

Worker views on safety at roadworks

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Abstract

Roadworks in live traffic environments are hazardous to workers and road users alike. In an increasing body of international research literature, roadwork risks and hazards have been comprehensively examined. As in the broader field of road safety research, much of the work rightly takes a quantitative approach to assessing risk and related issues and to addressing the identified risks appropriately. In Australia, however, limited official data constrains the ability of researchers to achieve an in-depth understanding of the situation at state/territory and national levels based on traditional quantitative analyses. One way to enhance and supplement the limited available data is to consult those who are directly involved in roadworks for qualitative information, although such an approach is rarely reported in the roadwork safety arena. As part of the major study focusing on safety at roadworks in Queensland, 66 workers were interviewed about their perceptions and experiences regarding roadwork safety. This paper thus outlines a qualitative examination of workers' perceptions of the causes of roadwork incidents and the effectiveness of hazard mitigation measures. Consistent with findings reported in the literature is the view among workers that speeding is a major hazard and that police enforcement is the most effective countermeasure. Other hazards commonly observed by workers but less frequently reported elsewhere include driver distraction and aggression toward workers, working in poor weather and working at night. Workers mostly suggested educational measures to address distraction and aggression issues, though such measures are only tentatively supported in the literature.

Introduction

Workers and motorists are at heightened risk of injury due to the need to accommodate live traffic through roadwork sites. Crash rates on a given road section are typically elevated during roadworks compared with pre-work periods, while crash severity is often also higher. Much of this is known from the international literature, but the situation in Australia is difficult to quantify due to problems with obtaining accurate and reliable data. In Queensland, for example, crashes at roadworks are only reported in official crash data if the roadworks were considered a contributing factor in crash causation. This approach leads to an underreporting of roadwork crashes, a potential underestimation of the problem, and little scope to examine complex interactions of multiple variables and confounding factors in crash data. In such situations it is therefore appropriate to seek alternative and supplementary data as a means to better understand the challenges in improving roadwork safety. With that objective, this paper summarises a qualitative study in which workers were interviewed about their experiences and perceptions of roadwork risks, hazards, incidents and related safety measures. Readers may refer to full length papers published previously on this study for greater detail (Debnath, Blackman, & Haworth, 2013, 2015).

Method

Semi-structured interviews were conducted with 66 roadwork personnel, aiming to identify and explore common roadwork hazards, safety-critical incidents and mitigating measures (see

Appendix for interview schedule). Participants of varying age and experience were recruited from several Queensland sites with assistance from government and industry partners. A variety of roles and occupations were represented, including traffic controllers (25), managers, engineers and supervisors (21), machinery operators and labourers (15), and directors, planners and designers (5). Participants were mostly male (92%) and aged between 30 and 54 years (73%). The interviews were digitally recorded for later transcription, then thematically analysed and coded using Nvivo software. Detailed methodology is reported in Debnath et al. (2015).

Results

Common incidents at roadworks

The most commonly reported incidents involved public vehicle entering work areas. Such incidents were reported by 38% of respondents. Most of these incidents involved the public vehicle hitting a work vehicle, machinery, or worker (excluding traffic controller). Examples of this type of incident include vehicles missing a detour, failing to slow or stop at traffic controls, and driving into closed lanes. The second most commonly reported incident type (33% of respondents) was a public vehicle hitting a traffic controller. The third most commonly reported type of incident was rear end crashes (29% of respondents), most of which were reported to occur at the roadwork zone approaches. Typically, a lead vehicle had stopped or decelerated in response to traffic controls and a following vehicle failed to notice the traffic controller's signals, subsequently colliding with the vehicle in front.

While the three most commonly reported incident types involved public vehicles, the fourth most common type reported involved vehicles and machinery used by roadworkers. Incidents involving a reversing vehicle, mostly a work vehicle or machinery, were reported by 23% of respondents. In particular, roadworkers reported that they get used to hearing reversing beepers all the time, and therefore sometimes become desensitised to the alarms.

Common causes of incidents

The most commonly reported causes of incidents were interrelated and were therefore difficult to quantify in isolation in the current study (see the following section for a breakdown of hazards). Frequently interrelated factors included excessive speed, drivers ignoring traffic controls, and distracted driving. Driver inattention, including not noticing road signs, is likely an important factor in noncompliance with reduced speed limits at roadworks. However, while distracted driving may result in failing to notice traffic controls, it was noted that some motorists deliberately disregard signals and other controls despite having seen them. This is arguably most critical in regard to roadwork speed limits, the perceived credibility of which has been questioned, as reported elsewhere (Blackman, Debnath & Haworth, 2014a, b). Human errors including driver inattention and excessive speed have also been consistently identified as the major causes of roadwork zone crashes in the research literature (Debnath, Blackman, & Haworth, 2012), suggesting that the perceptions of roadworkers are largely accurate on this issue.

As noted above, the workers interviewed did not hold public motorists exclusively responsible for incidents at roadworks. Desensitisation to alarms, worker fatigue, worker arrogance and inattention, poor worksite organisation and unpredictable movement of machinery and work vehicles were also noted as potential or actual contributors to injurious incidents.

Common roadwork hazards

Hazards causing the most concern for respondents were related to driver behaviour. Reflecting the incident types and posited causes, about 60% of respondents reported that most drivers exceed roadwork speed limits in the absence of enforcement and that this was a primary hazard. Distracted driving, particularly mobile phone use, was reported as a common hazard by some (17%) and perceived as a major cause of roadwork crashes. Distracted driving was said to result in motorists disobeying or not noticing signage and traffic lights, which was a major concern to roadworkers. Some 27% of respondents also noted driver frustration and aggression, due at least in part to lengthy and frequent delays as a related hazard which influences drivers' speeding behaviour at roadworks. As well as influencing speed choice, driver frustration and aggression also resulted in verbal abuse, throwing objects, spitting, or threatening traffic controllers.

In terms of environmental conditions, working in wet weather was reported as a hazard by about 30% of the respondents, specifically due to slippery surfaces, reduced skid resistance, greater stopping distances and reduced visibility compared to dry conditions. Related to this, working close to a traffic stream was considered to be a hazard by many respondents (21%). Roadworks during night, dawn and dusk hours were also considered relatively dangerous by 21% of participants, while peak hour works were perceived to be more dangerous than those during off-peak hours. Working on hills and curved roads was perceived as unsafe by some (9% of respondents), mainly because of limited visibility and physical confinement. Often hilly roads and bridges have limited escape paths due to roadside embankments and/or barriers. About 11% of roadworkers found working on highways less safe than on urban or local roads, which was primarily speed-related. Large vehicles are very common on highways where often the reduced speed limit is 80 km/h, compared with 40 km/h on most urban roads. In addition, some traffic controllers (9%) reported that setting up signage was less safe on highways than on urban roads.

Measures to improve roadwork safety

Many participants suggested that currently available safety measures would be adequate if drivers complied with traffic controls and regulations. Clearly this condition is a substantial caveat to the notion of adequacy regarding safety measures, given the widespread documentation of poor compliance with roadwork speed limits. Nonetheless it suggests a perception among participants that measures to improve compliance will bring greater safety improvements than the introduction of new safety measures. Improving compliance with speed limits and other traffic controls can thus be seen as the top priority according to many roadworkers – views which are well supported by research evidence (Debnath et al., 2012). Participants in the study (52%) believed that police presence and enforcement was the most effective measure, reflecting the findings of other research (Arnold Jr, 2003; FHWA, 1998, Debnath et al., 2012). Respondents in the current study also felt that police presence and enforcement has little or no lasting effect once removed, which is also consistent with findings from other studies (Benekohal, Wang, Chitturi, Hajbabaie, & Medina, 2009).

Education and awareness campaigns were highly regarded by 33% of participants in the current study. Some participants claimed that there is not enough educational material for learner drivers regarding work zones, although this may not actually be the case. The Queensland road rules booklet (TMR, 2011) describes roadwork-related signage in the 'Hazardous localities' section. An informative brochure was also produced in 2008 to assist drivers' safe passage through roadwork zones (Queensland Government, 2008) and was

generally thought to have been positively received by its target audience (TMR, 2009) (although its impact may have diminished by the time of the current study). While there are some indications that education and awareness campaigns are at least potentially effective, a lack of formal evaluations makes it difficult to compare perceptions with research evidence (Debnath et al., 2012). However, given that one third of study participants were highly supportive of such measures, their direct involvement in designing and delivering educational material in potential future campaigns is worth considering.

Limited effects of static signage on improving safety and their credibility were highlighted by the participants of the current study. Participants recognised that the practice of leaving roadwork signs out when no roadworkers are present contributes to greater complacency and frustration among drivers. This has been noted in related studies within the current project (Blackman et al., 2014a, b). However, the consequences of leaving signage out while no work is being undertaken must be balanced against the risks involved in retrieving and later repositioning signage. A more detailed breakdown and discussion of the perceived effectiveness of safety measures is provided in Debnath et al. (2015).

Limitations

There are inherent limitations in this study as in virtually all studies that rely on self-report data. The perceptions and beliefs reported by participants may not have been entirely accurate in all cases and may have been somewhat biased in relation to their specific roles. However, given the general nature of the questions and the assurance that their individual responses would remain confidential, there was arguably little motivation for participants to give deliberately misleading statements.

Conclusions

This study fills a key gap in the literature on understanding the perceptions of road construction and maintenance staff regarding roadwork incidents, their causes, hazards, and mitigating measures. Results from semi-structured interviews with 66 roadwork personnel revealed that perceived hazards at roadwork sites arise from a range of driver, environmental, worker and equipment factors. Driver factors include speeding, distraction, confusion and lack of awareness, frustration and aggression, impairment, fatigue and general non-compliance with traffic controls. Environmental factors include rain and poor weather conditions, poor lighting, obscured vision, limited working space and noise (ineffective alarms, machinery noise). Worker and equipment factors were less prevalent in the overall findings, but included inattention, communication problems, machinery proximity and unpredictability, and worker ignorance and arrogance. Roadworkers perceived that improving credibility of roadwork signage and driver compliance with posted speed limits could mitigate many of the common roadwork hazards. Driver education and public awareness campaigns were also perceived as highly effective measures to improve roadwork safety.

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Appendix

QUESTIONS FOR SEMI-STRUCTURED INTERVIEWS (treat most as open-ended)

Work role information:

- For how many years have you been working on roadworks sites?
- For how long have you worked at this site? - (*full-time or part-time*)
- What is your main role at work? - (*e.g., Traffic control, machinery/vehicle operator, site supervision, site management, design*)
 - Do you have any other roles – if so, what are they?
- In which parts of the site do you do most of your work? – (*e.g., office, off-road areas, behind barriers, in traffic lane*)
- At what times do you do most of your work (*day/night, weekday/weekend*)?
- Do you move around the site on foot much during your shift, or do you generally stay within a small area or stay inside your work vehicle?

Characteristics of past incidents:

- Have you experienced, seen or heard of any serious incidents at roadwork sites? Can you describe what happened?
 - What do you think could be done to prevent this happening again?

Perceived effectiveness of safety practices:

- What safety practices are used at this site and how effective are they?
- What changes would improve the safety of your worksite?
 - Are there any effective measures you're aware of that are not used where you work?

Perceived hazards:

- In which situations at roadworks do you feel unsafe? – (*e.g., work time, weather condition, working far from other workers, exposed to traffic, others*)
 - What are the particular hazards or dangers in those situations?
- What do you feel is a safe distance? - (*Less than 3 metres, 3 to 5 metres, more than 5 metres*)
 - Do you think that vehicles travel too close past where you are working? - (*Never, rarely, sometimes, most of the times, always*)
- What do you feel is a safe speed? - (*Less than 20Km/h, 20-40km/h, 40-60km/h, 60-80km/h, above 80Km/h*)
 - Do you think that vehicles travel too fast past where you are working? - (*Never, rarely, sometimes, most of the times, always*)
- Are there any particular types of vehicle you consider more dangerous to you than others? - (*Car, Truck, Motorcycle*)
 - If so, why do you think these vehicles are dangerous? - (*e.g., Travels too close, travels too fast, frequently disobey traffic rules, any other reason*)

Demographic details:

- Age - (*<30, 30-54, 55>*)
- Gender