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

Enhancing Dialogue and Execution of Dust Reduction Behaviors through Workgroup Communication

Section B

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1. Respondent Universe and Sampling Methods

Potential Respondent Universe

This project includes coal mines. Active mines are mining operations that reported mine operator employment during the year. In 2012, the Mine Safety and Health Administration (MSHA) reported 1,871 coal mines [NIOSH 2014].

This same database showed that there are roughly 92,472 coal mine operator employees. Subjects for this research project will be employees from this commodity.

Sampling Methods

For this research study we are using nonprobabilistic sampling methods to recruit individuals/groups that will allow for conceptual explanations of the topic being studied, rather than representation [Given 2016]. Therefore, this study utilizes a convenience, albeit purposive sampling strategy [Yin 2011]. Within this sampling approach, individual workers and sites are identified and sought out because they meet some sort of criteria for the goals of the study [Given 2016]. Therefore, within our purposive approach we are solely recruiting mines that are using the CPDM on a regular basis. We also acknowledge and plan to engage in convenience sampling upon arrival at the mine site because we intend to utilize cases that are easily available and accessible while we are present [Yin 2011]. However, we will make every attempt to engage a wide range of workgroups and/or scenarios to help avoid bias throughout the study [Yin 2011]. For example, when recruiting individual workers/workgroups at a mine site, purposive sampling would be used in asking the mine operator the area(s) where they want to know dust levels/have concerns with dust levels. These areas are likely to differ across mine sites and therefore would result in a variety of job types being selected for participation.

Because the current data collection efforts are primarily qualitative in nature, we will not be able to generalize from one mine to all mines. Qualitative research does not aim to be representative [Corbin & Strauss 2015]. However, according to qualitative scholars, the goal is not to obtain representation but rather, to learn from the study of one or more sites and how the findings may have application to another [Corbin & Strauss 2015]. Therefore, it is possible that findings from one mine within our convenience sample will inform what we know about workgroup and worker/supervisor communication practices as well as actions for reducing respirable dust exposures, based on data obtained in the pre and post assessments. Therefore, even if communication practices are high at one site and low at another site, these practices and performance measures can be used to inform final considerations from the project to be disseminated in outputs.

Because our primary concerns in this study are to identify what and how communication practices support healthier work behaviors and what corrective actions, as identified during safety circle discussions using CPDM dust data, can help reduce respirable dust exposure, the locations of the mines is not as critical as in studies that have to factor in varying geographies and environmental constraints. Rather than comparing differences among mining regions, we are seeking to identify trends in communication practices and corrective actions that, in the end, are most likely to reduce workers' dust exposures via healthier work practices. However, we will make an attempt to recruit mines of different companies, since their organizational structure and management system may affect communication processes and actions

on site. Therefore, NIOSH researchers are aiming to recruit mines owned by different companies, to obtain a diverse data set as well as diverse management systems within the organizations. A description of the mines where data is collected will be provided in any publications of the data (e.g., size, location, type of extraction method utilized, etc.). To date, we have a rough estimate of potential participating mines – illustrated in the table in the next section.

Respondent Selection Methods and Anticipated Sample

It is expected that the participants, both workers and members of management, 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 the studies are conducted at each participating site. However, because shift schedules and rotations vary from mine to mine and we cannot predict this rotating schedule, nor can the mine operator, randomization is inherent in the data due to the fact that our visits are not planned based on who is working.

Generally, within a particular area of a mine only a small number of workers are working during the shift. Because of the small sample of workers (i.e. workgroup) in a particular area, randomization is not possible because all miners working in the area may participate. For example, the longwall crew at an underground mine usually consist of 9-15 workers during a shift. Therefore, all of these workers would be given the option to participate as part of their respective workgroup. Across the participating mine sites it is expected that over the course of the three-year study no more than 90 individuals will participate in some capacity.

Because this is primarily a qualitative study, statistical methods for stratification and sample selection are not necessary. Although a pre and post-test survey is administered as part of the study, only means of survey scales will be used to inform the cumulative data analysis (i.e. focus group responses and worksheet responses). For each separate mine case, power calculations will not occur because the samples at each mine are small. However, at the end of the study, after participation from approximately three to five mines, power calculations may occur because we will have a higher sample and can perform more tests to determine statistical significance of the overall study of (i.e. changes in workers' perceived H&S proactivity, knowledge, and communication).

The primary purpose of the study is to document what and how organizational communication practices and worker behavior changed, using the CPDM dust data, to identify areas in need of discussion and corrective action. Because this study is longitudinal, it is more important to assess employees over a period of time rather than more but at only one time point. The number of employees at medium-sized mines often ranges from 50-299 [NMA, 2014]. It is expected that at each participating mine, roughly 8-20 individual workers (or one workgroup) will participate and roughly 1-2 mangers will participate at each mine site. So, the response rate at each mine is intentional and appropriate given the time intensive case study design for each mine. Below is a sample table of the anticipated range of corporations and respondents we expect, based on previous experience with field research and who we have been in touch with during preliminary conversations about the study. As the table shows, we have representation among four corporations and have varying demographic locations, mine sizes, and experience using the CPDM and participating with NIOSH.

Anticipated Sample of Respondents

Mine Site	Commodity	Owner	Geographic Location	# of Employees	Used CPDM	Recruitment Effort	Year of last NIOSH branch field visit
1	Underground Coal	Patriot Corp.	West Virginia	180	Yes	Site secured via phone call to mine H&S manager	2007
2	Underground Coal	Consol Energy	Virginia	343	Yes	Discussed project via phone call to mine H&S manager	N/A
3	Underground Coal	Walter Energy	Alabama	1,200	No	Discussed project via phone call to mine H&S manager	2005
4	Underground Coal	Rosebud Mining	Pennsylvania	500	Yes	Discussed project via phone call to mine H&S manager	N/A

2. Procedures for the Collection of Information

Sampling and Recruitment Procedures

A purposive sampling approach will be used to initially recruit the mines and then a convenience sampling approach will occur while NIOSH researchers are present at each participating mine site. Mines are recruited using previously established contacts that may be recent relationships or previously established relationships. We tend to recruit mines using e-mail but sometimes will call contacts on the phone to discuss a study. In other instances, we network with mine operators at mining-specific conferences. In the current study once mines are recruited and we are working with our mine point of contact, generally the mine would not be concerned with a specific individual, but rather, with the dust levels in a certain area. Therefore, operators are expected to choose a workgroup in which higher levels of dust may be generated (i.e. a work crew at the face). Therefore, selecting specific participants would not occur, rather a work group based on job tasks at the time would be selected. It is also expected that varying job tasks experience higher exposures at one site to another and therefore, we would have varying job tasks/roles that participate. Although findings will not be representative or generalizable across all mines, it is possible that findings from mine to mine within our convenience sample will inform what we know about communication practices as well as activities and areas where exposure is higher and subsequently, actions that workers find useful for these exposures.

Upon traveling to a participating mine site the study will be introduced to the group(s) and then facilitated by key personnel on the project (NIOSH researchers trained in mixed methods data collection). Consent forms will be read and provided to participants before any data collection begins. After reading the consent form, each individual has the option to choose whether they would like to participate. Any individual who decides to participate will stay in the room. 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.

Data Collection and Organization

The two trips and data collected during these trips per mine site study are summarized in the Table below. The data collection instruments are further discussed after the table.

Estimated Time Table:

Type of Respondents	Data Collection Effort and average response time (in minutes) for each effort	No. of Respondents (total, not by mine site)	Total Average Response Time per Respondent
Mine Workers	**Visit 1 (Week 1)** • Survey pre-test (15) • Dust control assessment worksheet (15) • Safety circle focus group meeting and worksheet (45)	80	1.25 hours
	Visit 2 (Week 6) • Survey post-test (15) • Safety circle focus group meeting and worksheet (45)	80	1 hour
TOTAL TIME for Workers:		**2.25 hours over a six-week period**	
Mine Site Leaders/ Managers	**Visit 1 (Week 1)** • Initial HSMS assessment interview or focus group (45) • Dust control assessment worksheet (15)	10	1 hour
	Initial Feedback from Pre-assessment (Week 3/4) • Provide email to management that contains initial results, recommended communication practices to support dust reducing behaviors, and particular corrective actions that workers identified as being feasible and useful that can be encouraged.	10	30 minutes
	Visit 2 (Week 6) • Safety circle focus group meeting (45)	10	45 minutes
TOTAL TIME for Leaders:		**2.25 hours over a six week time period**	

NIOSH researchers may read the survey to mine workers if they want to participate but do not want to read the survey and the researcher will simply fill in the answers for the participant as requested. The other data will be collected via focus groups or interviews and researchers will record information from participants using hand written notes and collect any checklists/worksheets completed by the group (see data collection instruments attached).

Upon returning to the office, members of the research team will enter the information from the survey 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. Our branch has an Insight 20 scanner that we purchased from Scantron that has the ability to download the survey data directly into the computer to avoid the possibility of human error.

Qualitative data (focus groups and discussion worksheets) will be collected via note taking and at the end of the discussion. This data will not be used for statistical analysis. Upon returning from the data collection, the NIOSH researcher taking notes will transcribe the notes to Microsoft Word and save the worksheet files with a de-identified password. Each team member will be responsible for typing their individual notes and summarizing major points during the focus groups.

Statistical Analysis

The only quantitative data analysis includes workers' pre and post-surveys – a NIOSH-developed and previously validated survey that assesses safety climate. In order to answer whether or not the communication model significantly changed mine workers' (1) perceptions of communication on site and (2) level of proactivity from the pre-test to the post-test, a paired-samples t-test or repeated measures ANOVA can be used to determine if an intervention or training affected some other variable, in this case, mine workers' proactivity. A paired-samples t-test is used to determine whether there is a significant difference between the average values of the same measurement made under two different conditions such as in a pre and post assessment (Pallant, 2010). In the case of a sample too small statistical analysis will not be performed.

Note on sample size for quantitative analysis: It is possible to increase the sample size at each mine, during our first visit, but we also want to be cognizant that we have a burden on each worker not just one time but another time when we return to the mine. We are also saying that the sample size may be small because we need to have the same workers participate on our follow-up visits. Despite trying to coordinate a return date with the mine where the same people will be working, we foresee some challenges with this (e.g. people being on vacation, out sick, or in a new job role). We are trying to be a little more on cautious side in the protocol but of course hope we have a large enough sample, which we believe we will.

Other Analysis

1. CPDM dust data cards are discussed during the focus groups but is not being recorded. Although we discuss with workers when their max dust exposure readings occur, rather than focusing on the number, we focus on the conditions/behaviors that may have caused the elevated exposure and what actions can be taken to reduce future elevations. Dust exposure data is not recorded because on follow-up visits workers may not wear the CPDM in the exact same area, for the exact same time, doing the exact same thing; therefore, comparing exposure data cumulatively is not possible. Rather, noting an exposure level while doing a task, such as shoveling in the face one day, and noting the difference in exposure level if a worker sprays the rock dust before shoveling it, is the purpose of the using the CPDM dust data in the current study – identifying things the worker and manager can do to reduce dust exposures.

2. Qualitative summary notes from the focus groups will be consolidated, summarized, and coded using theories of health behavior and health and safety management systems as categorizing mechanisms. Methods of qualitative data coding (Boyatzis, 1998; Patton, 2002; Charmaz, 2006) will be applied during

the analysis phase, including engaging in initial and focused coding and then constant comparison of the results. In addition, some of the responses provided during the interviews that are more close-ended or number counts will be coded using qualitative content analysis methods. Content analysis is a flexible method for analyzing text data in order "to provide knowledge and understanding of the phenomenon under study" (Downe-Wamboldt, 1992, p. 314).

The purpose of these analyses is to simply provide tailored recommendations about optimal communication to different levels of leadership at the organization to support the corrective actions identified that can reduce exposure to respirable dust. This content will not be used to make any generalizations about communication practices from an industry perspective.

Specifically, any perspectives that workers provide about communication with their leadership or work crew will be analyzed and coded to allow researchers to see patterns in communication practices and to note whether or not participants appreciated these interactions in terms of facilitating healthier work perceptions and behaviors. The purpose of this analysis is to simply provide tailored information about communication practices at different levels of workgroups and leadership at the organization. This content will **not** be used to make any generalizations from an industry perspective.

3. We are also collecting qualitative information at both time points via the worksheets participants will complete during the focus group discussion with their peers. These worksheets will be used mainly, to spark discussion among the participants but also to determine corrective actions that participants felt worked and did not work in reducing their exposure to dust, as well as what changes they made personally to be healthier in this aspect. We intend to apply process tracing as an analysis technique to help address the challenge of how to meaningfully assemble all of the disparate information we receive throughout the focus group discussions into coherent information that establishes causality [Tashakkori and Teddlie, 2010]. Because a series of time points and observations with workers and leaders can be analyzed concurrently in a way that build upon each other, this project will have strong narrative explanations that support the targeted behavioral outcomes (i.e. communication practices and corrective actions taken) over time [Tashakkori and Teddlie, 2010]. In addition, by collecting data on more than one level (worker and leader) we can explain how and why these different factors came together to yield a targeted outcome (i.e. proactive health/safety behavior or sound communication implementation practices).

Therefore, data will be analyzed independently and then together during the two time points, shortly after data collection. At the end of the project, the data results from each time point will be viewed "organically" to help "mix the methods" in an effort to trace data and determine factors at the workgroup and leadership levels that caused changes in workers' pre and post-test survey including their noted behavior changes over time [Tashakkori & Teddlie, 2010, p. 731]. This process will involve analysis of the data by a research team of approximately three people.

3. Methods to Maximize Response Rates and Deal with Nonresponse

CDC does not claim that the workers selected for this study are statistically representative of the entire population of U.S. underground coal miners. It should not be assumed that the findings of this exploratory

study are generalizable to other groups of miners. Based on previous research studies completed with mineworkers, it is anticipated that at least 85% of individuals selected to participate in the evaluations will participate. The instruments will be administered in group sessions, which should help to ensure a higher response rate. In addition, extensive prior experiences with this mixed methodology at mine organizations suggest that the response rates will achieve the expected levels. For example, in a safety culture assessment that NIOSH OMSHR completed, the response rate was typically in 80th or 90th percentile for those who were selected to participate in a survey and interview [Kosmoski et al., in progress]. Due to normal absences from work, a few miners may be unavailable on the particular days that the data collection activities are conducted.

4. Tests of Procedures or Methods to be Undertaken

All of the data collection instruments have been pilot tested in the field under smaller IRB project protocols, to ensure they make sense to the mining population and can inform the questions guiding this study. Feedback provided during these pilot data collection efforts with workers and management informed the current study design and data collection materials. Final data collection materials were developed for the current study based on data obtained in the following, separately approved protocols:

- HSRB 14-OMSHR-05XP - "Exploring the Use of Dust Control Technologies on Bagging Operators' Perception of Risk and Health Protective Behaviors" (approved on 06/18/2014). Nine workers were interviewed about their perceptions of dust exposure and acceptance of mine health and safety technologies. This study informed questions in the focus group guide and worksheets.
- HSRB 14-OMSHR-07XP "Understanding How Mine Leadership Uses Technology to Improve Mine Site Health and Safety" (approved on 09/15/2014). Nine members of management participated in one focus group about their uses of and benefits of barriers of using new mine technology to control workers' exposure to respirable dust. This study informed questions in the focus group guide and worksheets.
- HSRB 14-OMSHR-11XM "An Analysis of Top-ranked HSMS Elements and Practices" (approved 02/27/2015). 12 health and safety managers participated in focus groups about the best ways to manage and communicate about health and safety to their workers. This study informed questions in the focus group guide.
- HSRB-14-OMSHR-08XM "Assessing the Impact of Organizational and Personal Antecedents on Proactive Health/Safety Decision Making" (approved 01/17/2015). 117 mine workers completed the pre/post safety climate survey to validate the survey scales for larger sample distribution and analysis. Each scale within the survey rendered a Cronbach's alpha of at least .75, which is good reliability. The survey items were created based on a thorough literature review of using occupational health and safety, applied psychology, and public health communication. 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 revalidated each scale upon initiating data collection with 117 mineworkers at two mining corporations in April 2015, to ensure that the survey

measured what we intended. The Cronbach's alpha for each scale within the pre and post survey are below.

Construct	Reliability (Cronbach's Alpha) *n* = 117
H&S Proactivity	.882
H&S Compliance	.814
Supervisor H&S Support	.798
Coworker Communication	.888
Supervisor Communication	.849
Engagement	.752
H&S Training	.778
H&S Motivation	.887
H&S Knowledge	.877

These pilot tests of procedures were undertaken in order to create the most accurate, resonant study and informed the data collection instruments for both groups and the overall study design. Cumulatively, the focus group data will be analyzed to determine if any notable communication practices were identified as useful and desirable within the workgroup and between workers and leadership in supporting healthier work behaviors (i.e. corrective actions). Additionally, the worksheets will be analyzed to determine possible corrective actions that worked and perhaps did not work in reducing exposures to dust. Finally, the pre and post survey will identify any changes in the scale means to assess possible trends in improved communication support and worker proactivity.

If for some reason researchers do not identify or interpret any notable practices or trends in the data to answer our questions of interest after our first mine visit, we will revisit the data collection instruments and study design to determine what changes may be more amenable for the study and submit an amendment as necessary. However, due to the extensive piloting of all instruments and the overall study design in a previously approved protocol (OMB control number 0920-1082), we do not anticipate problems with the study design or data in terms of answering our research questions.

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.

1Project Staff:

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

Designed the data collection, will lead data collection and qualitative analysis:

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

Will assist with data collection, and will lead statistical analysis (if statistical analysis is applicable):

- Kyle Stanyar, Ph.D., Associate Service Fellow, NIOSH Pittsburgh Research Laboratory, 412-386-6415, ygm1@cdc.gov

Will assist with data collection and qualitative analysis:

- Dana Willmer, Ph.D., Human Factors Branch Chief, NIOSH Pittsburgh Research Laboratory, 412-386-6648, dpr4@cdc.gov
- Cassandra Hoebbel, Ph.D., Associate Service Fellow, NIOSH Pittsburgh Research Laboratory, 412-386-6133, whd1@cdc.gov