Request for Office of Management and Budget Review and Approval for Federally Sponsored Data Collection

Assessing the Impact of Organizational and Personal Antecedents on Proactive Health/Safety Decision Making

Section B

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1. Respondent Universe and Sampling Methods

Active mines are mining operations that reported mine operator employment during the year. In 2012, the Mine Safety and Health Administration (MSHA) reported the following number of mines, by commodity [NIOSH 2014]:

- Coal - 1,871
- Metal - 351
- Nonmetal – 641
- Stone - 4,433
- Sand & Gravel - 6,797

This same database showed that there are roughly 261,784 mine operator employees. A more specific breakdown of employees by commodity is as follows:

- Coal - 92,472
- Metal - 44,458
- Nonmetal - 21,586
- Stone - 66,201
- Sand & Gravel - 7,067

Subjects for this research project will be employees from these commodities.

This study utilizes a purposive sampling strategy [Yin 2011]. Purposive sampling allows researchers to obtain a variety of information and perspectives pertaining to the research topic, meaning that participants, who may offer differing views, can and should be enlisted [Kuzel 1992]. Utilizing purposive sampling methods and recruiting a wide range of cases will also help avoid bias in this research project [Yin 2011]. In an effort to recruit as wide a range of participants as possible for this study, researchers are aiming to recruit 2-3 mines to participate from each of the commodities so a broad sample can be analyzed and differences compared between commodities. The National Institute for Occupational Safety and Health (NIOSH) believes that 2-3 mines from each of the five commodities can be recruited, based on previous data collection efforts and mine contacts, for a total of 10-15 mines. In addition, within those commodities, NIOSH researchers are aiming to recruit mines owned by different companies, to obtain a diverse data set. A description of the mines where data is collected will be provided in any publications of the data (e.g., size, location, height of coal seam, type of extraction method utilized, etc.). Besides purposive sampling when recruiting mine sites, we also utilize convenience sampling at the mine site because we intend to utilize cases that are easily available and accessible while we are present on site [Yin 2011].

It is expected that the employees of the participating mines will vary across a number of variables including age, gender, and experience. Convenience sampling will occur based on the availability of mine workers at the point in time when surveys are administered. Across the 10-15 participating mine sites it is expected that a total of 1,800 individuals will participate in completing the organizational values survey. The survey instrument is close-ended and requires respondents to rate their opinions using a Likert-type scale about worker perceptions and behaviors.

Upon returning back to the Bruceton Research Center, all survey results will be scanned into SPSS and analyzed to determine (1) which of the external and internal antecedents are positively associated with participants' health and safety proactivity on the job?; and (2) What are the most important antecedents (IVs) associated with participants' health and safety proactivity (DV)? Although multiple regression analyses can determine what predictors are correlated with proactive work decisions, other regression approaches allow for more accurate variance partitioning among correlated predictors [Tonidandel and LeBreton 2011], which is possible in this study. Results will produce a table that rank orders the most important predictors (IVs) of proactive safety (DV). For a list of the internal IVs and external IVs (i.e. the predictors or antecedents), refer to Table 1 below. Each intern and external IV is measured in a previously validated survey scale made up of 3-5 questions.

Effect size measures the sizes of associations or the sizes of differences. The most common effect-size measure for regression tests, as being conducted in this study, is *r* [Ellis, 2010]. R covers the whole range of relationship strengths, and how large the relationship is between the variables we are studying – and is independent of how many people participated in the study [Kelley and Preacher, 2012]. Cohen [1992; 1988] provided "rules of thumb" for interpreting these effect sizes, suggesting that an *r* of .1 is a small effect size; .3 a medium effect size, and .5 a large effect size. Our goal is obtain at least a medium effect size of .3 for the relationships we are studying.

Additionally, power analysis is the name given to the process for determining the sample size for a research study [Cohen, 1988]. It is generally accepted that power should be 0.8 or greater; that is, we should have an 80% or greater chance of finding a statistically significant different when there is one [Cohen 1988; Smith 2004]. Although NIOSH researchers made an effort to determine a sample size for this research study, the reality is that no "simple formula" exists due to the complexity of many statistical analyses. In response, we will aim to increase the sample size to account for varying sampling methods and mine sizes. Many online research calculators can provide a "rough estimate" for how large a sample size should be, based on your desired power level, significance level, and the number of IVs (or predictors) you have in a study. NIOSH consulted the online Statistics Calculator [2016], where we were prompted to enter our desired effect size, statistical power level, number of predictors (IVs), and probability level (.05). This tool indicated a minimum sample size of n = 67 is needed to perform our intended study. The number of employees at medium-sized and large-sized mines often ranges from 50-499. Because all five commodities will be used, and possibly up to three per commodity, our goal is obtain n = 1,005 participants to obtain a 0.08 power level during the respective analyses (.08 is the acceptable level of power for statistical analyses [Cohen 1988]). Below is a sample table of the anticipated range of commodities, corporations, and respondents we expect, based on previous experience with field research.

<u>Sample Table of Respondents</u>

Mine Site	Commodity	Owner	Respondents
1	Sand/Gravel (Industrial Mineral)	Corporation A	~150
2	Metal	Corporation B	~50
3	Sand/Gravel (Industrial Mineral)	Corporation C	~50
4	Coal	Corporation D	~150

5	Non-metal	Corporation E	~60
6	Stone	Corporation E	~100
7	Stone	Corporation E	~75
8	Non-metal	Corporation E	~100
9	Industrial Mineral	Corporation C	~150
11	Coal	Corporation F	~200
12	Coal	Corporation G	~200
13	Metal	Corporation H	~285
14	Sand/Gravel (Industrial Mineral)	Corporation I	~150
15	Non-metal	Corporation J	~80
			= ~1800

2. Procedures for the Collection of Information

A convenience sampling approach will occur while NIOSH researchers are present at each participating mine site. The employees that are working while the NIOSH research team is present will have the option to participate in the study at that point in time. However, employees who are not present will be made privy to the survey link (e.g. the link can be written on the announcement wall in the break room). Recruitment and discussion of the survey will occur during an already scheduled safety meeting at each mine site, because this is the only time when all employees are present (during one shift) and a captive audience.

The survey will be introduced to the group(s) and then facilitated by NIOSH researchers trained in survey administration. An oral consent script will be read to the participants before data collection begins. After reading the oral consent script, each individual has the option to choose whether they would like to participate. Any individual who decides to participate will stay in the room to fill out the survey. Those who decline participation can simply leave the room. In addition, contact information will be provided for participants to take home for future reference in case they have any questions after the study. Individuals can also request a survey link to complete the questions online if that is preferable to them.

The estimated completion time, based on time tests, is no more than 15 minutes. Upon request, NIOSH researchers may read the survey to mine workers if they want to participate but do not want to read the survey. Then, the researcher will fill in the answers for the participant as requested.

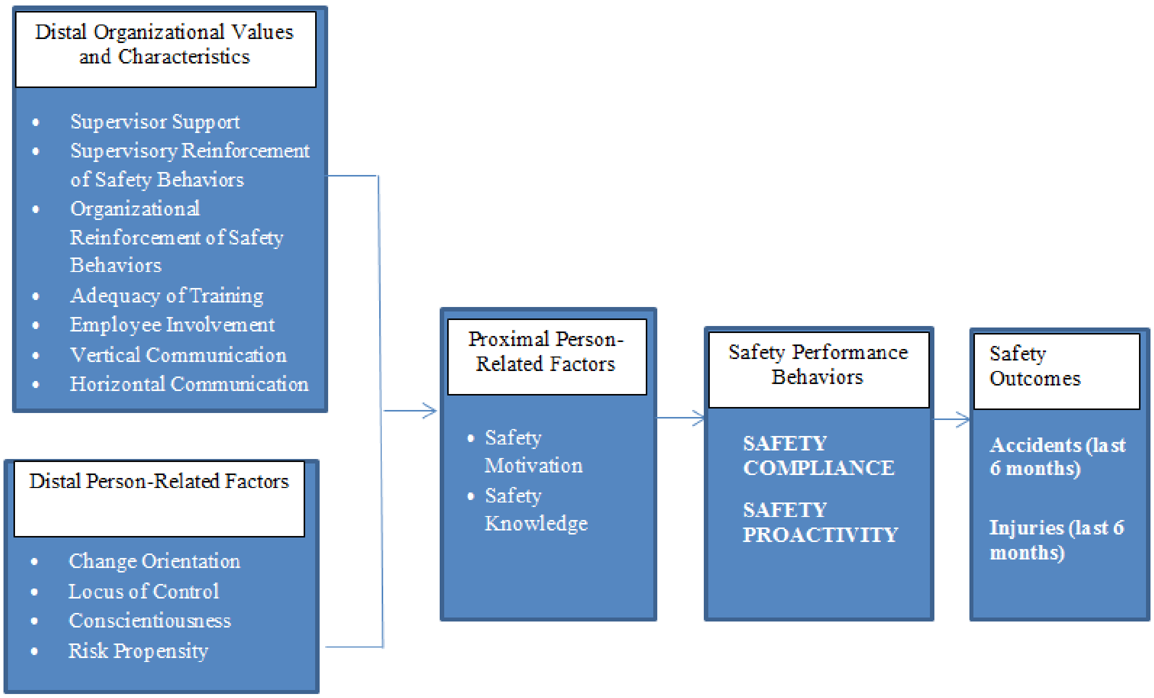
Upon returning to the office, members of the research team will scan the information from the collected surveys into a password-protected computer database using the Statistical Package for the Social Sciences (SPSS), a word processor program, and a database spreadsheet. If respondents complete the web-based survey this data will be directly imported into SPSS with the paper-pencil information that was entered.

Upon collection, cleaning, and organization of the data, it will be used to answer the research question of what internal/external characteristics have the biggest impact on proactive and compliant health and safety behaviors in mine workers. Although multiple regression analyses can determine what predictors (e.g., coworker communication, health and safety training) are correlated with proactive work decisions, there are drawbacks to only using this statistical approach. Other regression approaches allow for more accurate variance partitioning among correlated predictors. These approaches include dominance [Budescu 1993] and relative weight analysis [Johnson 2000].

Dominance analysis assesses the relative importance of a given independent variable in predicting a given dependent variable when a set of possibly correlated independent variables is considered [Azen & Budescu, 2003]. Dominance analysis combines both absolute and relative importance indexes in the determination of predictor importance, which makes the ranking somewhat invariant across different predictor subsets [Budescu 2003]. In other words, the importance of a predictor (e.g., supervisory communication) within a multiple regression framework (where dependent variable is worker health and safety proactivity) can be assessed quite easily in this study, including the predictors' unique contribution in the model, after partialling out any shared explanatory variance with other predictors. Similarly, relative weights methodology uses a series of regressions and transformations to determine predictor importance [Johnson 2000].

Using this method, results provide prediction of a dependent variable (DV) by a predictor independent variable (IV) in terms of: (1) its direct effect (i.e., its independent effect with no other predictors); (2) its total effect (i.e., when all other relevant predictors are considered); and (3) its partial effect (i.e., when subsets of predictors are considered). Dominance and relative weights analysis can be used to come to similar conclusions about the rank ordered importance of predictors in numerous regression contexts, making this approach ideal to answer the current research questions for this study. Safety proactive and safety compliance will serve as the dependent variables in these regression analyses, with the organizational and personal characteristics as independent variables. In addition, mediators are present that researchers can account for using these same methods. The model that is being tested in these statistical analyses is below.

Figure 1: Conceptual Model for Study (adapted from Christian et als [2009] model of workplace safety)



The data will be examined for correlations and internal consistency (reliability) between items – specifically what internal/external predictors have the biggest impact on health and safety proactivity of workers. In addition, descriptive statistics (e.g., variability and mean scores for each item across the participants) and tests for statistical significance of group differences will be performed by request of the mine site for their specific needs. Demographic information will be collected to describe the sampled group (through means and ranges) and to see if the variables correlate with proactivity.

3. Methods to Maximize Response Rates and Deal with Nonresponse

Within the current study our convenience, purposive sampling strategy is useful and practical for our applied field research because we can reach a targeted sample quickly while obtaining opinions of our target population. However, we also realize this a purposive sample we are more likely to overweight subgroups in mining population that are more readily accessible [Trochim, 2006]. Therefore, overall implications of this survey study will need to be considered in context of its limitations. First, the sampling procedures and final sample, which will be a subsample from a broader set of employees who are first available and then elect to take the survey. Depending on the existing culture at each participating mine site, there may be varying levels of response rates and the findings might apply more to trusting, engaged workers [Griffin et al., 2010]. The results would only be unbiased if non-respondents were missing at random [Enders, 2006; Rubin, 1976]. However, research in statistical analysis and sampling has found that assuming missing at random participants is appropriate in many cases and results in little bias in estimates and standard errors [e.g., Collins et al., 2001]. Even so, due to the sampling strategy of convenience, ultimately, NIOSH cannot assume or discuss generalizability of the outcomes. Finally, even if an individual chooses to respond, there is the issue of self-reporting in each of the measures. However, self-assessments have been deemed desirable for independent and moderator variables [Griffin et al., 2010] so this study may not be too heavily impacted by self-assessment although it will be cited as a limitation.

It is anticipated that about 80% of workers at each participating mine will respond to the survey Although survey response rates are typically lower (~ 75% or greater), the surveys for this study will be introduced during an already scheduled all-employee safety meeting, which should help achieve a higher response rate. Attending these already scheduled meetings is the most convenient way to obtain our desired sample. Also, because every worker attends these meetings from salary to hourly, we are able to obtain a purposive sample. Usually at these all-employee safety meetings, nearly everyone except perhaps designated occupations (which are few) are required to attend. Due to normal absences from work, a few miners may be unavailable on the particular days that the data collection activities are conducted at each mine. Therefore, accounting for workers in designated occupations who perhaps cannot leave their post for a meeting, others who may be absent that day, and the few that may choose to not participate, we are estimating an 80% response rate. However, extensive prior experiences with this methodology suggest that the response rates will achieve the expected levels. For example, in a safety culture assessment that NIOSH Office of Mine Safety and Health Research (OMSHR) completed, the response rate was typically in 80^{th} or 90^{th} percentile [Kosmoski et al., in progress].

In addition, by offering the survey in a web-based form in addition to the paper-pencil form, a higher response rate may be more likely because researchers can provide the link and keep the web-based survey open upon leaving the mine site. Therefore, employees who were absent on the day(s) NIOSH was present will still have the opportunity to complete the survey if they are interested and choose to participate.

4. Tests of Procedures or Methods to be Undertaken

For all of the variables listed above there are numerous existing, validated scales used in other industrial and/or mine settings. The survey items for this study were created based on a thorough literature review of using occupational health and safety, applied psychology, public health communication, as well as past practice utilized by NIOSH researchers when developing psychometrically supported surveys for mine workers. OMSHR researchers used existing scales and/or adapted scales to be consistent with mine terminology. Each item within the current study is studied using a 6-point (strongly agree to strongly disagree), Likert response scale format. To make the items relevant in the mining context, information was gained by reviewing previous NIOSH research and data in which mine workers completed survey questionnaires. This process helped ensure correct terminology and reading level. Even though all scales used to complete the survey were deemed valid, OMSHR researchers will revalidate each scale upon initiating data collection to ensure that the survey is measuring what we intend to measure. Therefore, after initial data collection at the first mine, OMSHR researchers will analyze the data and determine if items loaded as anticipated. If not, researchers may make minor word changes or remove items to increase the validity of a scale. If any items are added to the survey, an OMB amendment will be completed and submitted.

5. Individuals Consulted on Statistical Aspects and Individuals Collecting and/or Analyzing Data

The persons who will collect and/or analyze the data are listed below. Should the project require further guidance on scientific issues regarding data, other internal resources are available through teams within the project staff's branch.

These are the primary individuals who are leading study design, data collection, and analysis efforts:

Will assist with data collection:

- Cassandra Hoebbel, PhD, Associate Service Fellow, NIOSH Pittsburgh Research Laboratory, 412-386-6113, whd1@cdc.gov
- Dana Willmer, Ph.D., Human Factors Branch Chief, NIOSH Pittsburgh Research Laboratory, 412-386-6648, dpr4@cdc.gov

Designed the data collection, will assist with data collection and analysis:

- Emily J. Haas, Ph.D., Behavioral Research Scientist, NIOSH Pittsburgh Research Laboratory, 412-386-4627, EJHaas@cdc.gov