,  $d = 0.50$ ). For further details of study results, the reader is directed to Olson, Anger, Elliot, Wipfli and Gray (2009), and to Wipfli, Olson and Koren (2013).

## Study 2: Community of Practice and Safety Support for Home Care workers (COMPASS)

### Background

It is well documented that health care workers, especially those who lift and move patients, are at high risk for musculoskeletal injuries and symptoms (Magora, 1970). Rates of such injuries have systematically increased and, recently, the high prevalence of back injuries in health care

workers has been described as an “epidemic” (Galinsky, Waters, and Malit, 2001). In Ireland, the Healthcare and Social Support sector has above average illness and injury rates, with the fourth highest sector rates in both measures in 2012 (Health and Safety Authority, 2013).

Within the healthcare sector, home care workers are at even greater risk of occupational injury. Home care workers are predominantly female, older than 40 and they assist the elderly and disabled with self-care and mobility in private homes. They are often not very well paid, being self-employed or employed by their client, which raises stressful line management issues (Olson et al, 2014). As a consequence, they mainly operate as lone workers and lack supervision and typical organizational support structures, such as safety committees or health promotion programs. The job can be lonely and extremely demanding.

In the USA, the injury rate for home care workers is nearly four times higher than that of the average worker and they are at elevated risk for mental and physical health problems (Bureau of Labor Statistics, 2010). In addition to manual handling and healthcare-related risks, home care workers face many and varied hazards that stem from operating in private homes. In a Northern Irish context, Taylor and Donnelly (2006) noted that such hazards include access issues, hygiene and infection, manual handling, aggression and harassment, domestic and farm animals, infestation (e.g., fleas, vermin) and safety of home equipment.

### *Participants and Setting*

Nineteen workers (18 female, 13 Caucasian) were recruited from home care workers serving clients in publicly funded programs in the Portland Oregon metropolitan area. Participants have an average age of 57.3 yrs (SD=7.4), body mass index of 28.3 (SD=8.4), and 20.1 weekly work hrs (SD=13.9). Eighty-nine percent (n=17) of workers reported musculoskeletal pain interfering with work or living activities during past 3-months.

### *Intervention*

A considerable number of supportive interventions have been developed and tested for family home caregivers (see Sorenson et al., 2002 for a review). These interventions have not included home care workers (e.g., paid caregivers) and have primarily focused on improving wellbeing and knowledge of caregivers, without addressing illness and injury prevention. The COMPASS (Community of Practice and Safety Support) intervention is ongoing and organizes workers into neighborhood-based teams that meet regularly for education and social support. It integrates health promotion and protection topics, and uses scripted peer-led education methods (Elliot et al., 2007) and social support groups for caregivers (Toseland et al., 1990).

### *Results*

Process measures recently obtained suggest that the intervention was enjoyable and produced behavioral change. Average attendance was 81%, mean favorability rating was 4.2 on a 5 point scale (SD=0.2), and the average knowledge gain (pre/post meeting) was 17.6% (SD=3.0). Sixty-three percent (SD=18.7) of participants reported making behavior changes between meetings. Baseline levels of primary outcomes show room for improvement post-intervention. Self-reported experienced community of practice averaged 44.2 (SD=7.1) on a 60-point scale (60 = highest/best score), and physical and mental well-being averaged 9.3 and 9.2, respectively, on 14-point scales (14 = highest/best score). The sample averaged 2.6 (SD=1.4) days per week with 30 min of moderate exercise, 6.8 (SD=4.9) daily servings of fruits and vegetables, and 29.7% (SD=5.9) dietary calories from fat. Self-reported safety compliance averaged 4.3 (SD=0.7) on a 5-point scale (5=best). When asked to report new safety practices in the past 6 months, 16% (n=3) had adopted a new tool for lifting or transferring clients, 26%

(n=5) adopted a new tool for housekeeping, 42% (n=8) talked with a client about safety, and 47% (n=9) corrected a hazard in a client's home.

### **TWH interventions for Irish lone workers**

As mentioned previously, Irish truck drivers and home healthcare workers are at increased risk of illness and injury in the workplace relative to the average worker. Indeed, at the European Union level, there is recognition of the importance of truck driver safety. Legislation has imposed regulations (EU 3820/85 and 3821/85) on the trucking industry to improve driver safety. For example, these regulations limit the amount of time truckers are allowed to work during a 24 hour-period to a maximum of 9 hours per day, with the possibility of working 10 hours per day 2 days a week (Phillip, 2005). Perhaps the most obvious application of Total Worker Health™ interventions to the Irish context, however, is to the farming sector.

Internationally, agriculture is a very dangerous occupation (Von Essen and McCurdy, 1998). Farmers are exposed to a broad range of risks, ranging from using complex heavy machinery, animal handling, working with noxious chemicals, enduring prolonged exposure to hazardous weather conditions, and working in difficult terrain and physical circumstance. These risks can and do interact to create even more challenging working conditions. In the USA, the Farming, fishing, and forestry sector has the highest fatality rate of all occupational sectors (23.3 per 100,000; Bureau of Labor Statistics, 2014), and is approximately 50% higher than the next most fatal sector, Transportation and material moving (14.0 per 100,000).

In Ireland, farming is a highly valued occupation that is central to our national conscience and yet, farmers are by far the most likely occupation to die at work. Since 2008, the Agriculture, forestry and fishing sector has consistently had the highest rate of fatalities, with a rate of 29.2 per 100,000 in 2012 (Health and Safety Authority, 2013). This was four times higher than the Construction sector, which was the next most fatal (6.9 per 100,000) and fifteen times higher than the remaining sectors (all lower than 2 per 100,000). The figures for this sector include fisherman and foresters, but the majority of fatalities in this sector stem from farmers (e.g., 21 of 28 in 2012). The Agriculture, forestry and fishing sector also had the highest rates of illness in 2012 (48.7 per 1000), but the rate of injuries in the sector was relatively low in 2012 (18.7 per 1000). This relatively low injury rate seems out-of-step with the fatality rate and it is worth noting that injury rates in the farming sector have been underreported in previous years (e.g., 2010, see Osborne et al 2013). Indeed, Osborne and colleagues (2010) reported that 56% of a sample of Irish farmers reported musculoskeletal disorders in the previous year, which is line with research on farmers in Kansas (60%; Rosecrance, Rodgers and Merlino, 2006).

A number of features of the farming occupation and farmer demographics in Ireland suggest that TWH interventions are appropriate in this context. As outlined earlier, TWH interventions are particularly suited to lone workers. The overwhelming majority of Irish farmers (95%) are self-employed or family workers (Connolly, 2007). In such contexts, lone working is often the norm, which makes hazards more likely and the effects of hazards more extreme. In addition, the number of farms and those employed on farms have declined steadily since the 1990s. Farm size has increased by almost 20%, but farming activities now provide a much smaller proportion of gross household incomes than 20 years ago. Such tightening of resources increases financial stress, which negatively affects mental health directly (Peirce, Frone, Russell, and Cooper, 1996) and indirectly encourages unsafe decisions (e.g., "cutting corners").

In addition to developing and encouraging safe practices, TWH interventions focus on increasing overall worker physical and mental health and, thus, worker capacity to deal with occupational hazards. For example, enhancing social support is a common feature of TWH interventions and one that directly addresses aspects of lone working. Social support directly addresses mental health challenges (Pierce et al, 1996), enables safe practices to be transmitted through networks of lone workers and enables safety services to be provided more efficiently (e.g., providing a critical mass of workers for safety training). Such safety support initiatives would be facilitated by strong casual and formal networks of support that Irish farmers have traditionally maintained.

The demographics of farming in Ireland constitute an increasing safety challenge. In 2011, the average age of a farm-holder was 54.4 years, ranging from 49.7 years in dairy farming to 64.6 in Tillage (Teagasc, 2012). A significant portion of farmers, 20.6%, receive a pension, indicating that they are older than 65. For such a physically demanding job, increased age is a risk factor for serious injury and fatality. Of the 28 fatalities in the Agriculture, forestry and fishing sector, 20 (71%) were suffered by individuals over the age of 45 and 9 (30%) were over 65 years old (Health and Safety Authority, 2013). The focus of TWH interventions on physical health makes them especially useful for dealing with age-related hazards. Exercise and diet are the most effective defences against age-related deficits on cognitive and physical function (Park and Reuter-Lorenz, 2009; Rowe, and Kahn, 1987). By enabling farmers to improve their physical and cognitive fitness, TWH interventions will reduce the effect of aging and enhance and extend the voluntary working lives of farmers.

## **Conclusion**

Total Worker Health interventions broaden the focus of safety intervention from identifying hazards and developing safe procedures to a focus on positive physical and mental health outcomes that empower workers to deal with workplace hazards. TWH interventions have already been developed for truck drivers and home healthcare workers, two lone worker populations that endure high illness and injury rates in Ireland. Finally, Irish farmers constitute a lone worker population who are exposed to very hazardous environments, and, for whom TWH interventions seem particularly appropriate.

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