

Risk Perception and Cultural Differences of Latinos across Residential, Commercial, and Heavy Civil Construction

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In the construction industry, Latino workers currently suffer a disproportionately high rate of injuries and fatalities compared to non-Latino workers. Socio-cultural barriers exist that may contribute to this disparity; but, what effect does the sector of the construction industry employing the Latino worker have on the rate of safety incidents? The purpose of this study is to investigate differences in Latino construction worker's perceptions about safety culture and risk across three construction sectors: residential, commercial, and heavy civil. Analysis was conducted on 219 Latino responses to surveys collected in the Denver Metro and Northern Colorado areas. Results suggest that significant differences occur between Latinos working in different construction sectors. The following perceptions regarding safety were identified to be dissimilar: work productivity and quality having a higher priority than safety, feeling uncomfortable with work practices being observed and recorded, safety rules and procedures being difficult to understand, immigrant workers making the worksite unsafe for all workers, willingness to take more risks than coworkers, and the notion that dangers present on construction sites cannot cause my death or the death of others. The contribution of these findings is to increase understanding of perceptions related to safety for Latino construction workers.

Key Words: Latino, Culture, Barriers, Risk, Safety

Introduction

The construction industry consistently maintains a higher rate of injuries and fatalities compared to other industries (Abudayyeh, Fredericks, Butt, & Shaar, 2006). When compared with other industries the construction industry is notorious for its poor safety record (Mohamed, 2002). The fatality rate is regularly exceeded only by rates in mining and agriculture making it among the most dangerous industries in the United States (Abudayyeh, et al., 2006). Over the past 10 years fatal and non-fatal injuries and illness rates in construction have maintained high levels despite focused attention by the industry on safety procedures and programs (Abudayyeh, et al., 2006). This trend has been attributed to a multitude of different factors that, in combination, are unique to the construction industry. A construction work environment is generally more hazardous than other industries due to the use of heavy equipment, dangerous tools, and hazardous materials; all of which increase the potential for serious accidents and injuries (Abudayyeh, et al., 2006). Another factor posing a challenge to reducing and controlling exposure to occupational hazards is the dynamic, temporary, and "ever evolving" nature of the construction industry (Brunette, 2005).

Of the injuries and fatalities that occur in the construction industry, Latino construction workers suffer a disproportionately higher rate than non-Latino construction workers (Irizarry, 2009). Although overall death rates in construction have declined in recent years, the gap between Latino and non-Latinos remains prevalent (Irizarry, 2009). Latino construction laborers rank in the top three occupations for nonfatal injuries and illnesses requiring days away from work and occur more frequently in construction than in any other industry (Brunette, 2005; Vazquez, 2004). Latinos, today, represent the fastest growing ethnic group in the United States (Canales et al., 2009). With the growing number of Latino workers in the construction workforce, understanding the factors that contribute to higher rates of injuries and fatalities is vital.

Several key obstacles impede Latino construction workers' safety awareness and behaviors. The most prevalent are language and literacy barriers between Latino and non-Latino construction workers. High illiteracy rates combined with an inability to linguistically communicate can compromise the safety of both Latinos and English-speaking construction workers on the jobsite (Vazquez, 2004). Two of the most influential barriers may be the fear of immigration status and strong economic pressures to stay employed (Brunette, 2004). Between 1996 and 2001 the

Census of Fatal Occupational Injury reported that the excess rate of fatal injury occurred more prevalently among foreign-born Latino workers, while U.S.-born Latino workers had fatal injury rates similar to the rest of the U.S. workforce (Jorgensen, Sokas, Nickels, Gao, & Gittleman, 2007). This led researchers to believe cultural barriers also hinder Latino workers from achieving a high level of safety within the construction industry (Arciniega, 2008; Brunette, 2004; Vázquez, 2004). When Latino workers immigrate to the U.S. they bring with them varied histories, cultural sensibilities, strong health beliefs, and a different cultural background compared with non-Latino workers (Brunette, 2004). Additional cultural differences exist between and within the various Latin American countries. Recent research suggests language, education and cultural differences may preclude or degrade safety activities such as instructions for safe work practices, effective safety meetings and training, and/or correct operations of equipment needed to perform their job (Gilkey & Lopez del Puerto, 2011).

While socio cultural barriers contribute to the disproportionately high rate of injuries and fatalities for Latinos, the question remains what impact does the sector of the construction industry employing the Latino worker have on safety incidents? Specifically what differences exist in risk perception and safe work behaviors? This study investigates differences in Latino construction worker's perceptions about safety culture and risk across the three construction sectors of residential, commercial, and heavy civil in the Denver Metro and Northern Colorado areas. The stated null hypothesis is that, no difference exists in risk perception and safety culture measures between Latino construction workers across residential, commercial and heavy civil sectors of construction. The contribution of this research is to add to previous research working towards a deeper understanding of safety culture, safe work practices and the growing Latino construction workforce to reduce injuries and fatalities among this at risk population (Brunette, 2005; Dongping, Yang, & Wong, 2006).

Methodology

This study is a continuation of research performed for a cross-sectional study by Gilkey and Lopez del Puerto (2011) on Safety Culture and Risk Perception Differences between Latino and Non-Latino Construction workers. Their study utilized a survey that was an adapted version of the Safety Culture Survey developed by Safety Performance Solutions, Inc (Geller, 1996). Their adapted survey was designed for Latino and non-Latino construction workers and included nine questions covering respondent demographics and 30 questions covering risk perception and safety culture. The study recruited subjects using convenience sampling through companies in the Denver metro and Northern Colorado area who had developed existing working relationships with the Construction Management program at Colorado State University. The field investigator contacted the company's project manager to schedule a time to administer the survey. Participants were either employed by participating general contractors or subcontractors. Participants could perform any trade, and be of any ethnicity, age, etc.; any interested construction worker was invited to participate. The only workers on the jobsites excluded from taking the survey were those of a foreman or higher level management position. Participation in the study was entirely voluntary. While no personal identification information was collected, the authors acknowledge that the sample population may underrepresent individuals uncomfortable with reporting personal information to outside "authorities."

Descriptive statistics, frequencies and comparisons between and within groups were used to evaluate the data. The goal of these analyses was to identify differences and similarities exhibited between Latino construction workers across the three construction sectors. The data was evaluated for assumption of normal distribution and appropriate parametric evaluation was carried out in SPSS™ version 18 using General Linear Model (GLM), Univariate Analysis of Variance (ANOVA) with Tukey's post hoc testing. Evaluation was accomplished for each dependent variable with fixed factors of Construction Sector and Latino vs. non-Latino to assess between and within group differences. Results yielded means, standard deviations, p-values and 95 percent confidence intervals.

The sample population for the survey study totaled 339 respondents in the Denver Metro and Northern Colorado geographical areas. Of that total sample population, 218 respondents were of Latino ethnicity. It should be noted that while the non-Latino ethnicity encompasses those of Anglo, African American, Puerto Rican or other descents, the majority of non-Latino workers in the Colorado geographical areas were of Anglo ethnicity. In the residential sector, survey responses collected totaled 124; 95 were of Latino ethnicity. In the commercial sector, survey responses collected totaled 105; 67 were of Latino ethnicity. In the heavy civil construction sector, survey responses collected totaled 110; 56 were of Latino ethnicity. This research focused specifically on difference among Latinos across construction sectors. Responses from non-Latinos are not evaluated as part of this study.

The mean responses are based on a Likert scale of 1 – 5 where, 1 = Highly Disagree and 5 = Highly Agree. P-values less than or equal to 0.05 represent significant differences between the mean score responses. The residential sector had 45.8% of its responses between the ages of 31 and 40 years old. The commercial sector appeared slightly younger with its largest proportion, 38.8%, indicating that they were younger than 30 years old. The heavy civil sector appeared to be the sector with the oldest population with higher percentages, >40% of respondents reporting their age between 41 and 51 or older than 51 years. In response to the demographic question of years working in construction the residential sector reported 37.5% of its responses between 6 and 10 years. The commercial sector was similar to residential in that they reported 31.3% had worked in the sector between 6 and 10 years. The heavy civil sector showed significantly more experienced workers with 33.9% responding that they had worked more than 16 years in their construction sector. The responses to highest educational level attained across the three sectors showed 66.7% of the residential sector were not high school graduates, 46.3% of the commercial sector were not high school graduates and 57.2% of the heavy civil sector were not high school graduates; but, heavy civil also had the largest proportion of college attendees with 17.8% either attending some college or college graduates. For each sector approximately half of the respondents had participated in five or more hours of health and safety training in the past year.

Results

Analysis of the results of the 30 questions focusing on risk perception and cultural differences from this sample suggest that six questions reveal significant difference between the sectors. Summary results for the six questions where the p-value showed significant difference in responses between sectors can be seen in Table 2, which shows the mean scores for each sector and the p-values for comparisons between the 3 sectors for each question. For the p-values any result less than 0.05 represents significant difference between the responses of either one of the sectors with one other sector, a significant difference between one sector and both other sectors, or significant difference between all three sectors.

Table 2 - Risk Perception Survey Results: Means and P-Values

Question	Sector Mean			Comparison P-Value		
	Residential	Commercial	Heavy Civil	Res - Com	Com - HC	HC - Res
At my company, work productivity and quality usually have a higher priority than work safety	3.38	2.78	3.02	0.01*	1.00	0.01*
Most employees in my company would not feel comfortable if their work practices were observed and recorded by a coworker	3.86	3.39	4.00	0.01*	0.82	0.07
Some safety rules and procedures are difficult to understand	3.44	2.94	2.63	0.01*	0.39	0.00*
Immigrant workers make the worksite unsafe for all workers	2.46	2.06	1.94	0.06	0.90	0.02*
I am willing to take more risks than my coworkers	2.79	2.26	2.00	0.11	0.41	0.00*
The dangers present on construction sites can not cause my death or the death of others	3.18	2.51	2.71	0.03*	0.94	0.00*

* Significant = p-values < 0.05

Responses to the remaining 24 questions did not indicate a significant difference between Latino's in the residential, commercial or heavy civil sectors of the construction industry. In addition, the data collected from the surveys had a certain number of non-responses for each question. These non-responses are recorded and can be seen at the bottom of each of the following data tables.

The six questions where the p-value showed significant difference in responses between sectors are, 1) At my company work productivity and quality usually have a higher priority than work safety; 2) Most employees in my company would not feel comfortable if their work practices were observed and recorded by a coworker; 3) Some safety rules and procedures are difficult to understand; 4) Immigrant workers make the worksite unsafe for all workers; 5) I am willing to take more risks than my coworkers; and 6) The dangers present on construction sites cannot cause my death or the death of others.

Responses indicating the level of agreement with the statement, “At my company work productivity and quality usually have a higher priority than work safety” are presented in Table 3. The responses showed 51% of respondents working in residential construction felt that productivity was a priority over safety. The mean response for the residential sector was 3.38 (95% CI: 3.06, 3.70), the commercial sector was 2.78 (95% CI: 2.41, 3.14), and the heavy civil sector was 3.02 (95% CI: 2.61, 3.43), seen in Table 1. The responses to this question showed significant differences between the residential and commercial sector and the residential and heavy civil sector but none between commercial and heavy civil.

Table 3 – At my company work productivity and quality usually have a higher priority than work safety

Responses	Residential		Commercial		Heavy Civil	
	N	(%)	N	(%)	N	(%)
1 - Highly Disagree	13	13.5%	18	26.9%	15	26.8%
2 - Disagree	14	14.6%	13	19.4%	7	12.5%
3 - Neither Agree nor Disagree	12	12.5%	9	13.4%	7	12.5%
4 - Agree	16	16.7%	10	14.9%	7	12.5%
5 - Highly Agree	33	34.4%	15	22.4%	17	30.4%
6 - No response	8	8.3%	2	3%	3	5.3%

Responses indicating the level of agreement with the statement, “Most employees in my company would not feel comfortable if their work practices were observed and recorded by a coworker” are presented in Table 4. Nearly 60% of each sector either agreed or highly agreed with this statement. The mean response for the residential sector was 3.86 (95% CI: 3.58, 4.14), the commercial sector was 3.38 (95% CI: 3.07, 3.70), and the heavy civil sector was 4.00 (95% CI: 3.63, 4.37). Significant differences were only recognized between the residential sector and the commercial sector with a p-value of 0.01. The differences between the heavy civil and residential sectors were nearly significant with a p-value 0.07 while, commercial to heavy civil showed no significant differences, with a p-value of 0.82.

Table 4 – Most employees in my company would not feel comfortable if their work practices were observed and recorded by a coworker

Responses	Residential		Commercial		Heavy Civil	
	N	(%)	N	(%)	N	(%)
1 - Highly Disagree	5	5.2%	11	16.4%	3	5.4%
2 - Disagree	5	5.2%	4	6.0%	2	3.6%
3 - Neither Agree nor Disagree	16	16.7%	13	19.4%	4	7.1%
4 - Agree	31	32.3%	21	31.3%	13	23.2%
5 - Highly Agree	30	31.3%	17	25.4%	25	44.6%
6 - No response	8	9.3%	1	1.5%	9	16.1%

Responses indicating the level of agreement with the statement, “Some safety rules and procedures are difficult to understand” are presented in

Table 5. The residential sector had the largest percentage of the three sectors, 35.4%, in high agreement with this statement. The mean response for the residential sector was 3.44 (95% CI: 3.13, 3.75), the commercial sector was 2.94 (95% CI: 2.59, 3.30), and the heavy civil sector was 2.63 (95% CI: 2.22, 3.05). Significant difference was seen between the residential and commercial sector with a p-value of 0.01, and also between the heavy civil and residential sectors with a p-value of 0.01. There was no significance between the commercial and heavy civil sectors which had a p-value of 0.39.

Table 5 – Some safety rules and procedures are difficult to understand

Responses	Residential		Commercial		Heavy Civil	
	N	(%)	N	(%)	N	(%)
1 - Highly Disagree	14	14.6%	16	23.9%	16	28.6%
2 - Disagree	15	15.6%	6	9.0%	4	7.1%
3 - Neither Agree nor Disagree	10	10.4%	18	26.9%	7	12.5%
4 - Agree	14	14.6%	15	22.4%	11	19.6%
5 - Highly Agree	34	35.4%	11	16.4%	8	14.3%
6 - No response	8	9.4%	1	1.4%	10	17.9%

Responses indicating the level of agreement with the statement, “Immigrant workers make the worksite unsafe for all workers,” are presented in

Table 6. Twenty-eight percent of residential workers reported that they agreed or strongly agreed with this statement. The mean response for the residential sector was 2.46 (95% CI: 2.16, 2.76), the commercial sector was 2.06 (95% CI: 1.72, 2.40), and the heavy civil sector was 1.94 (95% CI: 1.54, 2.34). Significant differences were seen between the heavy civil and residential sectors, at a p-value of 0.02. The differences between the residential and commercial sectors were nearly significant at 0.06 while commercial to heavy civil showed no significance at a p-value of 0.90.

Table 6 – Immigrant workers make the worksite unsafe for all workers

Responses	Residential		Commercial		Heavy Civil	
	N	(%)	N	(%)	N	(%)
1 - Highly Disagree	39	40.6%	35	52.2%	32	57.1%
2 - Disagree	13	13.5%	11	16.4%	3	5.4%
3 - Neither Agree nor Disagree	9	9.4%	8	11.9%	3	5.4%
4 - Agree	7	7.3%	8	11.9%	7	12.5%
5 - Highly Agree	19	19.8%	5	7.5%	4	7.1%
6 - No response	8	9.4%	0	0%	7	12.5%

Responses indicating the level of agreement with the statement, “I am willing to take more risks than my coworkers,” are presented in

Table 7. The mean response for the residential sector was 2.79 (95% CI: 2.48, 3.10), the commercial sector was 2.26 (95% CI: 1.88, 2.65), and the heavy civil sector was 2.00 (95% CI: 1.58, 2.42). Nearly 30% of residential sector workers either agreed or highly agreed with this statement. Contrast to the other sectors. This question showed significance between the heavy civil and residential sectors with a p-value of 0.00. The p-values between the other two sectors showed no significance.

Table 7 – I am willing to take more risks than my coworkers

Responses	Residential		Commercial		Heavy Civil	
	N	(%)	N	(%)	N	(%)
1 - Highly Disagree	23	24.0%	22	32.8%	22	39.3%
2 - Disagree	14	14.6%	10	14.9%	8	14.3%
3 - Neither Agree nor Disagree	18	18.8%	9	13.4%	3	5.4%
4 - Agree	8	8.3%	4	6.0%	7	12.5%
5 - Highly Agree	20	20.8%	7	10.4%	3	5.4%
6 - No response	12	13.5%	15	22.5%	13	23.1%

Responses indicating the level of agreement with the statement, “The dangers present on construction sites can not cause my death or the death of others,” are presented in Table 8. The mean response for the residential sector was 3.18 (95% CI: 2.81, 3.55), the commercial sector was 2.51 (95% CI: 2.04, 2.98), and the heavy civil sector was 2.71 (95% CI: 2.20, 3.22). In comparison of sector responses, the residential sector had nearly 10% more respondents than commercial and heavy civil responding in either agreement or high agreement. This question showed

significance between both the residential and commercial sector at a p-value of 0.03. Significant difference was also shown between the residential and heavy civil sector at a p-value 0.00. There was no significance seen between the commercial and heavy civil sector which had a p-value of 0.94.

Table 8 – The dangers present on construction sites can not cause my death or the death of others

Responses	Residential		Commercial		Heavy Civil	
	N	(%)	N	(%)	N	(%)
1 - Highly Disagree	21	21.9%	26	38.8%	17	30.4%
2 - Disagree	13	13.5%	5	7.5%	8	14.3%
3 - Neither Agree nor Disagree	8	8.3%	2	3.0%	-	-
4 - Agree	6	6.3%	4	6.0%	6	10.7%
5 - Highly Agree	35	36.5%	15	22.4%	13	23.2%
6 - No response	12	13.5%	15	22.3%	12	21.4%

Discussion

In this study, six questions out of 30 resulted in risk perception differences between the sectors. Specifically, results showed that residential construction workers differed from either commercial and/or heavy civil workers on every one of the six questions. Furthermore, not once was difference exhibited between commercial and heavy civil. These results support the findings of a study on fatal falls among Hispanic construction workers (Dong, 2009), that found it is the smaller establishments where fatalities occur more often and that residential construction ranked the highest in fatalities. Although the residential sector statistically differed from the other sectors there were questions that showed similarity across the sectors. The question with the strongest similarity in sector responses was, “Most employees in my company would not feel comfortable if their work practices were observed and recorded by a coworker” with nearly 60% of each sector agreeing or highly agreeing. The question covering Immigrant workers making the worksite unsafe for all workers also had a majority of the sectors responding in disagreement or high disagreement; although, residential differed from the other sectors in that it had the largest response in high agreement with the question. The causes of these potential differences cannot be identified from this study. However, several explanations may be offered as to why risk perception on these specific questions differed across the three construction sectors. The results do, however, provide evidence to reject the stated null hypothesis that no difference exists in risk perception and safety culture measures between Latino construction workers across residential, commercial and heavy civil sectors of construction.

Results indicate there is significant difference between the residential and commercial sector regarding the perception that most employees in a given company would not feel comfortable if their work practices were observed. The difference between residential and heavy civil was nearly significant at a p-value of 0.07, but Latino workers in heavy civil felt even more in agreement than residential workers about being uncomfortable being observed and recorded when working. A potential explanation for this response is that the heavy civil sector encounters more regimented recording and quality inspections than the residential sector. This could influence Latinos perceptions in the residential sector as they experience minimal inspections and are unfamiliar with the pressure heavy civil workers may feel due to more strict quality inspections and tests.

Results indicate significant difference between the residential sector and both the commercial and heavy civil sector regarding the perception of safety rules and procedures being difficult to understand. One of the most documented barriers to Latino safety in current literature is the language barrier (Canales, et al., 2009; Thompson & Siddiqi, 2007; Ruttenberg, 2004). The finding from this study support previous research and extend the findings to suggest that Latino workers in the residential sector experience the most challenges in understanding safety rules and procedures, perhaps due to literacy. Demographics regarding education help explain the difference in ability to understand rules and procedures. Of the three sectors, Latino residential construction workers had the lowest response of high school graduates with 66.7% not graduating high school. Such a high percentage could contribute to low literacy rates, which, in turn may impact the ability of individuals to understand safety rules and procedures.

Results indicate a consistent perception exists across all sectors that productivity and quality have a higher priority than safety. Nearly 30% of the Latino survey respondents were in high agreement with this statement. This

perception of safety may be influenced by the Latino culture. A study by Arciniega found that “Machismo”, a standard of behavior exhibited by Latino men, has a significant impact on job site safety and a role in higher injury rates (2008). Building on previous literature, this study supports the idea that Latino men, especially in the residential sector, put less priority on safety than productivity and quality. This may be due, in part, to economic pressures. One study found the Latino construction workforce in the United States may not raise issues about unsafe work practices because they are afraid to lose their job or face deportation (Irizarry, 2009). Agreement with safety being less of a priority could be the result of having potentially undocumented respondents fearful of losing their job. Such findings regarding the perceived priorities across jobsites are troublesome and certainly merit further research and future action.

Results indicate difference exists between the residential sector and the heavy civil sector regarding the perception that immigrant workers make the worksite unsafe for all workers. The difference was nearly significant between the residential and commercial sector with a p-value of 0.06. The residential sector was most in agreement with nearly 1/3 agreeing or strongly agreeing with the statement that immigrant workers make the worksite unsafe for all workers. This is particularly interesting because based on the sector demographics; the residential sector encompassed the greatest proportion of Latino workers. In the original study on Safety Culture and Risk Perception Differences between Latino and Non-Latino Construction workers the Latino population represented ¾ of the Residential sector workforce. Alternatively, the heavy civil sector had the most balanced demographics, nearly 50/50 Latino Non-Latino, and was in the highest disagreement with the same statement. From this viewpoint it could be proposed Latinos feel safer and more risk averse in a more diverse multicultural project site.

This study found nearly 30% of Latinos working in the residential sector agreed or highly agreed they were willing to take more risks than their coworkers. Multiple sources of research have found Latino cultural and worker characteristics can present a barrier to safety (Dong, Fujimoto, Ringen, & Men, 2009; O'Connor, Loomis, Runyan, dal Santo, & Schulman, 2005; Williams Jr, Ochsner, Marshall, Kimmel, & Martino, 2010). Characteristics such as undocumented status, relative youth, lack of construction experience, low-skill employment and high-risk occupations. In greater specificity, a study by Menzel and Gutierrez found illegal immigrants appeared to be more acceptable to taking more risk on the job (2010). Those findings are supported by the results of this study that found Latinos working in the residential sector were less risk averse than Latinos in the commercial or heavy civil construction sectors.

In that same study Menzel and Gutierrez found that the level of job skill affected perceptions of responsibility for safety and accident prevention (2010). This research found the residential sector had nearly 10% more respondents than commercial and heavy civil responding in either agreement or high agreement with the statement that dangers present on construction sites can not cause my death or the death of others. Risk averse workers or those with a high risk perception would accept that construction sites are some of the most dangerous workplaces in the industry and all workers should take greater responsibility for safety and accident prevention when employed in that industry. With the residential sector resulting in a 10% difference concerning risk perception, this sector needs extra awareness on the dangers of negligence towards safety, especially in regards to low skill job positions.

Future Studies

While several significant differences in risk perception were identified between residential and either one of or both commercial and heavy civil construction sectors, no significant differences in risk perception were discovered between Latino construction workers in the commercial and heavy civil sectors. Future research should be conducted regarding differences between the trades in the residential sector. It would also be interesting to further study the effect of an ethnically diverse workforce compared to a less diverse workforce on a project to identify differences in project safety. Could it be plausible that a more multicultural workforce propagates a better jobsite safety culture? As the Latino population continues to increase in the construction industry greater care needs to be taken to ascertain safe working environments. Developing a strong safety culture is an effective way to increase risk perception, promote safe work practices and conditions and prevent jobsite injuries and fatalities. While an increase in safety culture across the board would be advantageous to the industry, research has suggested that certain sectors need special attention. The research and results from this study adds to the literature of available knowledge and may help to achieve the overall goal of reducing the disproportionate safety incidents Latinos suffer in the construction industry.

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