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Understanding internal and external influences on seat belt use in the oil and gas extraction industry

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ABSTRACT

Introduction: Motor-vehicle crashes (MVCs) are the leading cause of work-related death among U.S. Oil and Gas Extraction (OGE) industry workers. It is possible that seat belt use could have contributed to reducing MVC-related deaths. Although research has identified instances of non-seat belt use in this industry, reasons behind this behavior are not well understood. *Methods:* A convenience sample of OGE employees participated in interviews (n = 18 workers) and three focus groups (n = 9 supervisors). Instruments incorporated theoretical constructs from the Health Belief Model (HBM) to obtain perceptions and experiences that might impact work-related seat belt use. Worker and supervisor data were qualitatively analyzed and then triangulated to cross-validate findings and ensure data saturation. Themes were deductively aligned with HBM constructs. *Results:* Most participants reported always using their seat belts or observing employee seat belt use. Some participants acknowledged circumstances when they or others might not wear a seat belt. Four primary themes emerged: Situational risk and readiness, Company behavioral norms, Belief-based barriers, and Personal safety standards. Within each theme, several codes provided additional insights that aligned with HBM constructs including perceived susceptibility to experiencing an MVC and severity of the outcome; perceived barriers and benefits to using a seatbelt; and cues to action that prompted seat belt use over time. *Conclusions/Practical applications:* Our data suggest that worker knowledge of company programs and associated consequences of non-compliance, including supervisory enforcement, support seat belt use. State laws and technology found in company vehicles such as in-vehicle monitoring systems and phone apps also influence seat belt use. Future research may explore how to integrate these aspects into a driving safety program that serves as a comprehensive cue to action hence, enhancing perceived benefits of seat belt use, correcting misconceptions about barriers, and incorporating strategic messaging, training, and education during onboarding and at times of heighted perceived susceptibility and severity.

1. Introduction

Work-related motor-vehicle crashes (MVCs) can significantly impact workers and their families, communities, and businesses. In the Oil and Gas Extraction (OGE) industry, nearly all workers drive as part of their job. These workers might drive long distances from their homes to work sites and between work sites, putting them at increased risk of fatigue, crash involvement, and injury (Mason et al., 2015). OGE-specific research has documented that work-related MVCs are the leading cause of death in this industry (Hagan-Haynes et al., 2022; Wingate et al., 2023b). At the state level, research found that MVCs were the leading cause of work-related death among OGE drivers in New Mexico (Faturos et al., 2021). In 2022, the OGE industry had a MVC fatality rate of 6 deaths per 100,000 OGE workers (U.S. Bureau of Labor Statistics, 2024).

Workers employed in drilling oil and gas wells (North American Industrial Classification System (NAICS) 213111) and in support activities for oil and gas operations (213112) lose a median of 100 and 30 days from work, respectively, from nonfatal MVC injuries (U.S. Bureau of Labor Statistics, 2017). In 2019, all work-related MVCs cost U.S. employers $39 billion – $75,176 per nonfatal injury and $751,382 per death. Costs per employee associated with MVCs are among the highest in the OGE industry (Network of Employers for Traffic Safety, 2021). Although not specific to OGE, failure to use seat belts while on-the-job cost U.S. employers $1.7 billion in 2018. The cost per non-restrained injured or killed worker ($62,770) was almost double the cost per

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restrained worker (Network of Employers for Traffic Safety, 2021).

Research involving the general population (Kahane, 2015; National Highway Traffic Safety Administration, 1984) as well as worker populations (Eby et al., 2002; International Association of Oil and Gas Producers, 2023; Kim & Yamashita, 2007; Retzer et al., 2013) suggests that behaviors such as seat belt non-use, distracted driving, alcohol-impaired driving, and speed can impact the frequency and severity of crashes. OGE companies report that not wearing a seat belt often results in fatal outcomes in the event of an MVC (International Association of Oil and Gas Producers, 2023).

Studies addressing MVCs in OGE have provided seat belt use estimates, identifying some instances of non-seat belt use across the industry (Faturos et al., 2021; Wingate et al., 2023b; Witter et al., 2014). For example, a survey conducted among OGE workers in three states (Wingate et al., 2023b) found that 12% of participants reported not always wearing a seat belt. Another study analyzing health risk factors by industry and occupation reported that miners and OGE workers have a significantly higher prevalence of not always wearing seat belts when compared to other manual labor and nonmanual labor workers (Yeoman et al., 2020). Data on why workers in the OGE industry do not always use seat belts are limited. To our knowledge, only one study (Rothe, 2008) has focused solely on seat belt use behavior among OGE workers. Results from this Canadian study suggested that OGE workers tended to be situational seat belt users who buckled up to compensate for hazardous driving situations such as: (1) heavy presence of trucks on narrow roads, (2) poor visibility because of snowstorms, and (3) the threat of other drivers who may be fatigued or drunk.

Recognizing the limited and dated U.S. data on this topic, and the increased risk of death given a crash driving while unbelted, the National Institute for Occupational Safety and Health (NIOSH) prioritized research to understand the barriers and facilitators to seat belt use among OGE workers in its 2019-2026 strategic plan (NIOSH, 2022). Our study sought to identify perceived benefits and barriers to seat belt use among OGE workers by examining the ways in which external factors (e.g., company seat belt policies, in-vehicle technologies, and leadership) and internal factors (e.g., efficacy, values, perceived risk) intersect to support or discourage seat belt use among OGE workers who drive as part of their job. The Health Belief Model (HBM) was used to guide this study and identify potential intervention points for OGE employers.

2. Materials and Methods

2.1. Study Design

We used semi-structured interviews to identify and understand perceived benefits and barriers to seat belt use among OGE workers in the United States. The study included a convenience sample of small companies, defined as those with <100 employees, and large companies, defined as those with ≥100 employees. Cutoff points for company size were determined following guidance from National Occupational Research Agenda (NORA) OGE Sector Council researchers (NIOSH, 2025).

Researchers facilitated virtual interviews with workers and focus groups with supervisors of oil and gas wells and support activities for oil and gas operations companies. Hereon we use the terms drilling and well-servicing when referring to these companies. Researchers included supervisors to triangulate information provided by workers, as well as understand any organizational barriers to seat belt enforcement and behavior maintenance. The use of qualitative methods allowed for the collection of thoughts, opinions, and perceptions of study participants. This methodology also afforded the opportunity to probe relevant information provided by participants throughout the discussions, a drawback of quantitative methodology (Tashakkori & Teddlie, 2010) used by most seat belt use studies to date. This study was reviewed and approved by the CDC NIOSH Institutional Review Board (IRB)[1].

2.2. Recruitment

A convenience sample of OGE companies from across the United States that perform drilling (NAICS code 213111), and well-servicing (NAICS code 213112) were invited to voluntarily participate in this study. The Project Officer (PO) invited companies to participate during various presentations in Spring 2022. Twelve companies contacted the PO and three volunteered to make the study information available to their employees. Companies were emailed two sets of promotional materials to distribute: (1) a set for workers who drive as part of their job, and (2) a set for their supervisors. Interested employees were instructed to contact the PO separately so companies would not be aware of employee participation. Recruitment and data collection occurred from August 2022 to July 2023.

Workers. Upon contacting the PO by phone, the PO checked eligibility criteria, which included: employed by a well-servicing or drilling company with a written motor vehicle safety program, reached the age of majority in their state (i.e., 18 years old), drove as part of their job, and reported not always using a seat belt. Eligible workers were interviewed at a time convenient to them, outside of work hours. Participants received a $15 electronic gift card as a token of appreciation. Contact information (i.e., name, email, and phone number) was destroyed once participants received their electronic gift card.

Supervisors. When interested supervisors contacted the PO, they received a similar overview of the project. Eligibility criteria included: employed in a supervisory position with a well-servicing or drilling company, responsible for the implementation and follow-up of safety programs, including motor-vehicle safety programs, and reached age of majority in their state. Eligible supervisors were scheduled to be part of a company-specific virtual focus group. Focus group participants did not receive a token of appreciation because participation occurred during work hours. All contact information was destroyed once focus groups were completed.

2.3. Instruments

Two separate instruments were developed – a semi-structured interview guide for workers and a focus group guide for supervisors. Both instruments were based on previous literature around seat belt use and theoretical constructs (Şimşekoğlu & Lajunen, 2008; Tavafian et al., 2011; Janz & Becker, 1984). Specifically, instruments incorporated constructs from the Health Belief Model (HBM) (Becker, 1974; Rosenstock, 1974) to assess knowledge about seat belts and perceived attitudes, behaviors, beliefs, and external influences that might impact workers' decision to use (or not use) a seat belt, including technologies that may monitor compliance (e.g., in-vehicle monitoring systems (IVMS)). Focus group questions probed similar topics but also sought to better understand company programs addressing seat belt use, their implementation, and how seat belt compliance was assessed and enforced. See Table 1 for example questions as they related to HBM.

2.4. Participants

All participants provided verbal informed consent and agreed to be recorded. We completed 18 virtual interviews with workers (1:1 ratio). On average, interviews lasted 46 minutes. Three virtual focus groups with two to four supervisors were conducted, each lasted an average of 51 minutes. A facilitator and a note taker were present during each focus group. Focus groups were facilitated using the MS Teams platform. Interview and focus group audio recordings were transcribed and

[1] See 45 C.F.R. part 46; 21 C.F.R. part 56

Table 1
Health Belief Model Constructs and Definitions [adapted from Janz and Becker, 1984] with Example Interview Questions.

HBM Construct	Definition	Example Questions
Perceived Susceptibility	Perceived likelihood of experiencing a negative safety or health outcome (i.e., a subjective sense of risk)	• Compared to other drivers, what are your chances of getting injured or hurt while driving for work? • In the last six months, have you been involved in any motor vehicle [close calls, crashes] and if so, describe any behavior changes made as a result.
Perceived Severity	Perceived seriousness of the negative outcome including health, monetary, and social consequences	• Do you know people who have gotten hurt on the job while not wearing a seat belt? • What are potential consequences of not wearing your seat belt?
Perceived Benefits	Perceived effectiveness of the protective health action of interest in reducing risk or severity of the outcome	• What is your main reason for wearing a seat belt? • Describe a situation where you would wear your seat belt.
Perceived Barriers	Perceived challenges or negative outcomes such as cost, inconvenience, or side effects, that may deter the protective health action	• What is your main reason for not wearing a seat belt? • There may be situations when you might decide not to put on your seat belt. Explain.
Cues to Action	Triggers – both internal and external – that prompt engagement in protective health action	• What messages or other information do you receive about seat belt use at work? • Describe how your environment might impact your seat belt use.
Self-efficacy	Confidence in personal ability to act and execute the protective health action	• Tell me about any safety-related decisions that you make when you're getting ready to drive as a part of your job

combined with notes from the project team. Once the transcripts were completed, the audio recordings were destroyed via permanent file deletion.

Workers. All 18 workers who participated were males and 83% were 30 to 59 years old. Eight job titles were *driver,* which entailed driving water hauling trucks also referred to as "water bottles." The other 10 participants drove various pick-up truck models and reported job titles such as *field mechanic* and *electrician*. Workers reported driving as a part of their job for their current employer for an average of nine years (range: 6 months to 20 years) and an average of 14 years when considering all other jobs (range: 6 months to 33 years). The average daily miles driven ranged from 20 miles to 400 miles. Workers reported driving on a variety of road surfaces, terrain, and weather conditions. Differences in driving conditions by geographic location were reported. For example, those in the Northeastern part of the United States reported driving on roads with twists, turns, and hills, on curvy roads, and in snowy and icy conditions.

Supervisors. Nine supervisors participated in three focus groups with each focus group representing a participating company. Two companies provided drilling services and one well-servicing. The companies operated in West Virginia, Pennsylvania, Texas, and Oklahoma. All three had a motor-vehicle safety program in place at the time of data collection. We did not collect demographic information from focus group participants; however, during focus group introductions participants shared their job title and supervisory experience. Time worked in their current management position ranged from 2 months to 15 years, although combined with previous experience some had over 20 years of supervisory experience.

2.5. Analysis

Transcripts were independently coded by two researchers using qualitative analysis methods (Boyatzis, 1998; Charmaz, 2006; Corbin & Strauss, 2008; Pope et al., 2000; Saldaña, 2015). Several phases of coding were used to separate, sort, and synthesize the information to identify patterns and respective themes within the interview and focus group transcripts. The worker and supervisor data were coded separately and then triangulated to cross-validate findings and ensure saturation across patterns. Triangulating the data also helped reduce bias by providing multiple vantage points for topics of interest (Tashakkori & Teddlie, 2010). The 18 interview transcripts were analyzed first, followed by the three focus group transcripts.

The analysis phase followed a series of iterative coding steps (Charmaz, 2006; Boyatzis, 1998; Saldaña, 2015). First, during initial coding, we read, reread, and labeled potentially relevant pieces of data within each transcript to further compare and synthesize across transcripts. Then, focused coding grouped similar quotes together to identify patterns and conceptualize themes. During this phase, our conceptualized themes were deductively aligned with HBM constructs, which informed the nomenclature used in the codebook. From this deductive standpoint, we moved from describing the findings to articulating construct links between wearing/not wearing a seat belt. Finally, constant comparison coding was used to examine the grouped themes against each other for similarities and differences. This not only added depth to our understanding of the data but became an important aspect when triangulating and integrating focus group codes with the interview codes in each theme.

The two researchers met before and during each phase of the coding processes described above to discuss identified patterns, spending approximately six hours discussing the themes and codes. The themes and codes were organized into a codebook in Microsoft Word, consisting of the theme, theme definition, respective codes, code definitions, and examples to illustrate each code (see Table 2). This codebook and a sample of the deidentified transcripts were shared with two other researchers for inter-rater reliability review, discussion, and final verification. Once the two reliability coders reviewed sample transcripts and the codebook, the four researchers met to discuss and update the codebook. Most of these interrater discussions focused on negative case analyses to prevent premature conclusions or confirmation bias within the data (Fife & Gossner, 2024). This resulted in the removal of two codes from the codebook that did not have enough feedback across participating companies.

Originally, researchers estimated that up to 60 participants might be necessary to achieve saturation based on the lack of published qualitative research on OGE driver seat belt use. However, as the researchers debriefed the interviews and focus groups using handwritten notes taken during the calls, saturation was achieved from a frequency perspective

Table 2
Summary of Emergent Themes and Codes from Participating Workers and Supervisors.

Theme	Definition	Codes
Situational Risks and Readiness	Response to unexpected hazards or incidents on the road, influenced by work experience and awareness of external risks.	• Road Hazards • Incident Exposure
Company Behavioral Norms	Procedures and practices to ensure compliance with policies.	• Technology use and influence • Carrots and sticks
Belief-based Barriers	Instilled beliefs around seat belts as protective equipment	• Being trapped • Micro-trips
Personal Safety Standards	Personal and social meanings attached to seat belt use	• Confidence in seat belt efficacy • Evolving norms and mindsets • Pride in protection

early in the data collection process. In other words, participants reported shared, perceptions, experiences, and practices with little feedback deviating from the theoretical constructs of interest (Corbin & Strauss, 2008). It is possible that data saturation was reached sooner because of this homogenous sample of one industry group who performed one specific task (i.e., driving) as a part of their job.

3. Results

Researchers used semi-structured interviews and focus groups to better understand the possible ways in which company seat belt programs, technologies, and leadership might intersect to support (or deter) seat belt use among OGE workers who drive as part of their job. Most participants reported always using their seat belts while driving for work or always observing employee seat belt use. A few participants from both groups (i.e., workers and supervisors) acknowledged circumstances when they or others might not wear a seat belt. Four primary themes emerged from the analysis. Because the feedback was consistent between groups, results are presented together, delineating whether sentiments came from workers or supervisors. Within the themes there were several codes that provided additional insights into HBM constructs (Table 2).

3.1. Situational risks and readiness

In expressing their desire to always be prepared while driving, participants acknowledged the likelihood of unexpected hazards and potential incidents in their environment. In many cases, defensive driving behaviors encompassed using a seat belt while driving their vehicle. Participants discussed specific hazards that they personally experienced or heard about, which functioned as a cue to action around initiating or continuing seat belt use. Redundant areas discussed were roadway hazards and experiencing, witnessing, or hearing about an incident.

Road hazards. Road hazards that influenced participant's decisions to wear a seat belt included winding roads, steep hills, spills, presence of animals, school zones, potholes, and snow and ice patches. One worker described leased roads as being particularly steep, increasing the risk of missing gears and rolling backwards. Another worker expressed, *"But if you had poor conditions like bad rain, … snow or anything like that, it increases your chances of an accident a lot more than just driving on dry roads" (Interview 02W05)*. Alternatively, many participants noted that, if driving on a straight roadway/highway, they felt less at risk for experiencing a negative outcome on the road and consequently, some drivers may forego a seat belt during these road conditions.

Incident exposure. Participants noted the influence of MVCs and close call experiences on their decisions to wear a seat belt, often referencing them as a "lifesaver." In cases where there were serious injuries or deaths and seat belts were not worn, participants usually acknowledged that a seat belt could have helped reduce the severity of the outcome. One worker commented, *"I've actually had a seat belt save my life before. I was in a vehicle rollover back in early 2000's where my passenger was ejected but my seat belt kept me in the vehicle" (Interview 02W04)*. Another worker recounted when a driver lost traction in his truck and jumped out the passenger window, getting pinched between the truck and a cliff.

Similarly, a supervisor who used to not wear his seat belt shared:

> *…so for a while I did not wear [a] seat belt because I was like, well, the thing's worth nothing. … but I race cars and in every sanctioning body, you have to wear a seat belt. And after I wrecked in a sanction body race and felt the impact of the seat belt, I was like, you know what? These things kind of make a little sense now. (Focus group 02M)*

Although these experiences do not denote causation or correlation, it was evident across the discussions that varying levels of individual risk perception played a role in subsequent seat belt use.

3.2. Company behavioral norms

This theme entails procedures and practices deployed at the organizational level to ensure seat belt use among employees. Various IVMS technologies, including mobile apps and cameras, were referenced for seat belt monitoring and other driving behaviors such as speed. Participants detailed various consequences of following or not following rules, all of which influenced seat belt use and other safety behaviors. Workers and supervisors shared similar sentiments of workplace safety programs, including their implementation and influence on safety and health perceptions and behaviors.

Technology use and influence. Participating workers discussed IVMS that served as a surveillance tool to track and record employee seat belt behavior (i.e., not wearing a seat belt or pulling the seat belt behind them after interlocking it). Although participants indicated already wearing a seat belt, for some, the presence of IVMS reinforced the behavior. As one worker put it, "*We got a camera on us 24/7 when we're in the truck, so we always got to wear it*" (*Interview 01W07)*. Participating supervisors verified and discussed how IVMS supported workplace safety initiatives. Some participants shared ways that IVMS recorded data are used to ensure compliance with seat belt use indicating, *"We have safety guys, and they review. They do periodic reviews of our cameras and our trucks. They'll pull a couple of camera cards here and there. And they'll watch them just to see if we're putting on our seat belts" (Interview 01W03)*.

Participating workers also reported having a phone app that guides them through a checklist of safety activities, including seat belt use, that they use when driving for work. Along these lines, supervisors noted that tracking devices, IVMS, and phone apps are often used to assist them in disseminating safety-related information.

Carrots and sticks. Desired safety behaviors were rewarded and negative behaviors discouraged by using verbal warnings, writing up or terminating employees, or removing a safety bonus. When discussing consequences for noncompliance, one worker said:

> *They will call you and say you [are] not wearing a seat belt, and they'll give it to the supervisor or alert the supervisor and safety [manager]. There'll be an incident and you'll be reprimanded… There's a fine involved if you don't. And like I got to work, it's company policy. So, we get a safety bonus. So, I'd rather stay with our policy. That way I can get a bonus. (Interview 01W07)*

Other repercussions shared were verbal reprimands and additional training requirements or driving courses to reinforce desired safety behaviors. All three participating companies had programs to protect workers from hazards associated with operating a motor vehicle. As one supervisor stated, "*Our policy here is pretty simple. If your [inaudible] brakes are released, it doesn't matter if you're just moving on the path. Our policy is that your seat belt [has] to be on when the truck is in motion." (Focus group 01M)*

Although not prevalent or shared across all participating companies, workers and supervisors from one company discussed their bystander intervention program that recognized peer-led communication. Under this program, if workers observe noncompliance with safety requirements, including seat belt use, they are encouraged to approach coworkers to help remind and reinforce the company's safety rules using provided talking points. Company supervisors acknowledged that they may reward workers who actively intervene to prevent risky behaviors.

Relatedly, supervisors indicated that their companies have a zero-tolerance policy on seat belts. One supervisor stated:

> *The drivers are aware of the documentation and of course it's kept in their records. If it's a problem child, then it is addressed from there because sometimes these guys will take off in the truck and they're snapping their seat belt as the truck is in motion. That will come up as a violation…Our safety guy, head safety guy, does not tolerate that at all. You need to be buckled in prior to that truck being in movement. (Focus Group 01M)*

Because seat belt use was the norm, supervisors noted that violations were rare. However, that participants often drew from national or state seat belt laws as a caveat in their feedback, expressing that workplace policies themselves aren't the sole factor that influences behavior.

3.3. Belief-based barriers

If participants reported [rarely] not wearing a seat belt, it was mostly on their personal time or as past behavior. However, there were a couple scenarios mentioned where seat belt noncompliance might be higher.

Being trapped. Participants shared examples of people they knew getting trapped inside a vehicle during an incident because they were wearing a seat belt, perceiving their use as potentially harmful. One participant knew people who were entrapped by their seat belts stating, *"I've known people who actually died from their seat belts. You know, trapping them and they couldn't get the seat belt off. Strangled by the seat belt" (Interview 01W03)*. Along a similar vein, some participants reflected a viewpoint that if a truck is going off the road, one quick exit strategy to survive involves unbuckling their seat belt. The example below illustrates this sentiment:

> *Years ago, I had a friend of mine, a coworker at a different company. Um, he had a bad habit of taking his seat belt off when he was going down the lease road. And the reason he did it is because he was always scared. And he thought that if he lost control of the truck, his best course of action was to jump out of the truck instead of riding off the cliff. (Interview 01W06)*

While this was a common hypothetical situation, some more commonly occurring scenarios were also discussed.

Micro-trips. Participants repeatedly discussed driving short distances or getting in and out of their vehicle often as scenarios when OGE drivers might not wear a seat belt. Participants indicated either personal or observed annoyance at constantly taking a seat belt on and off and the perceived lack of need to wear it during short drives that were not on a public road. One worker explained,

> *If I'm getting a vehicle to move it like a couple of feet, then I probably won't put my seat on. … just because it's redundant. It's not going to really protect you if you have to move a vehicle like 4- or 5-feet. Um, it's safe to move the truck just a little bit. (Interview 02W07)*

Another common scenario involved opening and closing gates, discussed by another worker:

> *…Every pad that I go to, I have to, I have to jump out of my truck and open the gate and drive through the gate and jump back out of my truck and close the gate and then jump back in my truck and to go get a load of water. I'm out, in and out of my truck six times just to get the water. And then I got to go to deliver it. And then … if I'm on a land, an old property that's got three gates, then I have to get out two times for each one of them gates. So that'd be six times. And then I have to do it six times coming out. So, there's 12 times. (Interview 01W03)*

Supervisors also brought this up as a specific instance, sharing that workers find it "*monotonous to put a seat belt on to drive the length of the truck" (Focus group 01M),* specifically pertaining to opening and closing a gate. Consequently, supervisors expressed the importance of serving as a role model for workers and leading by example. For example, one supervisor shared and agreed that putting a seat belt on when moving trucks in and out of a garage 10 feet at a time can be annoying. But he stated, "*We still put on the seat belt, and we'll move it to ten feet and then set the brakes on it and take the seat belt off. I myself have done that multiple times. And yes, it's redundant and kind of silly, but that's policy. It's that simple" (Focus group 01M)*. Participating supervisors indicated that, if they do not wear a seat belt during these tasks, their employees would not either.

3.4. Personal safety standards

There were a couple patterns that captured participant's beliefs that seat belts can save lives, positioning them as a type of personal protective equipment (PPE) on the job.

Confidence in seat belt efficacy. Participants personally believed that seat belts were effective in saving lives. When asked his thoughts about seat belts, one worker said: *"… It's gonna save your life. You won't go flying out of the window or you won't kiss the steering wheel, or you won't kiss the dash" (Interview 01W09)*. Because most participants noted the efficacy of seat belts, they tended to indicate that little would deter them from wearing it. For example, one worker expressed, *"I wear my seat belt. I don't want something that's stupid to kill me. No, just to be safe and it's too preventable to die from not wearing one. Just to protect myself. … A vehicle is moving. I have it on" (Interview 02W01)*. Supervisors also believed in the benefits of seat belt use and made sure their employees used them.

Evolving norms and mindsets. Participants identified that younger and older drivers can be divided by generational differences. They discussed the evolution of trust in seat belts among older participants who grew up without seat belt laws. One worker shared:

> *I think a lot of it is just my generation. We never had seat belts. We never were brought up that way. I'm still here today. That's how I look at things… The younger generation pretty much just puts them on. They just, I mean, they're all about seat belts. The older generation, they're more like, I think it should be a choice thing. (Interview 01W02)*

Relatedly, a younger worker shared, "*My attitude changed when I was about 22-years old to always wear a seat belt no matter the scenario whenever I'm in a vehicle."* Although the notion of one group being "safer" was not referenced, driver maturity was often akin with worker experience. One worker alluded to this, explaining, "*I believe that's because of my maturity. My years in the industry. I'm driving for 16 years for multiple companies. I just spent, before I came to this this position, I spent four years over the road running, running ocean to ocean… I've seen too much not to wear a seat belt"* (Interview 01W06).

Pride in protection. Some workers referred to themselves as professional drivers, clearly articulating pride in their job as a motive for making safer decisions. One supervisor described two groups of drivers – one group that completes their pre-trip check that includes getting a layout of the day and another group that just "wings" the day. Along these lines, one worker stated:

> *You can tell the professional drivers as to the non-professional drivers. The professional driver is going to do everything he can do to keep himself safe. Non-professionals will take a risk. Take chances. Unnecessary chances.…You can just tell the rookie drivers as to the more senior drivers. And you could also tell the non-professional drivers from the professional drivers in the same manner. They take chances that they shouldn't be taken. (Interview 01W04)*

Participants who expressed this sentiment tended to generalize professional drivers as being safer.

4. Discussion

This qualitative study revealed internal and external factors that informed perceptions and decision making around seat belt use. Factors were aligned with HBM constructs, which is often quantitatively applied to understand seat belt behaviors. For example, perceived barriers and perceived susceptibility were the strongest predictors of seat belt use among Ghanaian passengers (Okyere et al., 2021) whereas Turkish drivers revealed that perceived benefits of using a seat belt was the strongest predictor of self-reported seat belt use (Şimşekoğlu & Lajunen, 2008). Quantitatively, however, the HBM has limitations. Some reviews suggest that the model is becoming static as economic, social, and environmental factors increasingly change, limiting predictive power (Alyafei & Easton-Carr, 2024).

This study did not seek to assess the predictive nature of HBM constructs. Rather, we applied the model to help ascertain and move past identifying significant predictors and rather, identify how constructs may be applied in the design and implementation of worksite safety programs. To this end, the discussion delves into patterns shared among participants that can inform cues to action to support not only seat belt use but possibly other protective behaviors among OGE drivers on the job. Each section suggests possible intervention and communication strategies to support these protective behaviors. These strategies are mainly intended for employers to consider in tandem with existing workplace safety and health programs.

4.1. External Factors Driving Perceived Susceptibility and Severity

Our results revealed external, work-related hazards and experiences that, in part, shaped participants' perceptions. Related to the HBM, discussions revealed that perceived susceptibility and severity to an incident's occurrence were often influenced by external factors. In this study, external factors referenced were hazardous road conditions – either by design or impacted by weather. The type of streets traversed has been shown to influence seat belt use among drivers, including OGE workers (Lipovac et al., 2015; Rothe, 2008). So, this situational use was not particularly surprising.

Experiencing or witnessing an MVC also influenced perceptions of probability and severity, as shared by participants. This finding aligns with previous research showing that, when a negative outcome is experienced or witnessed, an individual's personal assessment of encountering a similar, undesirable outcome usually increases (Alyafei & Easton-Carr, 2024). Further, because the outcome of an incident without seat belts tends to be more severe (i.e., fatality) (Febres et al., 2020; National Highway Traffic Safety Administration, 2018), when participants in the current study discussed MVCs that did not involve seat belts, seat belt use tended to increase. Therefore, after a near miss or serious MVC, employers may consider using employee testimony to personally debrief the incident or discuss the incident in more detail to capitalize on workers' possible sense of increased susceptibility to a negative outcome.

4.2. Organizational Factors Driving Cues to Seat belt Use

Although organizational factors can also be considered an external cue, safety programs implemented by OGE companies are worth highlighting separately. First, technologies that remind workers to fasten their seat belts are not new; however, their sophistication in use varies. In the current study, participants discussed IVMS as an annoyance but did not indicate it influenced behavior because they already wore their seat belt. This sentiment aligned with previous research indicating that interlock technologies are less supported among those who inconsistently wear a seat belt (Kidd et al., 2014).

More recent research suggests that not wearing a seat belt is associated with employers not using any form of seat belt monitoring technologies (Wingate et al., 2023a, 2023b). Because IVMS discussions among participants in the current sample were neutral, these technologies did not serve as a noteworthy cue to action for self-reported behavior change. In some cases, however, it could serve as a reminder if workers are in a rush when entering their vehicle. Smart seat belt systems continue to advance, especially in autonomous vehicles (Gheorghe & Soica, 2025). Like the integration of any technology, it may be useful for companies to proactively discuss new or updated seat belt technology with employees to facilitate acceptance and associated protective behaviors (Haas et al., 2019).

Second, rules and laws were discussed by participants as factors influencing seat belt use. At a federal or state level, previous research has shown that even if individuals prefer to take risks while driving, state laws influence behavior (Elvebakk, 2015; Thomas et al., 2017). The results of the current study align with these findings. Several participants noted that avoiding a ticket was more important than personal preference. However, if follow-through (i.e., a ticket) does not happen, noncompliance is more likely (Zabihi et al., 2019). Relatedly, our current study results also support previous findings that work-related variables (such as employer enforcement of seat belt use and presence of workplace safety programs) influence driver safety behaviors (Nævestad et al., 2020, 2022; Wingate et al., 2023a, 2023b). Therefore, visible motor-vehicle safety programs that outline the consequences of not following workplace expectations may be an implementation option for companies to consider.

Further, studies have argued that the formation of a culture that is committed to safety with modeling set by leaders (whether by policy or example), is important in employee decision making (Nævestad et al., 2022). All participating companies had motor-vehicle safety programs in place that had a zero-tolerance seat belt policy. However, in focus groups, several supervisors noted that smaller drilling or servicing companies they interact with may not have such policies. Consequently, company leadership modeling and enforcement of MV safety programs may be a useful cue to action.

4.3. Internal Factors Driving Perceived Barriers, Benefits, and Confidence in Seat belt Use

Regarding perceived barriers, workers and supervisors discussed two overlapping observations where employees may not wear a seat belt. The first scenario was if a driver was trapped by their seat belt in an accident, unable to escape. Research has corroborated this observation, showing that drivers of heavy vehicles perceive an inability to escape or move from their cabin if a crash occurs (Preece, 2002). Another common instance of noncompliance shared was the inconvenience and unnecessary use of seat belts during quick, shorter distance trips. Other studies have shown that drivers find the need to buckle and unbuckle often for frequent stops inconvenient and uncomfortable (Kidd et al., 2014; Kim & Yamashita, 2007).

While comfort and convenience drove instances of seat belt noncompliance, perceived benefits overwhelmingly drove consistent seat belt use among participants in our study. Previous studies have demonstrated the role of individual values and attitudes with respect to road safety behaviors (Nævestad et al., 2019; Nævestad et al., 2022). In this study there was also an element of personal pride in being a safe worker. Most participants had efficacy in not only the protection offered by seat belts, but also their own confidence and habitual seat belt use.

Additionally, research has shown the influence of certain demographic characteristics on normalized seat belt use, specifically, male, unmarried, and younger drivers, are less likely to wear seat belts (Mohammadi, 2009a, 2009b; Sadeghnejad et al., 2014). The OGE industry is predominantly male (84%) with approximately 25% of OGE workers being under 34 years old (Scott & Bushnell, 2025). In the current study, there were age and generational aspects shared when referencing attitude changes toward seat belt use with age. Specific to changes in risk tolerance, previous research has shown that, as individuals age, their tolerance for risk specific to traffic-related incidents tends to decrease, thereby influencing protective behaviors (Haas & Mattson, 2014, 2016).

OGE driver seat belt use has been associated with receiving driver safety orientation upon being hired (Wingate et al., 2023a, 2023b). Consequently, future education and outreach may be tailored based on age and perhaps experience in the industry. Or supervisors may opt to use stories based on personal life events to initiate safety-related individual conversations with employees, with the hope that they may be more receptive to safety messages. Population interventions of varying effectiveness aimed at promoting seat belt use (Kirley et al., 2023; Kostrzewski, 2024) are available and could be adapted by employers to fit the work environment. For example, primary enforcement seat belt laws and high visibility enforcement along with communication campaigns have demonstrated to be effective (Kirley et al., 2023). Employers

could establish equivalent workplace policies in their motor-vehicle safety programs.

Globally, the International Association of Oil & Gas Producers included requirements around seat belt use in a voluntary industry-specific standard on (global) land transport safety practices (International Association of Oil and Gas Producers, 2025). The U.S. Federal Motor Carrier Safety Administration (FMCSA) also has resources developed specifically for transport companies to support seat belt use including driver handbooks, knowledge tests, driver pledges and trainings, and on-site observations (Federal Motor Carrier Safety Administration, 2006). Though none of these methods have been evaluated for effectiveness by FMCSA, the results of the current study align with these requirements and resources regarding what cues to action may be effective.

5. Limitations

This study has limitations to consider when interpreting the results. First, this was a convenience sample, consisting of individuals representing views from the OGE industry and cannot be generalized (Andrade, 2021) to this respective industry or other industries that have job roles who drive as a part of their work duties. Specifically, there were limits to the job roles that met eligibility criterion to participate, which is one reason we used convenience sampling. Convenience sampling can elicit selection bias and an uneven sample (i.e., our sample was 100% male), which should be considered with these results along with any possible social desirability biases. Additionally, most of our sample was comprised of employees from two large companies ($\geq$100 employees) that may have invested more resources into their safety programs and technologies. Further, our recruiting sample was drawn from companies who were active participants in the NORA OGE Sector Council and included employees who reported almost always wearing their seat belts. It is likely that companies who actively participate in a voluntary partnership program with federal agencies have a vested interest and priority toward safety and consequently, may have stronger safety programs and individual employee compliance. Consequently, data collection with other companies and employees may have elicited different results.

Future research may opt to use a different sampling strategy to engage OGE companies who were not already involved in research activities or initiatives with NIOSH. Despite these limitations, researchers were able to engage with both frontline workers and supervisors, which provided a more holistic view of the observed and actual benefits and barriers to seat belt use among the sample.

6. Conclusion and practical applications

Our research suggests that in the United States, drivers employed in the OGE industry are more consistent seat belt users and that seat belt use among OGE drilling and well-servicing companies may be increasing. Workers who participated in our study thought of and used seat belts as PPE regardless of the driving conditions. Several factors may play a role in this finding. First, it may reflect the increasing trend in seat belt use nationwide, which reached all-time highs in 2022 (91.6%) and 2023 (91.9%) (National Center for Statistics and Analysis, 2024), the years when we collected our data. Second, our data suggests that worker knowledge of company seat belt policies and of the consequences for non-compliance, and supervisory enforcement, are key in getting workers to wear seat belts. Finally, the increased use of IVMS has allowed employers to ensure seat belts are used and take corrective actions such as coaching when company policy is not followed.

Although updated metrics around safety and health burdens are useful for intervention, without deeper insights that are connected to theory, knowing exactly how to intervene with workers to encourage behavior change is difficult. Despite self-reported seat belt use being high in the current study, seat belt use is still a documented burden across literature. The qualitative nature of this study offers tangible considerations for companies that may have lower seat belt use among employees. Specifically, participating companies possessed and used several cues that either supported or required seat belt use among their employees. Our data suggest that worker knowledge of company seat belt programs and of the consequences for non-compliance, and supervisory enforcement, are key in getting workers to always use seat belts. Nationally, state seat belt laws can also influence seat belt use at work and be included in company-specific resources. The use of technology such as in-vehicle monitoring systems (IVMS) and phone apps has also played a role in ensuring consistent seat belt use.

Future research may consider how to best integrate these resources into a seamless toolkit to serve as a more comprehensive cue to action that can elevate perceived benefits of seat belt use, while including focused messaging that corrects misconceptions around the perceived barriers. Finally, strategic messaging, training, and implementation of education first during company onboarding and then again at critical times when employee perceived susceptibility and severity may be higher, are also relevant options for safety and health supervisors to consider.

CRediT authorship contribution statement

Rosa L. Rodríguez-Acosta: Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Data curation, Conceptualization. **Emily J. Haas:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Data curation, Conceptualization.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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