National Institute for Occupational Safety and Health
NIOSH

Brief Report of Research Grant Findings

Occupational Energy Research Program

INEEL Edition **October 2000**

Glossary of Terms

Downsizing Rate

The ratio of the number of employees laid-off divided by the number of employees at the site, averaged across all departments/ work groups.

Downsizing Process

The procedures and policies used to carry out the downsizing; that is, the way the downsizing was handled, the fairness of the procedures, and the degree of open and honest communication with employees.

Downsizing Involvement

The extent to which employees had more direct experiences of downsizing, such as delivering layoff notices, being laid off and then rehired, and changing jobs/departments.

Survivor Syndrome

A cluster of symptoms which includes feelings of guilt, sadness, and worry seen in workers who retain their jobs after downsizing.

The Impact of Downsizing and Reorganization on Employee Health and Well-being at the DOE INEEL Facility

Investigator: Lewis D. Pepper, M.D., M.P.H., Associate Professor, Principal Investigator; Miriam Messinger, M.P.H., Project Manager, Department of Environmental Health, Boston University School of Public Health.

Study Sites: Idaho National Engineering and Environmental Laboratory, Los Alamos National Laboratory, Nevada Test Site, Oak Ridge (Y-12), and Pantex.

Study Focus: The negative effects of downsizing and reorganization on workers who lose their jobs is well known, but there is growing evidence that even workers who retain their jobs during downsizing also are affected in negative ways. It is common to find reports of reduced job commitment, low morale and low job satisfaction among "job survivors," as well as feelings of guilt, sadness and worry. The present study examined this "survivor syndrome" as well as other health and safety effects of downsizing at the Idaho National Engineering and Environmental Laboratory (INEEL). The study measured how downsizing was done in each department, the adequacy of communication, perceived fairness, and characteristics of jobs (e.g., workload, decision-making, etc).

Methods: Data were collected using a questionnaire survey that was designed specifically for this study. The questionnaire asked workers and managers about how the downsizing was accomplished (e.g., perceived fairness, openness of communication) and the extent of their direct involvement in the downsizing. In addition, the survey measured job characteristics such as workload, decision-making authority, conflict resolution, and supervisor support. The survey was sent to a random selection of 2,368 workers at INEEL. Responses were returned from 71% (N=1679 respondents) of those who received the survey. Additional data were obtained from archival records, including sick time data, overtime usage, and accidents/illnesses, and from focus groups and interviews with workers and managers at the site.

Study Findings:

1. Workers who felt that the downsizing process was fair, and that communication was open and honest, reported fewer medical symptoms (e.g., headaches, shortness of breath, backaches), fewer symptoms of survivor syndrome, less stress, better mental health, and less job insecurity.

2. Workers who were more directly involved with the downsizing process (i.e., delivered layoff notices, were laid off and then rehired, changed jobs/departments) reported more medical symptoms, lower mental health, and more job insecurity.

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Further NIOSH Information:

- For a copy of the final technical report or the executive summary for this study, call:

  1-800-356-4674

- For a summary of NIOSH research involving Department of Energy workers, visit online at:

  www.cdc.gov/niosh/oeindex.html

This study was supported by the National Institute for Occupational Safety and Health (NIOSH) Cooperative Agreement Program. The conclusions and recommendations expressed are those of the authors and not necessarily those of NIOSH.

Study Findings (Continued)

3. Workers in jobs with high workload demands but with low decision-making authority reported more medical symptoms, more symptoms of survivor syndrome, more stress, lower morale, and more job insecurity.

4. Workers who experienced threats or acts of violence or harassment reported more medical symptoms and more job insecurity.

5. Focus group and interview data yielded several common themes:

- relationships between senior management and employees were strained, and communication was inadequate
- dissatisfaction with the matrix system since it hampered effective employee-management relations
- workload was too high due to understaffing
- job insecurity remains a significant concern for workers
- the voluntary process used to downsize INEEL was seen as favorable by employees

Interventions: The findings point to recommendations that may help mitigate some of the negative impacts of downsizing on employee health and well-being. For example, organizations should consider:

1. Implementing processes and policies that emphasize fair procedures, and open, timely, and honest communication to employees in all work units.
2. Assessing workload demands following significant changes to a work unit or department.
3. Implementing regular surveys of the organization, with particular attention to communication, workload, and management relations with the DOE.

Important Announcements

Study findings will be presented at INEEL in October/November 2000. Details of the site visit will be provided later. For more information including developments regarding the scheduling of site visits, please contact DOE site representative, Stacey Madson at (208) 526-1532. Copies of the complete report, The Health Effects of Downsizing in the Nuclear Industry: Findings at INEEL, can be found in the DOE Reading Room, University Place, 1776 Science Center Drive, Idaho Falls, Idaho, (208) 526-1388. Questions concerning this study should be directed to Dr. Pepper at (617) 638-4620.

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The Health Effects of Downsizing in the Nuclear Industry

Idaho National Engineering and Environmental Laboratory (INEEL)

Executive Summary

September 2000

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Funded by a grant from the National Institute of Occupational Safety and Health (NIOSH)

Copies of the complete report are available in the Idaho Falls Department of Energy Reading Room or contact Joy McDonald with LMITCo (208-526-2070)

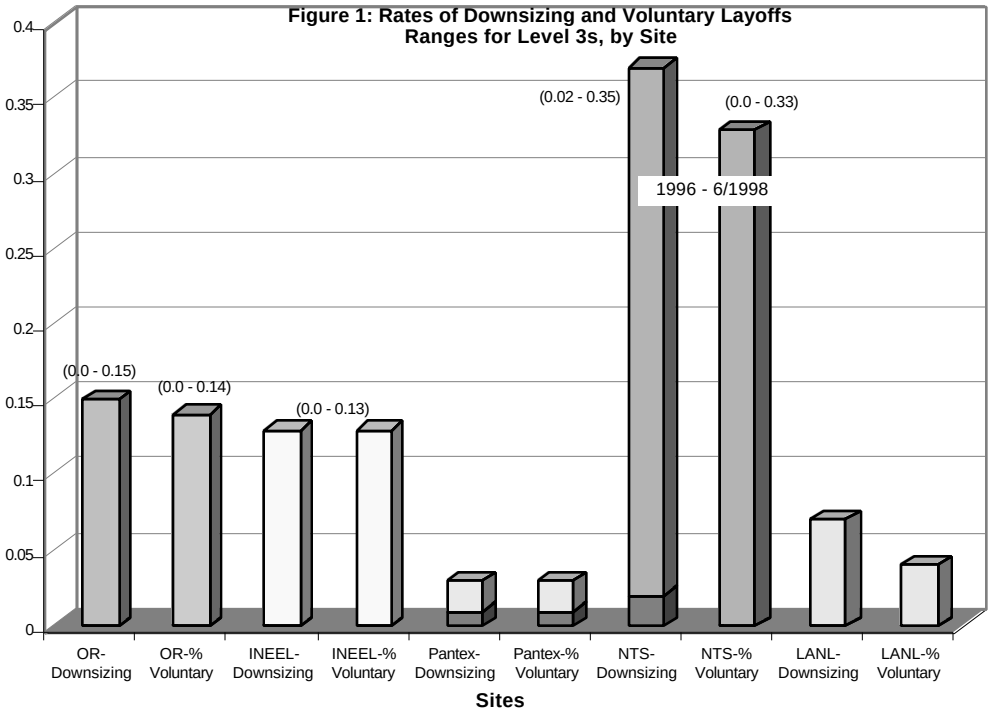
The Health Effects of Downsizing in the Nuclear Industry

Idaho National Engineering and Environmental Laboratory (INEEL)

Executive Summary

Organizational restructuring within the defense industry prompts research on health effects.

The dissolution of the Soviet Union and the ending of the Cold War in 1992 resulted in marked shifts in United States military strategy and budgets. Consequently, Congress passed Section 3161 of the National Defense Authorization Act for Fiscal Year 1993 outlining an approach to workforce layoffs in the nuclear weapons industry. Since then, there have been 46,000 layoffs of contractor employees at Department of Energy sites. More than 14,000 employees were downsized from the five study sites between September 1991 and September 1998 through voluntary and involuntary layoff events. In 1999, employment at the five sites was from nine to sixty nine percent lower than the highest employment level during the 1990's. The downsizing rates for each of the sites, including overall downsizing and the extent to which layoffs were of a voluntary nature, are presented below in Figure 1.



To better understand the impact of such downsizing and other organizational changes on both the remaining workforce and those who lost their jobs, the U.S. Department of Energy (DOE) and the Centers for Disease Control (CDC) solicited research proposals.

Boston University School of Public Health, with funding from the National Institute of Occupational Safety and Health (NIOSH), was selected to study and recommend ways to mitigate the impacts of workforce reductions on individual and organizational health.

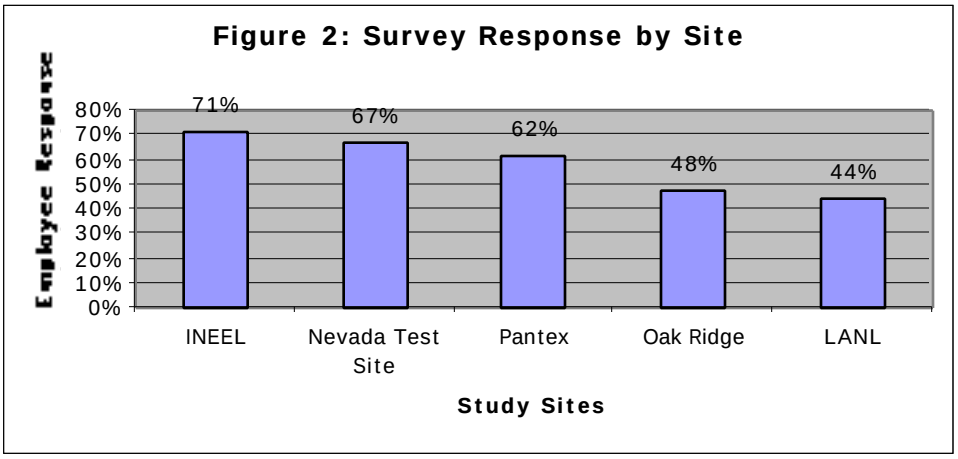
This study required enormous cooperation. Our biggest thanks are to the nearly 6,000 employees who participated in focus groups or interviews and completed surveys, and to those supervisors who helped make that possible. This report was peer reviewed by two experts in the field of workplace stress and psychosocial research.

Boston University School of Public Health study is most far reaching of its kind.

Our research, covering the period from 1991 through June 1998, is the largest of its kind--in both scale and scope--to investigate the health and organizational effects of

workplace restructuring. Marrying the disciplines of public health, organizational psychology and organizational management, we used several methodologies and designed a multi-level research model to best capture the complexity and variety of relevant data.

In our survey, which was only one piece of the data collection, we sampled 10,645 employees from our five study sites (or 43% of all eligible employees at those sites). We received an overall response of 55% and, at the Idaho National Engineering and Environmental Laboratory (INEEL), 71% or 1,681 employees completed the survey. Figure 2 compares response rates by site.



Globally, downsizing and organizational restructuring have become common management tools, used to improve operational and fiscal efficiency. However, little is known, about the effects of these tools on employee health or organizational effectiveness. Therefore, the knowledge sought through this research is important for employees, unions, and other employee organizations, contractors and federal entities managing organizational change in DOE facilities, as well as for those in other industries.

We identified and investigated four key issues in downsizing, reorganization and health.

1. Downsizing will have a negative effect on individual health and workplace functioning (i.e., employee morale, work performance and job security).
2. Employees are less likely to experience negative health effects and organizations are more apt to function normally the fairer the downsizing process and the fewer direct elements of downsizing the employee experiences.

3. During periods of organizational change, one's work and work environment, including job strain*, organizational style, co-worker and supervisor support, and workplace safety will affect both individual health and workplace functioning.
4. Workplace factors including job strain, organizational climate, and the employee's perception of the fairness of the downsizing process can moderate the impact of downsizing on health and organizational outcomes.

Findings at INEEL Demonstrate Need to Develop Interventions for Improved Employee Health.

The Idaho National Engineering and Environmental Laboratory (INEEL) has experienced extensive organizational change including contractor consolidation, contract changes and downsizing since 1993 as seen in Figure 2 We chose INEEL as a study site because it is large, located in a small fairly remote city and the Department of Energy is the major regional employer.

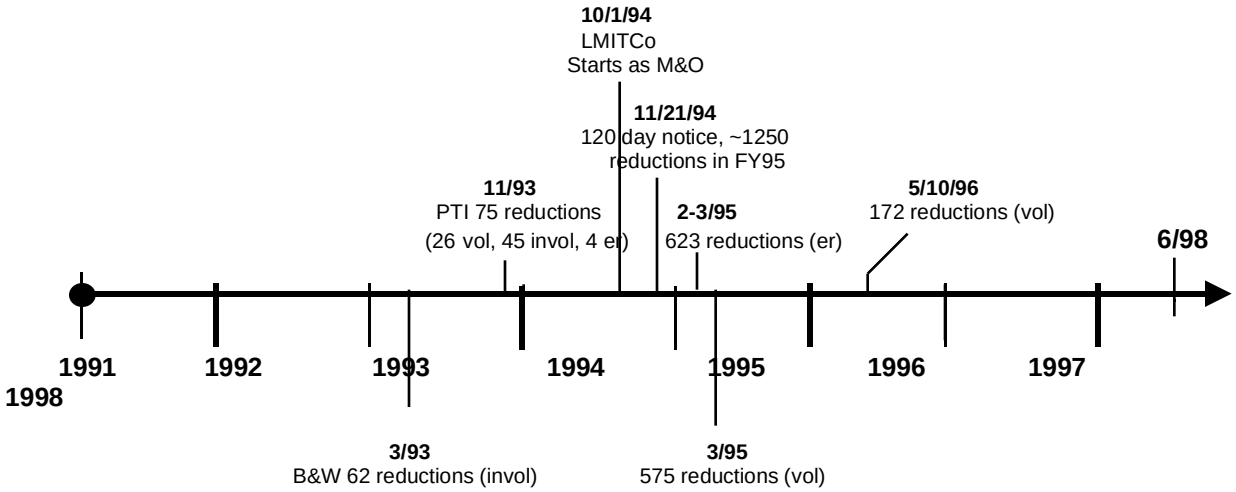
- **Definitions of terms**

Job strain measures both the "demand" one experiences at work (physical and psychological) and the "control" an employee has over work tasks, where job control refers to the ability to structure your work, feel challenged and use your skills and training. Job strain is measured using three scales: the job demands scale, the decision authority scale and the skill discretion scale.

Organizational style refers to managerial and leadership approaches, with particular attention to how relationships and problems are handled. We looked at the company's organizational style using four scales on: 1) handling conflict, 2) the relationship with the DOE, 3) how management communicates with employees, and 4) workplace violence.

Organizational climate is used here as an umbrella term for work environment issues. We include the components of organizational style listed above (four scales) as well as co-worker and supervisor support and workplace health and safety (three scales measuring general safety, toxic exposure and exposure to noise).

Figure 2: Timeline of INEEL Downsizing and Restructuring Events



Work force Reduction Type
vol= voluntary incentive, non early retirement
er= early retirement
invol= involuntary

Our research yielded the following five site-specific findings at INEEL.

1. Employees who perceived that downsizing was implemented with clearly explained reasons, worker input, open respectful, truthful and unbiased communication with employees, and consistent and fair rules experienced fewer negative health effects.
    - A process perceived as just and fair was associated with fewer reported medical symptoms and conditions.
    - Greater fairness was associated with better mental health status (MCS), fewer survivor syndrome symptoms and less perceived stress.
    - The more fair the downsizing, the less job insecurity was expressed and the higher the reported morale.

2. Employees who reported more direct experiences of the downsizing performed worse on five of the nine outcome measures.
    - A higher score on the downsizing experiences index was associated with more medical symptoms and conditions and with a lower overall health score (PCS).
    - These employees had lower mental health scores (MCS).
    - The more downsizing elements experienced, the greater the job insecurity.

3. Employees who experienced greater job strain reported an increase in adverse individual and organizational functioning outcomes.

    - Workers with higher job strain reported a greater number of medical symptoms and medical conditions.
    - Higher job strain was associated with poorer reported mental health status, more survivor syndrome symptoms and greater perceived stress.
    - Morale and job security were lower for employees who reported high strain and they reported more instances of poor work performance.

4. Employees who felt that INEEL managers and employees effectively resolve conflicts at the site, performed better on seven of nine study outcomes.

    - Effective conflict resolution was predictive of fewer medical symptoms.
    - A workplace that resolves conflicts is statistically association with employees who have better mental health, less stress and fewer survivor syndrome symptoms.
    - These employees also report higher employee morale, better work performance and greater job security.

5. Employees who experienced threats or acts of violence, harassment or discriminatory treatment have worse health outcomes.

    - Employees who report more experiences of violence, harassment or discriminatory treatment report worse physical health (on all three measures).
    - INEEL employees who experienced more instances of violence or harassment reported worse mental health.
    - More violent or harassing experiences was statistically associated with greater job insecurity and more instances of poor work performance.

6. Employees at INEEL expressed some consistent concerns in employee discussion groups, interviews and comments written on the surveys. We heard that:

    - the relationships between upper management (which had an increased workload and pressure) and employees had become strained and was highlighted by decreased trust and communication;
    - there was dissatisfaction with the matrix system as employees believed that it hampered effective employee/supervisor relationships;
    - there was a perceived difference between site and town employees with workers stating that it was a disadvantage to be working at the site;
    - organizational changes including downsizing, budget cuts, and increased workload were believed to present great challenges to a positive safety culture because employees preoccupied with job concerns were more likely to make mistakes and compromise safety;

- there was continued job insecurity resulting from lack of information about future changes as well as the lack of good external job opportunities.

INEEL findings are similar to findings at four other study sites.

At all five sites, our survey, focus group and interview data show the importance of a fair and just downsizing process on employee health. The more elements of downsizing that individual employees experience, the more likely they are to suffer negative effects, particularly related to medical symptoms, overall mental health and job security. High job strain had negative effects on employee health and organizational functioning at all of the study sites, each in its own stage of downsizing. INEEL was the site at which both job stain and fairness were associated with the most outcomes.

While the experience of violence or harassment predicted negative outcomes at three sites, including INEEL, it did not emerge as important at two others. The effective resolution of conflict emerged as an important theme at INEEL but none of the other sites.

Study employs various methods to understand the complexity of downsizing and organizational change.

We used multiple approaches to collect and compare information about the extent of downsizing, employees' perceptions of the downsizing, workplace safety and other organizational issues. Through our interviews with key individuals, focus group discussions and work-site observations, we were able to glean characteristics and themes within the workplace as perceived by the employees themselves. This qualitative data revealed aspects of employee culture and organizational climate that could not be obtained with other research techniques.

A central source of data was the responses to the *Boston University Workplace Survey*. The survey was sent to a random selection of 2,368 Lockheed Martin Idaho Technology Company (LMITCo) employees. We received a response of 71% from workers at INEEL. This survey, based on our review of relevant literature and knowledge gained from interviews and focus group discussion, was pilot tested at four sites, reviewed by NIOSH institutional boards and then revised.

We also reviewed archival records (including sick time data, overtime usage, downsizing data and accident and illness data, medical services utilization, etc.) for their potential use in this research.

Researchers maintained a high level of communication with employees and their communities throughout the study.

Throughout our research, we maintained the highest levels of communication with employees and members of their communities. We sponsored town and community meetings to relay information about and receive feedback on our study. We obtained informed consent from employees involved in any interview, focus group or who completed the employee survey. At various stages of the research we made available information about the study and research updates for publication in site and local media. Additionally, we established a study e-mail account and posted information on the World Wide Web. We will be presenting our results at each site and will make available written materials at all sites and by request from researchers and on the Web.

Researchers recommend interventions that target many levels of the organization and include further research.

Our findings point to many ways to mitigate negative impacts on employee health and workplace functioning. In order to be most effective, an intervention design should address the following three organizational levels and should feature a variety of approaches. We provide here only a few examples within each category. Our complete list of recommendations can be found in the final report for INEEL: The Health Effects of Downsizing in the Nuclear Industry: Findings at the Idaho National Engineering and Environemntal Laboratory (INEEL).

At the policy and structural level, interventions should include, for example, programs and policies to address: any incidence of workplace harassment and violence; flexible work schedules that respond to employee concerns about workload, work demand and poor work-home balance; and preparation and training of managers who must plan or implement a downsizing or restructuring event.

Interventions that address procedures and group functioning should include, for instance: training for managers on effective supervision and communication; employee training on workplace diversity; and programs that encourage employees to respond to workplace change openly.

Individual level interventions should include, for example: sessions on exercise and stress reduction; collaboration with employees to redesign jobs or work stations; and information that use of the Employee Assistance Program will not detrimentally affect one's career.

The Health Effects of Downsizing in the Nuclear Industry:

Findings at the Idaho National Engineering and Environmental Laboratory

Final Report

October 2000

Conducted by: the Boston University School of Public Health (BUSPH)
Funded by: the National Institute of Occupational Safety and Health (NIOSH)

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I. INTRODUCTION

- **Changing global economies require research on effects.**

In 1992 the Soviet Union dissolved and the Cold War ended. Consequently, the United States' military strategy and budget shifted. The Department of Energy (DOE) and the nuclear defense industry in the United States embarked on a process of changing its mission and determining revised, necessary staffing levels. In October 1992, Section 3161 of the National Defense Authorization Act for Fiscal Year 1993 was passed and outlined an approach to workforce layoffs in the nuclear weapons industry.

Anticipating major layoffs, the DOE and Centers for Disease Control (CDC) identified a key research priority: to study the impact of the expected downsizing and other organizational changes on both the remaining workforce and on those who lost their jobs. Boston University School of Public Health, with funding from The National Institute of Occupational Safety and Health (NIOSH), was selected to study the health and organizational impacts of workforce reductions. The goals were to: 1) understand those factors that mitigate or exacerbate the consequences of restructuring and downsizing; and 2) propose measures to prevent adverse consequences of downsizing.

This report explains our research methodologies as well as the findings at the Idaho National Engineering and Environmental Laboratory (INEEL), one of the five study sites. We discuss the significance of the findings and recommend ways to make all of the sites safer and healthier workplaces.

Downsizing and restructuring are two prominent manifestations of the continually changing global economic landscape. Business and government lack complete information about the economic, health and organizational impacts of downsizing. Our study contributes important data that can help ensure that decisions are made with more complete knowledge of how organizational restructuring will affect individuals and the workplace.

- **Study investigates impact of layoffs on health factors.**

Five study sites that best represented a variety of downsizing experiences were selected from a pool of 18 DOE defense sites: the Idaho National Engineering and Environmental Laboratory (INEEL), the Los Alamos National Laboratory (LANL), the Nevada Test Site (NTS), the Pantex Plant, and the Y-12 Plant at Oak Ridge. These sites also featured variation on other characteristics including size, location, the state of the regional economy, and percent of employees unionized. Data gathering included: interviews, workplace observations, employee discussion groups, an employee survey distributed to more than 40% of the site employees (over 10,500 people), and historical record review.

The study hypotheses are:

1. Downsizing will have a negative effect on individual health and workplace functioning (i.e., employee morale, work performance and job security).
2. Employees are less likely to experience negative health effects and organizations are more apt to function normally the fairer the downsizing

process and the fewer direct elements of downsizing the employee experiences.

3. During periods of organizational change, one's work and work environment, including job strain[1], organizational style[2], co-worker and supervisor support, and workplace safety will affect both individual health and workplace functioning.
4. Workplace factors including job strain, organizational climate[3], and the employee's perception of the fairness of the downsizing process can moderate the impact of downsizing on health and organizational outcomes.

We analyze data for each site, focusing on the impact of downsizing, job strain and organizational climate measures on physical health, mental health and organizational functioning. We examine downsizing as a work stressor and analyze how individual, organizational and systemic factors influence health.

- **Our study finds association between downsizing process, workplace factors and health.**

The principal statistical findings for the surviving employees at the Idaho National Engineering and Environmental Laboratory (INEEL) follow.

1. The rate of downsizing and the level of voluntary layoffs were not predictive of worse health for employees.
2. The more fair employees rated the downsizing process, the better they performed on seven of nine outcomes including fewer medical symptoms and conditions, higher mental health score, less survivor syndrome symptoms and perceived stress, greater job security and higher morale.
3. The more direct elements of the downsizing an employee experienced (from being laid off and rehired to distributing layoff notices to having one's job restructured), the worse the reported physical health (on all three measures), the lower the overall mental health score, and the greater the expressed job insecurity.
4. Higher job strain was predictive of more medical conditions and symptoms reported, lower mental health scores, greater survivor syndrome and perceived stress, less job security, more instances of poor work performance and lower employee morale.

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[1] Job strain is a concept that encompasses the physical and psychological demands a worker experiences and the control that employee has over work tasks. Control at work is defined as the ability to structure work as well as the extent to which a job is challenging and one's skills are used. Job strain is measured using three scales: the job demands scale, the decision authority scale and the skill discretion scale. See items B1 and B6 in the attached survey (Appendix E).

[2] Organizational style refers to several aspects of managerial and leadership approaches, with particular attention to how relationships and problems are handled. We chose four scales related to organizational style to assess how the company / organization handles or experiences conflict resolution, the relationship with the DOE, communication, and workplace violence.

[3] We use organizational climate as an umbrella term covering elements of the work environment. We include the components of organizational style listed above (four scales) as well as co-worker and supervisor support, and workplace health and safety (three scales measuring general safety, toxic exposure and exposure to noise).

5. Those who experienced more incidents of violence or harassment at work report significantly worse health, lower overall mental health, greater job insecurity and more instances of poor work performance.
6. Employees who felt that INEEL managers and employees worked effectively to resolve conflicts performed better on seven of the nine outcomes including fewer medical symptoms, better mental health (all three measures), greater job security, higher perceived employee morale and fewer instances of poor work performance.

From our qualitative analyses we learned that INEEL employees were relieved that the recent downsizing had all been voluntary. However, they reported high stress levels resulting from strict timelines and fewer people to meet them, a loss of expertise and an increase in paper work. Employees highlighted several major concerns about management: poor communication and lack of trust between senior management and other tiers of the organization were sited as significant problems. As at other sites, employees felt the workplace was operating safely overall although they were concerned about possible safety breaches by personnel without sufficient training, particularly matrixed and subcontracted employees. Employees frequently discussed the difficulty of living with job insecurity and a lack of clarity about the long-term site mission.

Our findings are discussed in detail in this report with references to findings at the other four study sites. This report also includes details about study methodology and site history. The *Five-Site Final Report* contains an overview of all findings from this study and examines both individual level health and functioning outcomes and workgroup level outcomes (i.e., sick time usage and accident rates). It also contains important policy implications for the Department of Energy complex.

- **Many people helped to make this study possible.**

This study required enormous cooperation. Our biggest thanks are to the nearly 6,000 employees who participated in focus groups or interviews and completed surveys, and to those supervisors who helped make that possible. In Idaho Falls, Idaho, special appreciation is due to our primary contacts Joy McDonald and Stacey Madson (and previously George Espinoza), as well as to Dr. Paul Creighton, Steven Duff, Sterling Andelin, Ken Minnix, Doc Detonanacour, Kevin Hulse and R.D. Maynard. Additionally, many researchers and agencies contributed to this study; they are acknowledged by name at the end of this report.

This report received two levels of external review, including a peer review by two experts in the field of workplace stress and psychosocial research. We accounted for and incorporated comments in this final report.

II. CONTEXT and HISTORY

IIA. Department of Energy Overview

- **Agency's missions change in response to ending of cold war.**

The Department of Energy (DOE), established as a cabinet-level agency in 1977, combined the functions of its predecessors: the Atomic Energy Commission (AEC), responsible for nuclear weapons development, and the Federal Energy Administration (FEA), created in response to the 1973 oil embargo to guard against energy supply disruptions. The DOE assumed the missions to protect the national security and reduce nuclear danger, enhance long-term energy security by advancing scientific understanding of conventional fuels and alternative energy sources, and develop technologies that contribute to US economic productivity.

With the end of the nuclear arms race and bans on weapons testing, the DOE weapons production mission shifted to one of weapons maintenance and research into longevity of weapons systems. Additionally, the DOE assumed responsibility for environmental stewardship to clean up radioactive and hazardous waste at 15 major locations in 13 states.

The DOE contracts with private corporations to run federally owned defense facilities. At most sites, these contracts lasted for long periods of time (up to 50 years) and were run on a dollar-plus basis. Since 1990, however, more contracts have been competitively bid, and contractors have been under tighter financial limits. Most contracts are now performance-based with no to limited capacity to expand funding in a given year.

The defense industry has always worked under the imperatives of secrecy. Though the ending of the Cold War prompted shifts toward a more open work environment, national security and secrecy continue to be paramount, particularly at the national laboratories and weapons facilities.

IIB. DOE Downsizing History

In 1992 the Soviet Union dissolved and the Cold War came to an end resulting in dramatic shifts in the United States' military strategy and budget. The DOE and the nuclear defense industry in the United States embarked on a process of changing its mission and determining necessary staffing levels. While layoffs (referred to as reductions in force or RIFs) had been implemented prior to 1992, the defense industry had generally been one of growth. In October 1992, Section 3161 of the National Defense Authorization Act for Fiscal Year 1993 (attached as Appendix A) was passed and outlined an approach to planning and implementing workforce layoffs consistently across the nuclear weapons complex.

> *Section 3161 also identifies objectives that each plan should address, including: minimizing social and economic impacts; giving workers adequate notice of impending changes; minimizing involuntary separations; offering preference-in-hiring to the extent practicable to those employees involuntarily separated; providing relocation assistance under certain conditions; providing*

retraining, educational and outplacement assistance; and providing local impact assistance to affected communities (OWCT, 1998).

- **Task Force established to plan approach to downsizing and to anticipate impacts.**

DOE management and union leaders anticipated that these employment and organizational changes would affect not only employees, but also the communities in which these facilities have been located for decades. In 1993, the DOE established a task force to assess the impacts of these transitions. In September 1994, this task force became the Office of Worker and Community Transition (OWCT). Reporting to the Secretary of Energy, its charge was to plan, implement, and evaluate programs that supported workers and their communities through the downsizing process (which included retraining, placement programs, resale of DOE assets and programs.

- **Strategic Alignment Initiative changed missions, budget and workforce size.**

In the fall of 1994 the DOE unveiled the Strategic Alignment Initiative, a planning process that shifted core DOE missions from defense production to environmental management and clean-up of production sites. In addition to the structural and mission changes, the DOE announced budget cuts in December 1994 to reduce operating expenses by $14.1 billion over five years. These announced changes resulted in reductions to the workforce, restructuring of contractor organizations, and the planned closure of certain facilities. Even though the shift from production to environmental management was expected to produce a one-time, major reduction in the workforce, other events and continued budget reductions led to ongoing downsizing in the DOE complex and affected sites differently.

Layoffs continued in 1995 and beyond, driven by budget reductions and the realization that the number of production workers who were retained for environmental remediation exceeded the demand.

DOE prime contractor employment fell 25% over five years (from 140,589 in September 1991 to just over 105,000 in September 1998) and is expected to decrease further.[4] The DOE had the greatest number of employees (148,686) at the end of fiscal Year 1992 (September 1993). Peak employment for the managing and operating (M&O) contractor at each study site was at the end of the following fiscal years: 1991 at INEEL, 1993 for Oak Ridge/Y-12, 1988 at NTS, 1989 at LANL, and 1995 at Pantex. September 1999 employment levels at the five study sites range from 31% to 91% of their highest employment levels (figures from OWCT annual report, Fiscal Year 1998).

Throughout the DOE complex (contractor, not federal employees) there have been approximately 46,000 official Section 3161 layoffs since 1992. Seventy-one percent of these

[4] Note: These overall employment levels and downsizing numbers are from the Office of Worker and Community Transition (OWCT). Later in this report, when we analyze downsizing rates by site or organizational unit, we rely on data received from the contractors, broken down by department (numbers downsized and type of event).

were voluntary separations.[5] The percent of involuntary Section 3161 separations increased from 19% of the total in Fiscal Years 1993-95 to 55% in FY 1998.[6] The five sites in this study downsized 14,018 employees between September 1991 and September 1998[7] (OWCT, 1999). At several sites, including the Y-12 Plant and the Pantex Plant, downsizing has occurred since June 1998.

IIC. Study Background

- **NIOSH requests research to study impact of downsizing on survivors.**

Little is known about the health effects of downsizing on remaining workers even though some studies, including preliminary research sponsored by the OWCT, have focused on the health, economic, or social consequences on those who are laid off.[8] In 1994, at the time of the Strategic Alignment Initiative, a joint committee of the DOE and CDC determined that it was a research priority to study the impact of the expected downsizing and other organizational changes on the remaining workforce as well as on those who lost their jobs.

To that end, the National Institute of Occupational Safety and Health (NIOSH) released a request for proposals to examine the impacts of workforce reductions on the health of employees who retain their jobs and on their organizations. Boston University School of Public Health was selected to conduct the research. Our study is the first large-scale project measuring the health impact of organizational change on survivors of a downsizing event(s).[9]

The on-going globalization of today's economy has been associated with numerous organizational changes. Business and government tend to champion downsizing as a positive response to global competitiveness. Yet, how well it has transformed companies from less to more competitive is open to discussion with some studies showing that companies that downsize do not subsequently perform above industry averages (Cascio, 1998). Some attention has been directed toward the impact of downsizing on organizational productivity. Only recently have researchers begun to

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[5] Voluntary separations include offers for early retirement as well as requests for volunteers (with either an enhanced package or a severance package similar to that given to employees who are laid off involuntarily). In most instances, certain job categories or positions were eligible to take advantage of these voluntary offers and others were not. Not all requests for voluntary layoffs are accepted.

[6] The totals here include voluntary layoffs, early retirements, attrition, and involuntary layoffs.

[7] This figure includes 1,294 employees downsized prior to the start of the 3161 program in Fiscal Year 1993 (October 1992).

[8] In 1995, the OWCT conducted a pilot study and then a broader study of the effectiveness of worker support and training programs and of an individual's success in achieving post-DOE employment plans (retirement, education, part or full-time employment) (Balcombe, 1995).

[9] The study agreement originally included a component to look at displaced workers. The task was revised: explore with contractors the possibility of accessing rosters of former employees for future potential research. It appears Human Resources departments can create such rosters of displaced employees but there are data challenges including accessing information about employees of prior contractors and access to home addresses.

ask specific questions about how organizational change affects employee health (Hurrell, 1998).

- **Boston University School of Public Health investigates results of organizational change.**

Worker insecurity, employee distrust, and decreasing organizational commitment are likely results of this era of constant organizational change. Focus groups and employee interviews conducted by our group at the DOE facilities have recorded such concerns at each of the study sites. Indeed, these symptoms of organizational change appear to significantly affect employee health and performance. Our study highlights those effects and recommends interventions to modify the way organizations implement change so as to positively impact employee health and organizational functioning.

This study covers the period from 1991 through June 1998. We chose January 1991 as a starting point for data collection as it preceded the post-Cold War downsizing whose parameters were stipulated by Section 3161.

We employed a collaborative approach at these federally connected work sites. It is believed that an outside entity having no official attachment to the downsizing process might have easier access to study participants. At the same time, given the high security environment, it appeared useful and necessary to have government employees assist with negotiating site access and attend some site visits to lend their credentials and affiliation.

III. HYPOTHESES and BACKGROUND LITERATURE

IIIA. Description of the Problem and the Model

Some of the impacts on workers who lose their jobs seem obvious: income loss, potential loss of identity, and uncertainty about their future. The purpose of this research, however, is to provide knowledge about the impacts of downsizing and other organizational change on the health of employees who retain their jobs and on organizational functioning. It is imperative that we understand the health effects for workers who remain given the likelihood that employees may be working more, yet will be facing fewer resources, job uncertainty, and changes in roles, required skills and site mission.

- **Research model considers downsizing as key stressor event.**

Few large-scale, epidemiological studies have been carried out to assess health outcomes. However, relevant literature exists on the impacts of work stress on health, job insecurity and health; the organizational consequences of downsizing; and perceptions of justice and fairness in the workplace. Findings from these areas are briefly summarized below with greater detail provided in Appendix B.

The model we tested uses downsizing as the stressor event. Downsizing is measured in four ways including a rate of downsizing, the extent to which it is voluntary, personal experiences of the downsizing, and perceptions of the downsizing process. We examine the links between the stressor event, other contributors to or buffers of stress (including organizational functioning, job characteristics, sociodemographic factors, and individual behaviors and experiences), and stress outcomes for the individual and the organization. Job strain, as defined by Karasek and colleagues (a construct summarizing job demand and job control), is included as a central concept in the field of work organization, stress and health (Karasek, 1979). Both the context and the outcomes in this model are viewed on individual, group, and system levels.

- **Hypotheses guide investigation at five DOE sites.**

We generated four study hypotheses to test at five Department of Energy work sites that had experienced downsizing. The hypotheses are:

1. Downsizing will have a negative effect on individual health and workplace functioning (i.e., employee morale, work performance and job security).
2. Employees are less likely to experience negative health effects and organizations are more apt to function normally the fairer the downsizing process and the fewer direct elements of downsizing the employee experiences.
3. During periods of organizational change, one's work and work environment, including job strain, organizational style, co-worker and supervisor support, and workplace safety will affect both individual health and workplace functioning.
4. Workplace factors including job strain, organizational climate, and the employee's perception of the fairness of the downsizing process can moderate the impact of downsizing on health and organizational outcomes.

IIIB. Relevant Theories and Areas of Study

B1. Stress models

This study is grounded in a work stress model. We ask what happens when a stressful event such as downsizing occurs. Although it is popularly recognized and accepted that work stress adversely impacts a workforce, there is much less agreement about what stress is, how to measure it, how it impacts health and what aspects of health are actually affected by it.

Our research examines the environmental causes of stress. Unlike other theorists who studied stress focusing on the individual and the way an individual interacts with the workplace, we examine work processes and climate as well as job characteristics (job strain and others). We study to what extent these influence the health and productivity of individuals in a changing work environment.

B2. Downsizing literature

Downsizing, or large-scale layoffs, has been adopted over the last decade as a management tool with the purported aim of strengthening a company or agency by reducing budgets and personnel. Sometimes downsizing is associated with a partial or complete restructuring while at other times it is simply a reduction in the number of employees. There is literature on downsizing in varied disciplines, with the vast majority coming from the fields of business (e.g., organizational management and human resources) and psychology (e.g., organizational development).

- **Previous research also examined effects of downsizing, but with a more limited scope.**

A 1995 study in six industrialized nations found that downsizing had been carried out at more than 90% of the firms studied (Wyatt 1993). This downsizing had been implemented without information about the health impacts on remaining employees and the organizational and productivity costs. Often, corporate executives are rewarded financially after a downsizing event, and stock prices increase. But, these stock increases are often temporary. For instance, stock prices of firms that downsized during the 1980s fell short of industry averages in the 1990s (Pearlstein, 1993). Data indicates that two thirds of companies that downsize will downsize again within a year (Cascio, 1996). These findings about the impact of downsizing bring into question whether downsizing is an effective tool for reducing budgets or for creating a more efficient and competitive organization.

From the field of organizational management, literature has emerged documenting impacts on productivity, quality, morale and turnover. Within the field of psychology, David Noer has looked at individual responses to downsizing, and documented what he calls “survivor syndrome” which includes symptoms such as fear, insecurity, frustration and anger, sadness and depression, and sense of unfairness as well as reduced risk-taking and lowered productivity (Noer, 1993).

Researchers have also documented additional organizational effects seen in tandem with survivor syndrome, including decreased job security, organizational commitment, trust among co-workers, and job satisfaction, and increased workplace conflict (Henkoff, 1994; Sommer and Luthans, 1999). Other studies found that the threat of or actual downsizing can lead to deteriorated health, increased work demands and tensions in the workplace (Woodward, et. al., 1999). Writing extensively about fairness, Joel Brockner reports that how employees react to a downsizing event is related to their perceptions of how fair and justified the action was (Brockner, et. al., 1995).

Research has focused either on the impact of downsizing on work factors such as security, productivity and satisfaction, or on the relationship between these work factors and health outcomes. A recently published longitudinal study is one of the first to look at causal pathways and to ask not only how downsizing affects work and home factors and health behaviors, but also how that affects health outcomes (Kivimaki, et. al., 2000). Kivimaki and colleagues demonstrate that downsizing "results in changes in work, social relationships, and health related behaviours" (smoking), and that these changes combined with downsizing contribute to increased rates of long term sickness absence. Sickness absence was two times more likely in job groups that had experienced major (>18%) as compared to minor (<8%) downsizing (Kivimaki, et. al., 2000). The significant changes in work

characteristics comparing groups that experienced low, medium and high rates of downsizing are: an increase in physical demands, a decrease in autonomy and skill discretion, lowered participation, and more job insecurity.

- **Boston University study adds to body of research.**

In our study, we used downsizing rate and the rate of voluntary layoffs as independent predictors. Two additional independent variables related to downsizing focus on the process: an index of the ways in which each person experienced the downsizing and perceptions of how fair the downsizing process was. We also used a six-item survivor syndrome scale (developed at NIOSH by Soo Yee Lim) as an outcome variable. The survivor syndrome scale covers many factors that relate to mental health and overall functioning concepts including guilt, sadness, and reduced motivation.

B3. Justice and fairness

- **Researchers hypothesize that perceptions of fairness can influence health outcomes.**

We posit that perceptions of fairness and justice directly affect health. We also posit that if an employee believes that workplace policies in general or a downsizing event are implemented fairly, then stressful events are less likely to have a negative impact on health. We are particularly interested in investigating two concepts: procedural justice or whether employees believe that policies and procedures are determined and implemented in a fair and consistent manner; and interactional justice or how employees are treated by supervisors and upper management (Niehoff and Moorman, 1993).

In addition to the work of Brockner and others who have written specifically about the concept of justice and fairness in the context of a downsizing event, a literature is emerging about workers' perceptions of justice and fairness in how decisions are made and implemented. Research to date shows that perceptions of fairness are important in the workplace and should be considered as an independent variable when analyzing organizational functioning and health (Alexander and Ruderman, 1987; Folger, 1987; Fryxell, 1992; and Greenberg, 1990).

In our employee survey we used two scales to measure fairness/justice. The first was about the organization in general and the second (used in the statistical model) focused on the downsizing event. The scale asks for perceptions about the extent to which employees perceived that procedures were fairly implemented, people were treated with respect, communication was clear and timely, and the downsizing process was effective.

IIIC. Importance of this Research

- **Study findings and recommendations can be used to positively affect health outcomes.**

It is clear that downsizing and organizational changes will have critical and varying impacts on employees and organizations. A change process, for example, can produce an excess demand on employees or, on the other hand, a greater sense of control and satisfaction at

work. Workforce reductions can either be voluntary (i.e., early retirement, voluntary incentive packages, normal attrition) or involuntary and can be well planned and well communicated or not. Downsizing can be part of a process of organizational restructuring or it can be implemented as a reaction to perceived problems, independent of other organizational assessments. These scenarios are likely to lead to different health and organizational functioning outcomes.

The knowledge sought through this research is important for employees, unions, and other employee organizations, contractors and federal entities managing organizational change in DOE facilities, as well as for those in other industries. Globally, downsizing has become a common management tool and more research is needed to understand the long- and short-term impacts and implications for individuals and companies.

IV. RESEARCH METHODOLOGY

IVA. Multiple Study Methods

- **Variety of methods leads to rich understanding.**

We used qualitative and quantitative approaches to collect data to fully understand the experience of downsizing. Quantitative data collection includes structured surveys and archival data. Qualitative methods were particularly important given the exploratory nature of this project and the importance of understanding employee perceptions and the context for recommendations. Qualitative, or ethnographic, data was drawn from the open-ended interviews, focus group discussions, and open-ended survey questions.

Ethnographic data, or descriptive information, which uncovers the patterns of the employee culture, is part of an important research strategy to study questions and populations that may be inaccessible with other research techniques. Ethnographic methods produce data that provides both depth and detail through direct quotation and meticulous description of situations, events, people, interactions, and observed behaviors (Agar, 1980; Spradley, 1979). Interviews with key individuals, work-site observations, and focus group discussions permit the researcher to understand the world as seen by the respondent within their everyday setting. Additional information on the importance of using qualitative data is presented in Appendix C.

Quantitative analysis on the other hand, involves the collection, organization, and interpretation of data according to well-defined procedures. Data gathered in this study are used to address questions such as how much, how often, where, and what kind. The data used in quantitative analysis include self-reported data (e.g., survey) as well as 'objective' or archival data (including sick time and accident rates).

Quantitative or statistical methods have at least three goals: 1) data reduction, 2) data

inference, and 3) relationship identification. We have used well-recognized and tested scales as part of our analysis, an important feature particularly given that some of the research questions are new. The analytic results, which have a numerical value attached, have a shared meaning and understanding which extends beyond the study's scope. Quantitative methods allowed us to document the experience of many employees across the five study sites in a time-efficient manner, to draw inferences and to use statistical techniques to test our hypotheses.

This multi-method study approach is well suited to the concepts under study as a way to more fully describe the experience of stress and the research setting. Pearlin suggests that to understand and reflect an individual's experience of stress, a study should measure various levels of social functioning including sick-day usage, filing of grievances, accidents, and injuries (Pearlin, 1989).

Additionally, multiple methods are useful to confirm validity and reliability. Triangulation is a process to compare and contrast different sets of data and offers the opportunity to run convergent validity and reliability checks of the data. Denzin defines the process as "the combination of methodologies in the study of the same phenomenon" (Denzin, 1978). The assumption is that "multiple and independent measures, if they reach the same conclusions, provide a more complete portrayal of the particular stress responses being studied" (Ivancevic and Matteson, 1988). In the discussion section of this report (Section IX) we identify where qualitative and quantitative results converge and where they provide distinct information.

IVB. Qualitative Data Collection and Analysis

- **Boston University School of Public Health study begins with carefully planned study methods.**

An overview of our initial data collection is presented in this section. Additional details and an evaluation of the process can be found in Appendix D. The first step in the study was to select Department of Energy sites to include in the study. Downsizing characteristics used to select sites included: the rate of downsizing, the number and content of support programs for surviving and displaced employees, and the level of worker participation in the process. Important organizational considerations included:

- a willingness to allow salaried and non-salaried employees to participate;
- availability of data; and
- management representatives open to an extensive research protocol including surveys and focus groups.

Sites were chosen where there was significant inter-site variability for the selection characteristics. Initial data collection and site selection was completed by June 1996.[10]

[10] The initial five sites were Pantex, Idaho, Nevada, LANL, and Rocky Flats. Subsequently, Rocky Flats was dropped from the study sample (issues of access and site cooperation) and the Y-12 Plant on the Oak Ridge Reservation was added, offering an example of a site with significant downsizing and other organizational changes (split contracts, new contractors, and outsourcing).

Site visits were made to collect the preliminary qualitative data. Generally, two to three research personnel attended each site visit and were often accompanied by personnel from NIOSH and / or DOE headquarters. The goals of the visits were to: 1) develop on-site relationships; 2) observe the conditions in the environment that people connect with stress; 3) collect current accounts of stress and downsizing via individual and group interviews; and 4) identify ways of measuring health and performance effects in the historical record. We developed instruments to carry out this research including an interview instrument, record review forms and focus group guidelines.

We used interviews to gather information about the structure of the site; processes and policies related to downsizing, personnel or other issues; data availability; and individual perceptions of downsizing. Some of the interviews were with individuals responsible for data management in offices housing records integral to our study.

We collected sample records to determine the format and availability of records from 1991 through June 1998 as well as policy statements and reports on relevant issues.
We chose focus group research to provide key data for this study. The focus groups provided rich and complex information from a wide variety of employees at each site. The data was used to:

- gain an understanding of each site: history, important issues, site functioning;
- determine the themes important to include in the employee survey;
- cross check quantitative data and the information that emerged from other data sources; and
- explain or better understand some of the quantitative results.

We conducted focus groups at four of our five sites: INEEL, Pantex, Oak Ridge and LANL. At the Nevada Test Site, the site visit team held a discussion group with representatives of the Southern Nevada Building Construction and Trades Council (SNBCTC).[11] Details regarding the process for getting a random sample of employees to invite and how the groups were conducted can be found in Appendix E, along with an overview of the group composition.

The discussion groups helped the researchers to learn about common concerns and to understand labor and management perceptions about the changing nature of work. Each group lasted one and one half hours. The facilitator posed open-ended questions about job demands, control over work, job security, social support, workplace safety and accidents, performance, physical and mental health issues, and downsizing. The groups' discussions were recorded and subsequently transcribed and analyzed for themes.

- **Communication with employees and communities is a priority.**

Because downsizing affects not only employees at a facility but their families and the communities in which they live, we sponsored meetings to offer information about the study to former workers and others in the community. These meetings allowed interested and involved individuals to comment on our study and the research issues. We organized

[11] We did not conduct focus groups at NTS as the initial (and only) site-visit for qualitative data collection was in March 1998, after the employee survey was developed and at the very end of phase I.

community meetings in four of the study communities including Idaho Falls, Idaho; 15 to 30 people attended each.

The research team established communication as a key priority to maintain throughout the study. The study population is large, consisting of approximately 24,000 potential participants at five study sites. More than 6,000 employees have directly participated in this study. In addition, employees throughout the DOE complex have been affected by downsizing and are interested in study results.

We obtained informed consent from employees involved in an interview, focus group, or who completed the employee survey. In the consent forms, we offered information clearly and succinctly. We made available at each stage of the research a summary of the purpose of site visits, and research updates to be printed in site and local media. We established a study e-mail account and posted information on the World Wide Web. We will present our results at each site and will make available written materials at sites, by request from researchers, and on the Web.

IVC. Quantitative Data Collection

C1. Boston University Workplace Survey

- **Survey developed to measure key hypotheses.**

With colleagues at NIOSH, we developed a preliminary model of analysis. We used interviews and focus group discussions and reviews of relevant literature and site documents to identify important themes to include in the employee survey. For each construct that appeared important, we identified scales or individual items that would best measure it, prioritizing those scales that have been used extensively and for which there are population norms. We created a number of questions and scales about downsizing, including a scale to measure the opportunities that might arise during a restructuring process.

We completed our draft survey--the *Boston University Workplace Survey (BUWS)*--in July 1997, pilot-tested the instrument at four sites[12] and revised it based on comments solicited during debriefing sessions. We also solicited comments from site and NIOSH institutional review boards.

The final *Boston University Workplace Survey* is intended to take thirty minutes to complete. The survey is divided into seven sections covering demographic information, job characteristics, health and health behavior information, assessment of organizational change, and organizational climate. A summary of the sections and scales as well as a copy of the survey is contained in Appendix F.

[12] We pilot-tested the survey instrument at INEEL (7/97), Los Alamos (10/97), NTS (3/98), and Oak Ridge (4/98) with one to two groups of 4-15 employees at each site. Participants were allotted one half-hour to answer questions and then a project staff person solicited feedback, probing on items that might be unclear and asking for opinions about the overall survey and the likelihood that their colleagues would complete it.

- **Survey protocols ensure confidentiality and random selection.**

While developing the survey instrument, we designed protocols for survey sampling, administration, and data entry and analysis (see Appendix G for more detailed information). Since confidentiality was a primary concern to all we spoke with, researchers developed a system where study numbers were not connected to the names database. Surveys were coded with an anonymous study number as well as for site, contractor, directorate and sometimes department. This allowed us to account for a person's work unit as one important element in the analysis.

At INEEL our study focused on the employees of Lockheed Martin Idaho Technology Company (LMITCo). These employees work at both the town and site locations. We randomly chose 2,368 LMITCo employees (~42% of the total workforce in spring 1998) from a database of all employees (except those exempted)[13] and invited them to complete the survey.

INEEL has approximately 45 directorates and they range in size from two to 1,252 employees, with 22 of these groups having fewer than 100 employees. There are between one and seven departments within each directorate. Nineteen directorates had fewer than 20 employees (ranging from one to 16 people). Researchers combined smaller directorates, based on functional and hierarchical similarity, into six groups for the purpose of sampling. This resulted in a total of 31 sampling units. Approximately 40% of employees in each sampling unit were randomly included in the survey sample. Because each contractor uses different organizational nomenclature, we employed the term "level 3" for this sampling unit where level 1 is the individual, level 2 a small work group, and level 3 a larger work group (directorate at INEEL, department or division at other sites).

Surveys were first mailed to sampled employees in August 1998. One researcher visited the site to encourage participation and was available for questions and to collect completed surveys. A thank you was sent two weeks after the survey to all sampled employees. Employees were asked to return the anonymous survey and a separate postcard with their name to indicate completion of the survey. Two additional reminder mailings were sent to all those who did not return a postcard.

C2. Collection of archival data

The grant proposal identified the need to collect and analyze organizational data to describe exposure, climate, and outcomes. In addition to downsizing rates, other data sets were used as objective outcome data. Certain information was central to the study hypotheses and was important to understand the quantitative results, such as information on employee assistance programs.

[13] Exempt employees were those who: a) pilot tested the survey, b) reviewed the survey for approval or who signed the cover letter, and / or c) served as contractor points of contact.

- **Data analysis includes extensive review of records.**

During the first few site visits to Pantex and INEEL, we reviewed many archival records to determine those organizational data sets that would be useful for the study. Unfortunately, records we reviewed[14] had numerous limitations. We established guidelines for final selection of archival data sets, including the availability of summary data by level 3 (to match survey data), records relatively complete in paper or electronic form (1991-98), and consistent data across sites. In total, four data sets were requested of the contractors:

- sick time / paid time off data;[15]
- overtime usage;
- downsizing data; and
- accident and illness data.

We also obtained information on policies, policy changes, and organizational restructuring changes during the study period, to assist us in interpreting the data. In addition to the four data sets, we collected data from Employee Assistance Programs at each site to understand services available to surviving employees. We gathered regional economic indicator data from publicly available sources to understand the regional context but did not use these data in the statistical models. The specific data elements, reason for inclusion, intended use of each data type, formulas for calculating rates, and an evaluation of quantitative data collection are described in Appendix H.

These four data sets were collected by level 3 and the data was stored in a separate database for each contractor by month (or quarter) and year for each level 3. This required extensive organizational research to determine, when possible, how now-defunct organizational units were related to the present day units (level 3).[16] This approach allowed us to relate the organizational outcome data (as the experience of defined groups of individuals within the organization) to the survey (as the experience of the individual as well as groups of individuals within the organization) in order to better understand the impacts of organizational change.

It was not possible to collect all the desired data points at each site for the entire study period and / or by the survey level 3s. At two of the study sites, a new, main contractor

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[14] Records reviewed during initial visits included medical records, health claims data, worker compensation claims, sick leave data, safety and regulatory affairs data, employee assistance program data, employee grievances, EEO records, outplacement data, procurement records, human resources data including employment levels and attrition, and downsizing data (reports, numbers, support program information, outplacement program data).

[15] At two sites, sick time is part of a paid leave or paid time off policy. We collected paid time off data when no sick leave information was available. While these raw numbers measure different phenomena, we felt we would be able to utilize the data for within site analyses although not for comparison with other sites.

[16] We started with the level 3s sampled for the survey and worked backwards to track work units that were merged, renamed, or had been discontinued at some point between January 1991 and June 1998. Given that we are studying restructuring, these changes were both ample and anticipated. For work units not currently in existence, we attempted to determine if the unit's function ended or if the unit was moved into another group. If units were merged or renamed, the data was labeled with the code for the current level 3. We used site experts and documentation of organizational restructuring to carry out this task. For level 2s and 3s that we could not trace, the data was retained but coded to level 3 = unknown.

assumed site management over halfway through the study period (in 1995 at INEEL and in 1996 at NTS). This meant that prior data, when available, was not analyzable by level 3 given the enormous organizational changes that took place during these management transitions. See Appendix I for details regarding data collected and not collected for INEEL, any limitations or special data parameters at this site, and for information on the percent of study period data that researchers were able to associate with the level 3s as they existed in 1998.

We measured the independent variables of downsizing rate and rate of voluntary layoffs for the entire study period (or all years for which data was available). We restricted analysis of organizational outcome data (sick time rates and TRC rates) to data from the last 12 study months (July 1997 through June 1998). EAP data were used to describe the mental health programs EAP offer, with special attention to services offered during times of major workforce change. No objective data regarding health care usage or medical symptoms were collected.

V. SITE DESCRIPTION

VA. Site Characterization

A1. Site history

The Atomic Energy Commission established INEEL in 1949 as the National Reactor Testing Station. INEEL's founding mission was to design, build and test experimental reactors and support facilities. Programmatic emphasis has shifted away from reactor development and defense-related work towards multi-program research, hazardous and radioactive waste management, cleanup, and environmental technology development (DOE, 1998). In addition to the nine industrial sites scattered over 890 square miles in southeastern Idaho, INEEL also occupies numerous buildings and laboratories located 60 miles away in Idaho Falls. Lockheed Martin Idaho Technology Company (LMITCo) manages INEEL for DOE.[17]

- **Study focuses on Lockheed Martin employees at the INEEL.**

This study focuses on all LMITCo employees working at INEEL, excluding employees of other operations at INEEL (Nuclear Reactor Facility or Argonne-West) or INEEL employees working in other states. In January 1998, there were 5,825 LMITCo employees, roughly 45% of them native to Idaho. Three tree principal bargaining unit bodies at INEEL represent roughly 21% of INEEL employees: the Oil Chemical Atomic Workers (OCAW), unions

[17] A handful of contractors over the years have managed INEEL--Phillips Petroleum (1949-1968), Idaho Nuclear (1968-1973), Aerojet General (1973-1978), EG&G (1978-1995)—all assisted by other managing and operating (M&O) contractors providing specific services such as construction, security, engineering or support.

encompassed within the Eastern Idaho Building and Trades Council (EIBTC) and United Plant Guard Workers of America (UPGWA).

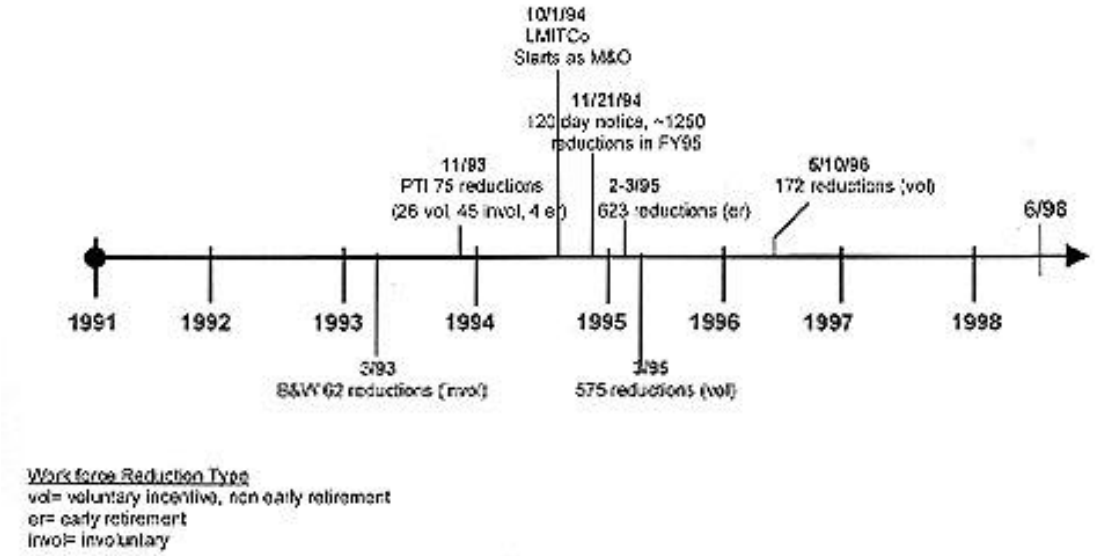
A2. Site selection characteristics

- **Most of the downsizing at INEEL was accomplished by voluntary layoffs.**

We selected the INEEL for several reasons: it is a large facility, located in a rural setting, and DOE and its contractors are the primary regional employers with few surrounding industries offering comparable wages. We were also interested in INEEL as a study site as it has experienced multiple forms of organizational restructuring including contractor consolidation and a new type of contracting relationship with DOE. INEEL achieved a high proportion of employee reductions through voluntary means, allowing researchers to contrast the impact of various forms of downsizing on employee health and organizational functioning.

The timeline below in Figure 1 shows that the bulk of the downsizing events and major organizational changes at INEEL took place during 1994 and 1995.

FIGURE 1: Timeline of Downsizing and Restructuring Events at INEEL



A3. Downsizing and restructuring history

- **Budget reductions and mission changes drive early downsizing.**

From 1949 until 1994, the site was run by a consortium of five managing and operating (M&O) contractors, each responsible for a separate piece of the site's operations. Prior to

1994, two of the five M&O contractors, Babcock and Wilcox (B&W) and Protection Technologies Idaho (PTI), were required to downsize their workforces.

In November 1992, DOE informed Babcock and Wilcox that programmatic budget reductions in the Specific Manufacturing Capability Project would result in a loss of 80 positions. Ultimately, 96 positions were eliminated, one-third through attrition and 62 employees were given involuntary layoffs with two weeks pay in lieu of notice as a means of reducing security risks. Employees were informed of the impending reductions in "All Employee Meetings" and letters sent to all employees advising of the need to cut positions. All managers were required to identify functions / positions that were “essential” to continued operation and compliance, “essential but over staffed” and “non-essential.”

In the first half of Fiscal Year 1993, INEEL began its transition from defense oriented programs to waste management / environmental restoration and technology transfer. The need for security services was diminished as a result of the shift. The security contractor, PTI, was required to reduce 50 positions and to disarm 55 security officers. Of the positions that were reduced, 75% were security officers with the remainder affecting supervisory, staff and administrative positions. A total of 75 employees were downsized by means of both voluntary and involuntary reductions.

- **INEEL's most dramatic organizational change during this study period began in 1994 with the consolidation of five M&O contracts.**

To increase economies of scale and operating efficiencies, DOE opted to change the management structure at INEEL by folding five managing and operating contracts into one performance-based management contract. On October 1, 1994 five contracts were consolidated into one prime contract under LMITCo.[18] Lockheed Martin was brought in to “consolidate the site and eliminate redundancies.” It was a period of change from multiple contractors each with their own work culture to a new single entity with a focus on being entrepreneurial.

Internal restructuring accompanied some of the contract changes since 1994. Restructuring activities included: new contracting arrangements, realigning management structures, eliminating duplication in positions or departments, and new business practices.

- **Contract consolidation initiates planning for downsizing.**

It was clear to DOE-Idaho during contract negotiations that changes in the workforce would be necessary and they prepared an initial draft Work Force Restructuring Plan. To minimize the number of involuntary layoffs, DOE Headquarters adopted a policy of allowing voluntary separation incentives prior to the completion and approval of the official Work

[18] Lockheed Martin Idaho Technologies Company (LMITCo) took over from the previous managing and operating (M&O) contractors (MK Ferguson Idaho, construction; Protection Technology Idaho, security; Babcock and Wilcox; Westinghouse Idaho Nuclear Company / WINCO; and EG&G). Babcock and Wilcox, Duke Engineering and Waste Management Federal are all teaming partners under the LMITCo contract. The LMITCo contract was for five+ years to be reevaluated in 1998. In 1998, DOE announced Lockheed’s contract would not be renewed after 2000 and that DOE was beginning an open bid process.

Force Restructuring Plan. DOE indicated that they would not defray the cost of incentives for voluntary departures.

LMITCo's general manager issued a 120-day notice (as outlined by Section 3161) on November 21, 1994 of the intent to cut 1,250 employees over the course of Fiscal Year 1995. The stated purpose was to eliminate overlapping functions resulting from the consolidation. The announcement was made early in the fiscal year so that the cost of instituting voluntary incentive separation programs would be off-set by reduced personnel costs for the remainder of the year. In February, the manager determined additional downsizing was necessary because of budget reductions in defense and reactor programs and that it would affect up to 1,000 employees through Fiscal Year 1996.

- **All LMITCo reductions were achieved through voluntary incentives and attrition.**

The three downsizing events during FY1995 and FY1996, resulted in 1,895 employee separations as follows: 623 early retirements, 769 (575 in 1995 and 172 in 1996 and 22 subcontractors) voluntary separations and the remainder (26%) through normal attrition.[19] LMITCo's primary goal was to reduce the ratio of support functions to program positions and, therefore, the greatest impact of the downsizing was felt within management, administrative and site support functional areas.

The first round of downsizing was an Early Retirement Incentive Plan (ERIP) announced in November 1994. The plan was structured to discourage people with certain skills from leaving and so as to end with a desired "skill mix". News of future budget reductions marked a second early retirement enrollment opportunity in February 1995.

A Voluntary Separation Package (VSP) was announced immediately following the ERIP. LMITCo senior staff met following the ERIP and determined desired staffing levels for each branch "based on known work scope requirements, planned reductions in services, and anticipated separations as a result of the ERIP" (WFRP A-7, 1995-1997). Managers deemed positions "critical" (A list) or "non-essential" (B-list) and those in the B list were eligible to apply for the Voluntary Separation Package (VSP). The Restructuring Plan for FY1995 and FY1996 was finalized May 10, 1996, just two weeks before the second and final round of voluntary reductions was approved. The second voluntary event used the same ranking procedures as before but targeted different managerial levels.

- **Monetary incentives for voluntary layoffs followed Section 3161 protocol.**

Similar to other DOE sites, voluntary layoff benefits included: severance/incentive pay for both ERIP and VSP (lump sum payment equal to six months pay for the VSP and at least one month pay for ERIP but more for lower salaries). For the VSP, additional incentives included: educational assistance (usually up to $10,000 over four years starting within one year of RIF), extended medical insurance with the employee paying increasing amounts, and relocation assistance. All employees electing to take early retirement benefits were denied any future reemployment to full-time positions within LMITCo, and part-time positions would be limited and require approval from top management. Employees who

[19] Some of the voluntary (22) and involuntary (17) layoffs included in these totals were of subcontracted employees and are not used to calculate LMITCo downsizing rates later in this report (Section VII).

took the voluntary separation agreed to the same restriction on reemployment at INEEL, but only for a period of three years.

- **Several forums provided communication and union involvement.**

The local DOE and contractor management developed a list of stakeholders in the workforce reduction process. Stakeholders received announcements about reduction plans, were sent draft versions of the Workforce Reduction Plans (WFRP) for comment, and were invited to community meetings. Union representatives were included on the list of stakeholders. The Work Force Restructuring Plan for FY 1995-1997 states that planned cuts in employment "could cause a high level of anxiety within our work force. "To minimize this anxiety," they continue, "we will endeavor to communicate frequently, openly, and honestly with our employees." A LMITCo Human Resources employee felt the downsizing process used throughout the FY95-97 period provided ample opportunity for stakeholder involvement and felt employees were provided sufficient time to make decisions and that rules were clearly communicated.

- **Centers provide support and training to downsized employees and survivors.**

INEEL's outplacement center is available to all employees who took a voluntary reduction as well as to employees separated in the early 1990s. The center's mission is to assist displaced employees in: coping with job loss; evaluating and identifying skills; determining career interests; and realizing potential career options. The outplacement center offers workshops and information related to current employment trends. Monthly newsletters are sent to all who request them. The center also processes requests for educational assistance funds and tracks displaced workers (all employees from the first VRIF and those from the second VRIF who used the center).

The INEEL Institute at LMITCo provides a Work Force Retraining Program. Workers can take courses in their job classification or another area at the Institute or register through the Institute for local university classes free of charge (if successfully completed). The Institute works with management to identify workers who need retraining to fill vacant positions or for promotion opportunities. LMITCo also sponsors an apprenticeship program. Workers accepted into the three to four year program are not eligible for other Section 3161 benefits and are not promised a job upon completion.

- **Organization formed to foster economic development.**

The Community Reuse Organization (CRO) for Idaho was started in 1992 under the auspices of the Eastern Idaho Economic Development Council, also known as Initiative 2000. This non-profit corporation provides the region with a single voice to DOE for economic development and community transition issues. The organization attracted new businesses to Idaho Falls, assisted in transferring INEEL technology to other arenas and helped entrepreneurs to establish businesses.[20]

[20] Examples of CRO activities include: funding Thermo Technology Ventures- an INEEL spin-off company that provides assistance to 18 projects and programs within a seven-county region on economic diversification feasibility studies for a Cultural Center and a Convention Center development.

VB. Site Visit and Focus Group Themes

B1. Site specific findings from interviews and observations

- **Site visits include several methods to collect data.**

The study team conducted three site visits (9/96, 8/97, and 9/98) to INEEL. These visits included interviewing union and management, meeting with employees in charge of data of interest, holding focus group discussions, pilot-testing the employee survey, observing the workplace, and conducting a community meeting. During the first two site visits to INEEL, we conducted 49 interviews with people from a variety of unions and departments (health and safety, human resources, employee grievances, medical services, EAP) at the site. We toured the facilities that did not require special clearance. See Appendix J for details about the site visits.

- **Findings reveal variety of employee concerns.**

Our initial visit to INEEL coincided with the year that significant organizational changes were being implemented at the site. Just a few months before, the final voluntary separation was completed. The overarching workplace issues expressed by those interviewed were associated with management-employee relations, safety, a changing work environment and impacts related to the RIF.

Interviewees repeatedly commented on the strained relationship that existed between LMITCo senior management and employees. Communication and trust were identified as significant problems between senior management and all other tiers of the organization. Workers felt that senior management based decisions affecting the site solely on the monetary bottom line, showing no regard for the potential impacts on employee welfare. LMITCo instituted cuts in vacation time, changes in personal time and changed the work schedule to four ten-hour days, which was perceived as especially tough on “site” workers because the longer days are coupled with a long commute.

We heard many concerns about the worker safety program. The Voluntary Protection Program (VPP) began in 1993 and transitioned the site’s safety culture into one where workers take responsibility for their own safety, rather than the traditional paternalistic over-sight method. At the time of our first visit, employees were still confused as to the safety roles and responsibilities required of them. Some employees believed that instead of empowering them, the VPP resulted in a more lax approach to safety policy.

Time seemed to resolve much of the concern about the VPP. Eleven months later, during our second visit, the people with whom we spoke championed the VPP as a success. There was no sense of safety being compromised. Employees seemed to be more conscious about their own safety and there were rewards for reporting as well as more options of where to report concerns or infractions. Unions remained concerned, however, about subcontracted construction workers who lack site specific training and an understanding of the site hazards, thus posing a safety threat to them as well as union workers who work beside them. We heard this same sentiment regarding matrixed employees.

Uncertainty about job or site future and the pace of work were much repeated themes. Many employees discussed the high stress levels involved in adhering to strict timelines with fewer people, a loss of expertise and an increase in paper work. One interviewee, however, stated that INEEL was overstaffed and the cuts were needed, interpreting employee dissatisfaction with the cuts as complaints about having to start working hard rather than being overworked.

Budget uncertainties and the lack of a clear tangible mission kept the fear of future downsizing events and site closure alive. One interviewee commented, "…the whole atmosphere here is one of not being needed any more and no longer doing anything important." We heard reports of increased violence (domestic violence as well as fights in the workplace), DUI cases, high blood pressure, strokes and insomnia.

Some improvements had occurred by the time of our second site visit. INEEL was in a hiring mode in response to a new long-range plan. Site employees felt that INEEL was emerging as the environmental lab of the DOE complex. Depending on whom we spoke with, employees' fears about future viability were either eased by the recent changes or increased if they thought new hires would replace their jobs.

B2. Focus groups: methods and themes

- **Data from six focus groups yield important themes.**

A total of 56 employees participated in six focus groups held in September 1996 during our first visit to INEEL. Focus groups captured employee concerns related to voluntary reductions, contractor changes and an evolving site mission. The groups took place after a 20 month period that included a contractor change, loss of companies that had been operating at the site for years or decades, and three voluntary layoff events.

We developed a list of concepts from an initial analysis of the focus group transcripts and concepts used in our employee survey. Comments from the focus groups were categorized (coded) in a database by concept and then each concept was described with supporting quotes. Themes were reported by site, followed by a cross-site analysis of themes. A summary of the dominant themes that emerged from the focus groups follows.

<u>Communication between upper management and employees was a concern</u> in all focus groups. Participants claimed that poor communication exacerbated the perceived distance between employees and management, fostered distrust in management and fed the extreme negative morale among employees. Employees felt that their feedback on operational issues or problems was never well received, further damaging trust and credibility in management. Some identified management's diminished effectiveness as symptomatic of increasing management pressures and workload, not simply a lack of caring or concern. "Supervisors are expected to cover, coordinate and control more people and more activities. They don't have time to spend with their employees that they (employees) sometimes need to improve their morale, to establish what their priorities should be and to understand their supervisors expectations." Consolidation and the workplace changes brought on by the new contractor were said to have created feelings of fragmentation and no sense of belonging among the workforce.

Two organizational structure issues emerged as consistent concerns among participants: matrixing and differences between site and town employees. Many participants were dissatisfied with the matrix system stating that the fragmented nature of a matrixed position hampers effective supervisor/employee relationships. Matrixed employees described having several primary supervisors, none of whom knew their work responsibilities and often dictated conflicting priorities. "I have three primary bosses that I'm dealing with. They don't always see eye to eye on what my priorities should be, yet I've got to make them all happy." Some employees believed that matrixing inherently reduces a worker's control over job tasks and work environment. However, beneficial aspects of matrixing were also noted including the continual challenge of an ever-changing workload and the ability to create one's own workload.

Site employees and town employees were said to operate under two different cultures. Site workers found working at the site to be increasingly a disadvantage. Cited examples included the distance and time spent traveling to work, a lack of promotion opportunities, and a poor grasp of site work issues by the management located in town making policy decisions.

Employees struggled with a workload that resulted in both non-exempt and exempt employees putting in overtime. Staff reductions due to downsizing resulted in workers having to take on extra work. Additional workload and increased work pressures left individuals feeling as though nothing got accomplished.

Organizational changes including downsizing, budget cuts and demanding work schedules presented challenges in creating a positive safety culture at the site. Workers preoccupied with job concerns were said to make more mistakes, potentially compromising safety. Some focus group participants questioned management's real commitment to safety, highlighting that while management talks about safety as a priority, they put the Environmental Safety and Health (ES&H) directorate on the list for budget cuts.

Employees favorably evaluated the voluntary downsizing process LMITCo used at INEEL. Participants repeatedly commented on the value of letting employees decide for themselves when it's time to leave the organization thereby eliminating the sense that losing one's job diminishes one's sense of self-worth. However, participants highlighted that LMITCo's lack of experience and understanding of the site when generating the "A" and "B" list, ; rather than simply reducing redundant positions, led to a loss of valuable employees and left INEEL with an inadequate skill mix. In addition to causing workload pressures for remaining employees, losing these valuable employees was seen as compromising the site's long-term viability. "Money that was saved (from the downsizing) wasn't reinvested to build capabilities and resources. Instead important resources were lost that could have aided in a new mission."

Job insecurity was a significant concern in all the focus groups in the face of decreasing budgets and the perceived lack of a viable site mission. Upper management's lack of communication regarding the site's state of affairs was a primary contributor to continued fears of downsizing. With a lack of information, rumors were rampant. For many focus group participants job insecurity was magnified because of poor external job opportunities in Idaho and a falling job market in general for applicable fields.

Some of the themes we discerned appear relevant to all of the five DOE sites. Other themes are particular to just INEEL or to INEEL and one or two other sites. The latter include extensive discussion about matrixing and the differences between town and site employment.

Themes that were important at all or most sites were particularly relevant in developing the employee survey. At several sites, issues of workplace structure including matrixing and outsourcing of work were brought up in focus groups and interviews. Constructs that appear in the survey based on focus group findings include: workload, the presence or absence of a strong mission, the notion of a broken social contract, leadership, communication, and morale.

VC. Employee Assistance Program

Below is a brief overview of what EAPs offer to survivors as well as common themes expressed at all sites. A summary of the information collected via interview and record review of the INEEL Employee Assistance Program (EAP) is attached as Appendix K.

C1. Workshops and services

- **INEEL was one of a few sites to offer targeted services for survivors.**

Brief therapy and group workshops offered by EAPs at the sites are a valuable resource for employees to help mitigate psychological stresses of work and home life. Based on our interviews, however, we are aware of only a few sites, including INEEL, that offered workshops directly addressing themes identified in the literature on "survivor syndrome." Workshops were voluntary and often were not evaluated by participants. In addition, we did not determine whether a sufficient number of workshops was offered. Employees were not as receptive to mandated workshops on change because these were seen as propaganda tools and not helpful.

EAP counselors conducted workshops related to the October 1994 consolidation (workshop titled: "Coping with Change") and the 1995 downsizing (workshops titled: "Downsizing and Violence", "Effects of Downsizing," "Up in Downsizing?" and "Dealing with Job Uncertainty"). The EAP scheduled the workshops so as to handle proactively issues related to the consolidation and survivor syndrome. At question for researchers is whether enough employees had the opportunity to attend such workshops. Half of the downsizing workshops offered were directed solely to managers and there were typically no more than ten workshops were offered per topic averaging 20 employees per workshop. It appears that INEEL's EAP aptly anticipated areas for improving employee well-being but lacked sufficient resources to reach a large number of employees. No increase in utilization of EAP services was observed during times of downsizing events.

A few interesting issues emerged at INEEL about the timing and types of employee stress related to downsizing events. One official interviewed noted an increase in substance abuse and family problems reported from 1995 through 1997. Employees also reported increased

stress as a result of major changes and the pressure to make life-altering decisions such as whether to retire early or take a voluntary reduction package. As at other sites, employees talked about feeling betrayed by their employer: they had committed to the site and felt that a "social contract" had been broken.

C2. Consistencies across sites

- **Employees express tension about layoff notices and reluctance to visit EAP.**

The interviews and questionnaires used to understand the Employee Assistance Programs yielded interesting information. This section reports on themes that emerged as consistent across study sites. A central issue mentioned by staff of these programs (and sometimes in employee focus groups as well) was a reluctance by employees to visit the EAP for fear of losing their security clearance. DOE requires many employees to report whether they have consulted a mental health provider or physician about a mental health issue in the last seven years and this can result in certain levels of security clearance being denied.

An interviewee at the Y-12 Plant in Oak Ridge, Tennessee explained: "It's part of a site's legacy. Any veteran employee you talk with knows of someone who was fired after speaking with the company psychologist." No data is available to validate these claims. It appears as though employees are not sure what needs to be reported, so they avoid the risk by not seeking mental health services. That said, respondents did report that these concerns have diminished in the past few years. A staff person at INEEL felt the issue was no longer central except among some union employees. At INEEL, management attempted to alleviate employee concerns by publishing an article on the topic and addressing it in meetings and seminars with employees. LANL staff expressed concern that recent espionage charges at the site might exacerbate these employee concerns.

VI. DATA ANALYSIS PROCESS

VIA. Employee Level Outcomes

The primary goal of our analysis is to assess the extent to which downsizing affects employee health. Using hierarchical linear modeling techniques, we account for variation in employee health related to employee and job characteristics (e.g., sociodemographic characteristics, psychological job demand) and workgroup characteristics (e.g., leadership, communication, job category). Variables in the statistical analyses are classified as dependent (outcome) variables, independent (predictor) variables, or as co-variates.

Co-variates are assessed for their potential confounding effects as well as main effects on the outcomes. The potential effect-modifying role of some variables is assessed in an analysis of interactive effect as delineated in Hypothesis 4 of the study.

- **Statistical analysis occurs in three phases.**

In the first phase we generated descriptive statistics for all study variables. These include means and standard deviations for continuous variables and relative frequencies for discrete variables. In the second phase we constructed multi-item or derived variables. This process involved assessing scale items using principal components analysis and evaluating internal consistency and reliability of established and newly developed scales using Cronbach's alpha coefficients (a description of each scale and alpha co-efficients can be found in Appendix L). The scores for all composite scales were standardized, on a range of zero to 100, for ease of comparability.[21] In the third phase we developed and evaluated statistical models to address the study objectives.

- **Researchers pare down the variables and consider them as three conceptual types.**

Prior to determining the final variables in the model, we examined correlations between variables within blocks. If two or more variables were highly correlated (0.4 or greater), we considered only one to include in the multivariable models to minimize collinearity. We also eliminated variables from the model if the alpha coefficient was below 0.6 or if missing data was considered problematic (8% or more of sample not responding). Throughout, we prioritized the co-variates included to avoid overburdening the model with either too many variables or variables for which it was unclear if they functioned as moderators or outcomes. Once we determined a final list of variables, we ran correlations again. Appendix M contains a list of each variable collected, with information about scale scoring and construction, how to interpret a high score and the model(s) in which each was used or why it was excluded from the final models.

The independent variables we used in all final statistical models were downsizing rate and downsizing process. Downsizing process is actually comprised of three scales/indices including an individual's experiences of downsizing, fairness, and the rate of voluntary downsizing.

Co-variates in this model were organized into blocks focusing on the individual, the job and the environment/organization.

- Individual level co-variate blocks: *sociodemographics/SES, alcohol/tobacco use.*
- Job level co-variate blocks: *job strain, job characteristics.*
- Organizational level co-variate blocks: *social support, organizational and management style, safety and health.*

We ran the model separately for each of the nine dependent variables. The dependent or outcome variables are grouped into:

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[21] Each scale in the analysis has it's own scoring calculation and the scales have varying number of items (anywhere from one to fourteen) and response categories (usually four or five). To allow for easier comparison, where appropriate, we standardized scale scores on a range of zero to 100. We used the following calculation to transform an individual's score for each scale into a standardized score:

$$\text{standardized score} = \frac{[\text{individual's score} - (\text{minimum possible score})]}{\text{Score range}} \times 100$$

where the range = maximum possible score - minimum possible score

- physical health outcomes: *physical component scale of the SF-12, medical symptoms and medical conditions;*
- mental health outcomes: *mental component scale of the SF-12, survivor syndrome and perceived stress; and*
- outcomes directly related to organizational functioning[22]: *work performance, job security and employee morale.*

- **Statistical model offers a view of how variables function individually and in combination.**

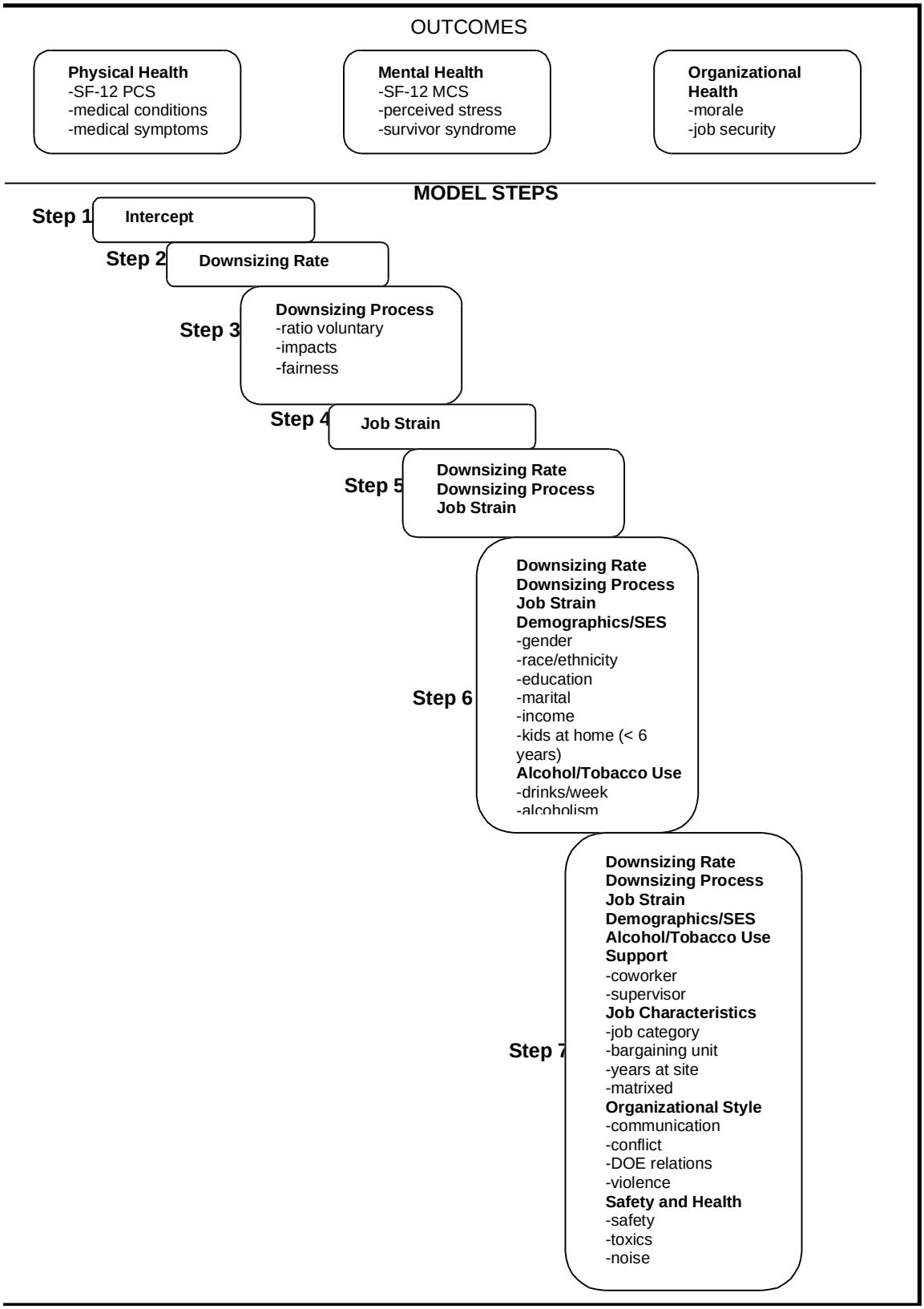
To determine the effect of potential confounders, we used seven steps to analyze data for each outcome. First, we looked at the outcome with no predictors (unconditional means model) which allowed us to examine variability in the mean for each outcome across level 3 organizational units. Then, in steps two and three, we examined each (set of) independent variables alone against the outcome of interest. We looked at job strain alone in step four as it has been extensively studied in this context and, in step five, we combined the variables from steps two through four. All other co-variates (individual, job and environment level variables) were added in steps six and seven. The final hierarchical model is presented in Figure 2 (next page), with the variables for each step and the variable block names in bold print.

After the seven step models were run for each outcome variable, we tested the interrelationship of variables. Using Oak Ridge data, we examined specific interactions by including a cross product term of the factor with downsizing in the model to determine if certain factors acted as moderators for the effect of downsizing on each outcome.[23] These factors included strain, fairness, race, violence, conflict resolution, supervisor support and co-worker social support.

[22] Two additional organizational outcomes, sick time rate and the rate of total recordable cases (accidents and incidents), are used in the level 3, five-site model and presented in the *Five Site Final Report*.

[23] We used Oak Ridge data to help construct and test models to be applied to the other four sites.

FIGURE 2: Hierarchical Linear Model Steps



- **Workgroup level outcomes used in separate model.**

We measured two outcomes of interest--sick time usage and accident rates (known as total recordable cases or TRC)--at the department level (level 3) rather than the employee level.[24] The number of observations available for the analysis of these outcomes (i.e., the number of organizational units) is then relatively small compared to the analyses of the employee level outcomes. Data for all five sites were combined for these analyses to increase our ability to determine the true relationship between model predictors and outcomes. Even though this approach increases the sample size, it does not provide a sufficient number of observations to use the modeling strategy described for the individual level outcomes. These analyses are not included in this site report but are included in the *Five Site Final Report.*

VIB. Hierarchical Linear Models

Hierarchical linear models, also known as multilevel models, can incorporate variation in employee health related to characteristics of the employee, the job and the workgroup. Individuals are affected not only by their personal and job characteristics, but also by characteristics of the social groups to which they belong. In this study, the social unit is the work group. Group characteristics, captured in downsizing, injury, and sick time rates, are distinct from those of individual group members. These group-level variables may affect outcomes independently of individual characteristics or modify how individual characteristics are related to outcomes.

- **Multi-level models assess complex environments.**

The study hypotheses are grounded in a belief that the climate of the workplace as well as of one's immediate workgroup will affect how health outcomes manifest in relation to stressful events. An HLM model allows us to account for similarities between members of the same work group that we may not have measured directly. A recent study testing the Job Strain Model (also called the Demand-Control Model) (Van Yperen and Snijders, 2000) found that differences both between work groups and within work groups (between individuals) were related to health outcomes, with a finding that lower job control contributed to absence rates.

The individual (level 1) is the unit of observation for this first set of models. We account for similarities within divisions (level 3) in this hierarchical model.[25] Level 2 is a workgroup; however, we could not sample at that level because the groups were often too small to offer anonymity and / or to have enough employees to achieve statistical significance. Two of the independent variables (downsizing rate and rate of voluntary layoffs) in this model are measured for level 3 and then assigned to each individual in that group.

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[24] We are not using overtime usage rate as an outcome because it is not recorded consistently for all employees (differences between bargaining unit and exempt employees).

[25] Hierarchical models are commonly used in educational studies looking at students within classrooms within schools. Another example is a study of doctors grouped into practice groups within hospitals.

As a simple case, consider a two-level model where the employee is level 1 and the workgroup is Level 2. At level 1, the outcome for employee i in the jth working group is the sum of an "intercept" (mean) for the employees' working group and random error:

$$Y_{ij} = \beta_{0j} + e_{ij}$$

where $e_{ij} \sim N(0,\sigma^2)$, that is, e_{ij} is distributed as a normal random variable with zero mean and fixed variance. At level 2, the intercept (mean) for the jth working group is the sum of an overall mean and a series of random deviations from that mean:

$$\beta_{0j} = \beta_0 + b_{0j}$$

where $b_{0j} \sim N(0, d_0)$. Using substitution we obtain the multilevel model:

$$Y_{ij} = \beta_0 + b_{0j} + e_{ij}$$

where β_0 is a fixed effect that represents the average outcome in the population, b_{0j} is a random effect that represents variability between working groups and e_{ij} is a random effect that represents variability within working groups.

VII. SUMMARY STATISTICS

We present here our findings regarding the rates of downsizing, sick time and accidents at the site. We then present information about the survey responders and descriptive statistics (i.e., means, standard deviation, range) for important scales included as co-variates or outcomes in our model. For those scales that have been used extensively in other studies, we compare our data to national norms. We also offer a summary of the major concerns employees described in their written comments.

VIIA. Archival Data

A1. Downsizing

The net change in employment from January 1991 (5,923) through June 1998 (5,825) was a loss of 98 employees according to data submitted from LMITCo, Human Resources. From the highest employment point in 1992 (8,162) to the end of the study (1998), INEEL lost more than 2,300 employees or 40% of their 1991 base population through downsizing as well as attrition.

- **Downsizing rate varies by study year.**

At INEEL, 1,490 employees of major contractors (B&W, PTI and LMITCo) were laid off through downsizing events between 1993 and 1996.[26] The annual downsizing rate, calculated as the number of people downsized divided by the population at the start of the calendar year, ranged from 1% in 1993 to 14.5% in 1995 (see Table 1). The study average was 4.3 percent (averaged for 1995-1998 since prior data was not available for level 3 analysis). All of the employees laid off received voluntary layoffs, either through an early retirement program or by means of a voluntary incentive program.

TABLE 1: Annual Downsizing at INEEL (numbers and rates)

Year	Population (in January)	Voluntary		Involuntary (IRIF)	Total Downsize	Downsize Rate	Voluntary Rate
		VRIF	early retire (ER)				
1991	5923*	0	0	0	0	0	0
1992	5784*	0	0	0	75**	0.013	--
1993	5968*	0	0	62	62	0.010	0
1994	5686*	0	0	0	0	0	0
1995	8162	575	606	0	1181	0.145	0.145
1996	6223	172	0	0	172	0.028	0.028
1997	5900	0	0	0	0	0	0
1998	5825	0	0	0	0	0	0
Study period (1991-1998)		747	606	62	1490	0.025	0.022

* Note population numbers for 1991-1994 reflective of EG&G employees only. No data could be located for other previous contractors.
** Combination of voluntary and involuntary downsizing by Protection Technology Idaho (PTI).

We collected downsizing data by level 3 from the current contractor. This data was collected for each study year, 1995 through 1998, for which there were layoffs and available data at this level. At INEEL, we were able to assign a level 3 to all of the downsizing data from 1995 and 1996. If we look at the downsizing rate at INEEL by year and by level 3 (Table 2) we see noticeable differences, across level 3s (for example, the 1995 level 3 downsizing rate ranged from 8% to 46%) and between 1995 (17%) and 1996 (2%).

[26] Please note that all figures regarding net employment change and downsizing in this section come from contractor data and INEEL-specific Work Force Restructuring Plans. OWCT numbers in their complex-wide Annual Reports on Contractor Work Force Restructuring may differ as they include multiple contractors in Idaho and information from previous contractors and because the data may be gathered by distinct personnel according to different criteria. OWCT records for the period September 1991 to September 1998 show a net change in employment of 1,680 employees (from 7568 to 5868), with a drop of 2,120 from the employment high in September 1992 (7,988), and total downsizing of 1,945 employees. They also record five downsizing events in FY93-FY96).

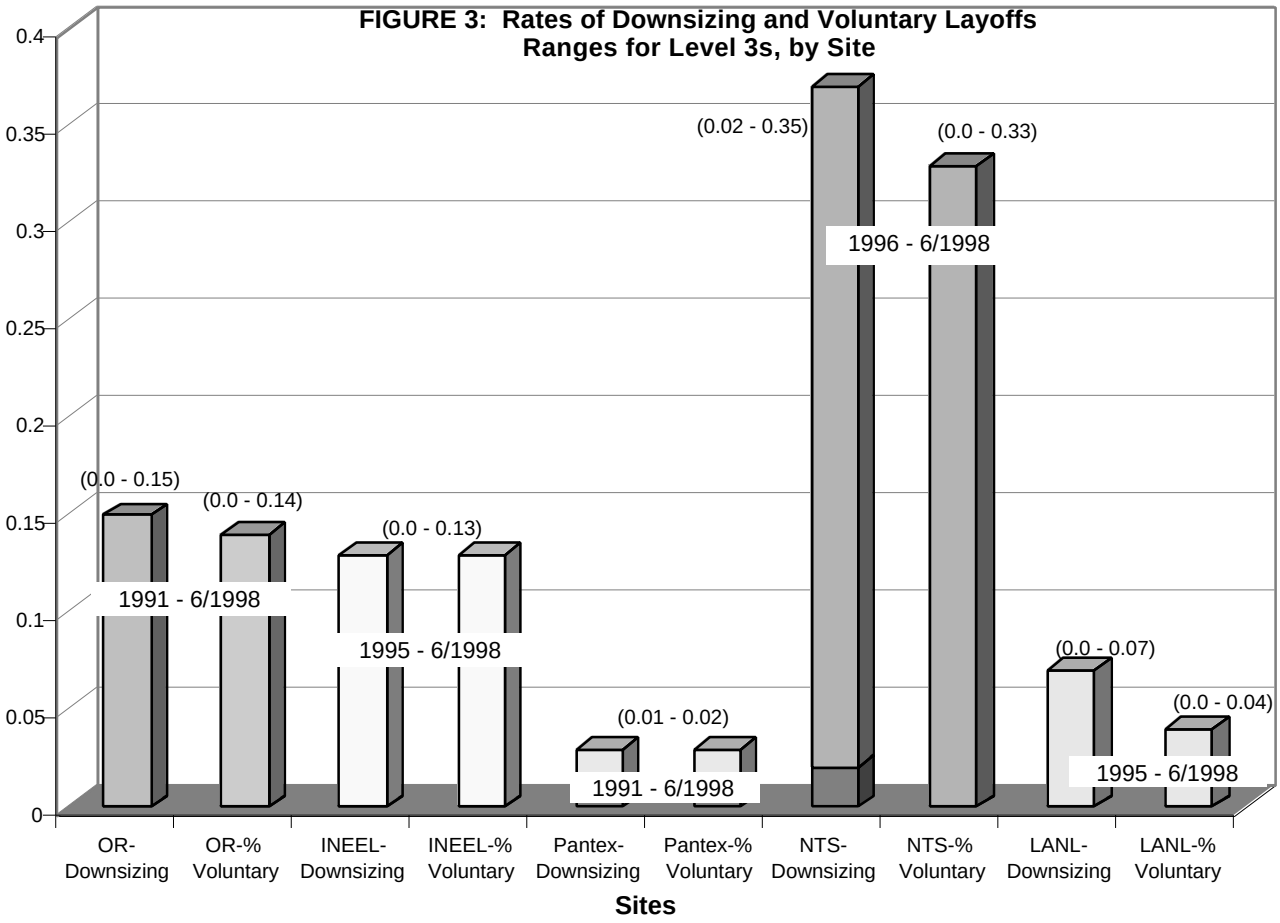
TABLE 2: Annual Downsizing at INEEL by Level 3 (ranges) (N=31)

	Downsizing Rate & Voluntary Rate*	
Year	**Range (min - max)**	Mean
1991-1994	data not available by level 3	
1995	0.078 - 0.464	0.17
1996	0 - 0.071	0.02
1997	0 - 0.000	0.00
1998	0 - 0.000	0.00

* All RIFs in 1995 and 1996 were voluntary and therefore mean and range is the same.

We averaged the annual rates for each level 3 to derive a downsizing rate and voluntary rate for the level 3 for the entire study (data from 1995 through 1998 only).

The bar graph below (Figure 3) shows the range of study period downsizing and voluntary rates across level 3 for each of the five sites. Study period downsizing by level 3 at INEEL ranges from 0% to 13%, with a mean of 4% and 90% of the level 3s having a downsizing rate of 5.6% or lower. At INEEL, as at Pantex, all downsizing was voluntary and so the voluntary rates are the same as the downsizing rates. The rates at INEEL are comparable to the Y-12 Plant / Oak Ridge, much greater than rates at Pantex and LANL and much lower than rates at NTS. Five downsizing events occurred during the study period (January 1991 to August 1998) with more than two years between the time of the last event and the administration of our survey.



A2. Sick time and accident data

We summarized two of the organizational outcomes of interest by level 3. Rates of sick time usage and total recordable cases (TRC or accidents) were calculated for the period July 1997 through June 1998 (the last 12 months of the study prior to survey administration). At INEEL, sick time data was not available as sick days are combined into a paid leave package. Table 3 shows the descriptive statistics for this data across level 3. The study-wide analysis of this data, using these two workgroup measures as outcome variables, will be presented in the *Five-Site Final Report.*

TABLE 3: Total Recordable Cases for INEEL and All Sites

Facility		Mean	SD*	N (# of level 3s)	Range for Level 3s(min - max)
INEEL					
	TRC rate	0.03	0.03	31	0 - 0.10
All Sites Combined					
	Sick time rate**	64.79	26.48	78	18.35 - 149.78
	TRC rate	0.03	0.03	126	0 - 0.15

where: ***trc rates= sum level 3 trc 7/97 -6/98/ level 3 population***
sick time rates= sum level 3 sicktime hours from July 1997-June 1888/ level 3 population
**** SD = Standard Deviation***
***** LMITCo does not compile sick time data apart from paid time off. These rates are for three sites only.***

VIIB. Survey Data: Descriptive Tables

B1. Survey responders

- **High response rate is obtained and INEEL employees respond most frequently.**

We sampled 10,645 employees from our five study sites (or 43% of all eligible employees at those sites) to receive the *Boston University Workplace Survey*. Overall, 55% of those sampled (5,897) completed and returned their surveys between July and November 1998 while at the Idaho National Engineering and Environmental Laboratory 71% of the sample or 1,681 employees[27] completed the survey—the highest response of the five sites. Response rates at the five sites are shown in Table 4.

TABLE 4: Survey Response Rate by Site

Site	Percent of employees who returned survey
INEEL	71%
Nevada	68% (includes 2 contractors)
Pantex	62%
Oak Ridge	48%
LANL	44% (includes prime + 2 subcontractors, UC alone: 50%)

The majority of the INEEL sample are male (71.4%), Caucasian (93.8%), and younger than fifty years old (67.7%). Responders are well educated: almost 50% have completed college or attained a degree beyond college. The largest segment of responders is exempt, salaried employees (66%) and approximately 16% are members of a bargaining unit. Demographic information on INEEL responders is summarized in Table 5.

[27] While there were 1,681 responders from INEEL, some of the totals in the Tables are lower as they refer to the number of employees responding to particular demographic or other questions. Percentages are calculated using the responders for the particular item as the denominator.

TABLE 5: Survey Responder Demographics

		N*	% of responders
Gender	Female	474	28.6
	Male	1182	71.4
Race/Ethnicity	White/Caucasian	1547	93.8
	Native American/Alaskan	10	0.6
	Asian/Pacific Islander	24	1.5
	Black/African American	13	0.8
	Hispanic	32	1.9
	Multiracial	23	1.4
Education Level	Grades 7-11	7	0.4
	Grade 12/GED	100	6.0
	High School Plus Other Training	266	16.0
	Associates Degree/2 Year College	198	11.9
	Some College	277	16.7
	Bachelors Degree	451	27.2
	Advanced/Professional Degree	361	21.7
Age	20-29	67	4.1
	30-39	388	23.5
	40-49	663	40.1
	50-59	467	28.3
	60+	67	4.1
Marital Status	Married/Significant Other	1383	83.5
	Single, Never Married	74	4.5
	Separated	12	0.7
	Divorced	175	10.6
	Widowed	13	0.8
Spouse Job Status	Works Outside Home	975	58.7
	Does Not Work Outside Home	687	41.3
Children	Yes	1436	86.5
	No	223	13.4
Household Income	< $15,000	2	0.1
	$15,000 - $30,000	100	6.1
	$30,001 - $60,000	717	43.7
	$60,001 - $90,000	574	35.0
	$90,001 +	247	15.1
Pay Status	Exempt (not eligible for overtime)	711	43.0
	Exempt (eligible for overtime)	382	23.1
	Nonexempt	289	17.5
	Bargaining Unit	272	16.4
Tenure		mean=13.6 years	
	1 - 2 years		5.0
	3 - 8 years		20.0
	9 - 12 years		25.0
	13 - 26 years		45.0
	27 or more years		5.0

* There were 1,681 responders at INEEL. The numbers in Table 5 are those answering the specific survey item
The percent is determined by the number of people responding to the specific item, not total responders.

- **Site has tradition of long tenure.**

As with most DOE sites, employees of INEEL have long job and site tenure. Of those responding to the survey, the average site tenure is 13.5 years with 75% of employees at the site for at least nine years (see Table 5). The average site tenure for the five-site sample was 14.5 years.

- **Responders were representative of the site but differ in some key respects.**

In Table 6, we compare responders with all site employees on demographic variables including gender, race, age, and union status. The group of responders was fairly comparable to the site overall, although responders had less non-white and union representation and higher than representative responses from female employees. We were not able to conduct a statistical comparison of responders and non-responders to determine if there was a non-response bias because of the method used to maintain responder confidentiality.[28]

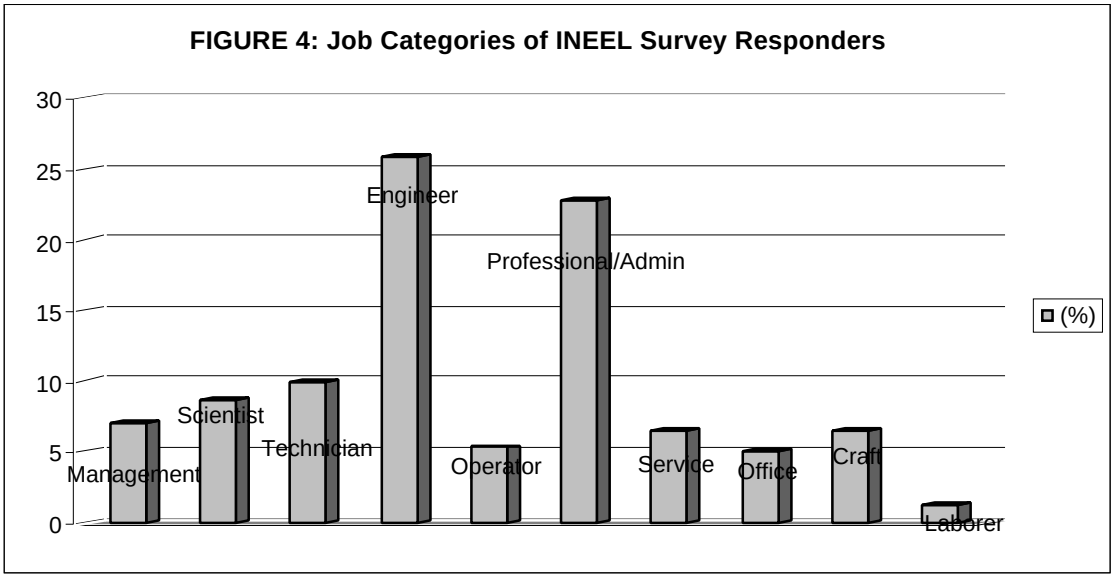
TABLE 6: Survey Responders Compared to INEEL Population

		Responders		All employees	
Variable		**#**	**% of responders**	**#**	**% of total**
N*	(sampled=2368)	1681	71% responded	5596	42% sampled
Female		474	28.6	1410	25.2
Non-white		102	6.2	439	7.8
	African Amer	***13***	***0.8***	***47***	***0.8***
	Latino	***32***	***1.9***	***211***	***3.8***
	Asian/Pacific Islander	***24***	***1.5***	***107***	***1.9***
	NativeAmerican/Alaskan/ Multiracial	***33***	***2***	***73***	***1.3***
50 years or above		534	32.4	1766	31.6
Union member		272	16.4	1180	21.1

*Note: total responders does not reflect the demoninator for the subsequent sub-categories ***as some responders did not answer each question (missings).***

INEEL is one of the DOE's laboratory facilities. This mission is reflected in the distribution of employees across job categories: nearly 35% of employees are scientists and engineers and another 23% professionals. The ten job categories below (Figure 4) are taken from the Department of Energy's Common Classification System (COCS).

[28] We could not create two groups to compare statistically (responders and non-responders) as we only knew who had sent back a postcard but not who had returned a survey. The best comparison then was to the site demographics overall.



B2. Summary statistics on survey scales

Table 7 lists the summary statistics (i.e., mean, standard deviation, and range) for the nine outcome scales in the survey instrument and the other scales and indices included in this model. The scale scores have been standardized (zero to100 points) for easier comparison.[29]

[29] Information of interest referenced earlier includes the tables describing the conceptual basis and the statistical basis for each scale. They can be found in Appendices L and M.

TABLE 7: Descriptive Statistics for all Survey Variables

	INEEL				All Sites Sample	
Variable (Standardized)	**N**	**Mean**	**SD***	**Score Range (Min-Max)**	**N**	**Mean (SD)**
Outcome scales and indices:						
SF-12 Physical Component Summary (PCS)	1604	75.00	10.19	28.56 - 94.33	5608	74.55 (10.25)
Medical Conditions	1658	12.10	13.22	0 - 75	5808	11.72 (12.89)
Medical Symptoms	1666	26.75	22.97	0 -100	5831	24.57 (22.83)
SF-12 Mental Component Summary (MCS)	1604	63.50	14.99	16.38 - 87.12	5608	65.91 (14.36)
Survivor Syndrome	1547	60.87	11.34	20 - 100	5340	59.98 (11.77)
Perceived Stress	1660	47.54	14.31	20-100	5836	45.42 (14.29)
Job Security	1591	52.82	12.23	25-91.67	5523	52.84 (13.82)
Work Performance	1679	13.73	12.88	0 -77.78	5897	13.04 (12.37)
Morale	1665	52.31	17.33	20-100	5856	55.69 (17.96)
Independent or co-variate scales and indices:						
Individual downsizing experiences	1611	21.59	20.19	0-100	5670	25.21 (21.86)
Fairness/Downsizing process	1582	55.10	10.71	20-88.57	5505	54.43 (11.73)
Strain	1588	24.06	5.94	9.17-66.67	5550	23.88 (5.85)
Matrixing	1631	18.11	27.48	0 - 100	5744	11.75 (23.39)
Alcoholism	1626	5.52	16.17	0 - 100	5697	4.37 (14.18)
Violence	1651	16.23	26.24	0 - 100	5805	14.76 (24.91)
DOE	1662	50.41	15.82	20 - 100	5817	52.25 (16.29)
Communication	1660	54.16	18.57	20 - 100	5840	54.22 (18.98)
Conflict Resolution	1640	56.47	12.59	20 - 100	5761	57.79 (12.84)
Supervisor Support	1646	72.08	15.60	25-100	5785	74.41 (15.32)
Coworker Support	1638	75.23	11.24	25-100	5772	75.88 (11.43)
Safety and health	1660	77.19	12.63	22.5 - 100	5830	77.29 (12.62)
Toxic	1653	45.86	14.53	33.33 - 100	5798	47.30 (15.31)
Noise	1661	45.86	13.44	25 - 96.67	5824	47.30 (13.62)

**** SD = Standard Deviation***

B3. Summary statistics compared to national norms

Three of the outcome scales are nationally used and validated measures. We were able to compare data from INEEL employees and our entire sample (All Sites) to those national norms; that information is presented in this section with a table in Appendix N. We also incorporated other widely used measures into our survey, in particular, several

scales from the Job Content Questionnaire (JCQ).[30] We do not present comparative norms here because the international JCQ norms are reported by job category and differ from those that we collected in this study (comparisons are pending).

We compared summary statistics from our sample with general population norms for the two SF-12 scales and for perceived stress.[31] Because our demographic categories differed from the way the normative data was grouped, we were limited in our ability to test comparisons. Reported here are results from a one-sample t-test to determine whether scores on PCS, MCS and perceived stress were different among INEEL and the sample of all five sites combined (All Sites) compared to published, general population norms.[32] We compared our data (both INEEL-specific and All Sites) with national norms for the total samples and by gender.

- **Comparisons to national norms reveal expected results.**

In summary, INEEL data and the All Sites data showed significant differences for all comparisons to the national population on all three measures, the physical health scale (PCS), the mental health scale (MCS), and perceived stress scales ($p \leq 0.0001$). The INEEL sample and the DOE contractor population are somewhat healthier than the national sample with females showing the greater differences (2.9 points higher for the INEEL sample and 2.4 for the All Sites sample compared to 1.7 and 1.4 points higher for males). Both the INEEL population and the All Sites sample, when compared overall and by gender to the national data, demonstrated poorer mental health on both the MCS and the perceived stress scales ($p \leq 0.0001$). Male employees at INEEL scored substantially lower than the national sample on the mental health scale (they scored 4.6 points lower on the MCS).

All comparisons with the normative data were statistically significant. However, it is not clear how the score differences from the national samples translate into actual health differences. In general, we might expect that a working population would be healthier than a general sample of US adults. For physical health as measured by the PCS scale, this expectation holds. One might also expect workers to have better mental health scores than the general population. However, our hypothesis that downsizing has an overall stress effect on employees is borne out by these results which show INEEL and the All Sites populations with slightly lower mental health on the MCS and higher perceived stress than the normative data.

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[30] Scales from the JCQ include psychological job demand, skill discretion, decision authority, supervisor social support, co-worker social support, toxic exposure, noise exposure, macro decision authority and job insecurity.

[31] Comparative national data for the SF-12 is described in the SF-12 Manual: "How to Score the SF-12 Physical and Mental Summary Scales, " Third Edition, Quality Metric Inc. Comparative national data for the perceived stress scale is described in: Cohen, S., and Williamson, G. (1998). Perceived Stress in a probability sample of the United States. In S. Spacapam, and S. Oskamp (Eds.), The Social Psychology of Health: Claremont Symposium on Applied Social Psychology. Newbury Park, CA: Sage.

[32] Higher scores on PCS and MCS mean healthier physical and mental status while a higher score on perceived stress indicates higher stress levels or a less healthy status.

B4. Review of the *Boston University Workplace Survey* comments

Our survey included two open-ended questions encouraging respondents' comments on the following: 1) important job issues not addressed in the survey and 2) ideas for improving the quality of one's work life. All comments were entered into a database. A list of categories and subcategories was created and used to code comments (see Appendix O for coding themes). Frequencies were run on the categories for both open-ended questions to identify areas about which respondents most frequently commented (990 employees or 59% of respondents offered one or more comments).

- **Employees report a variety of concerns.**

The majority of the comments from INEEL employees fell into three general categories: evaluation of management and employee-management relations, organizational issues, job demands. A substantial number of comments were offered about job security and site future. Within these categories, employees documented a wide variety of concerns and, at times, expressed conflicting opinions. A summary of the major points is presented here.

Most comments about management addressed leadership, layers of management, poor communication, trust, and empowerment. Respondents had differing opinions as to whether supervisors were technically competent at managing work within their respective areas. However, they consistently deemed management ineffectual in leading the organization and managing personnel. No specific concern was voiced about managers not treating all employees equally.

Comments about multiple layers of management and a top-heavy organization were common. As one employee stated, "Six levels of management have insulated the senior staff from the employee." Employees wrote that this organizational structure has resulted in communication gaps between employees and management and has generated a lack of trust and care from both parties. Respondents consistently asked for more input into decisions which affect both their work environment and work processes: "Allow the employees to have some input on policies that affect them, instead of having everything mandated or dictated."

Several comments on organizational factors mentioned the need to provide employees with more up-to-date job training and a desire for greater professional growth and career advancement opportunities. Other comments reflected employee concern about present procedural requirements for site operations and about the matrixed system. One employee stated that a "major contributor to inefficient operation is the excessive and complex system of procedures and directives. At the INEEL we are way past the point of diminishing value for both cost and safety." Many comments reiterated claims about the proceduralization of work, stating that the additional layers of paperwork and requirements have affected the work flow, safety and morale of employees.

Many employees expressed criticisms of the matrix system, with some asking that it be abolished or altered. Comments focused on matrixed employees not getting equal consideration from their home organization for promotion, performance awards and achievement awards. In addition, the matrix system was stated as being the source of

productivity and safety problems since matrixed employees are often unfamiliar with specific work areas to which they are assigned.

Prominent issues regarding job demands included the increased volume of work, lack of flexibility in work schedule, job security and employee interest in job change. Employees attributed the increased workload at the site to the reduction in the workforce and lack of hiring replacements. Some employees inferred that these issues significantly affected work safety at the site. Comments about work schedule focused on the amount of time employees were prepared to spend at work, flexibility in their work schedule and their desire to spend less time commuting to work. There were conflicting comments about how to structure the work week but a majority of employees addressing this topic would prefer a system that allows for flexibility in their work schedule to enable a better balance between work and personal obligations. Some of those who work at the site complained about the commuting time. One of the comments was that the long commute has resulted in increased health problems such as back and joint pain.

Job security is an important issue for workers at the INEEL. The constant threat of outsourcing posed by management has led to the feeling of job insecurity. Some of the employees are dissatisfied with their work and would prefer obtaining jobs outside the site that have equivalent compensations as their present jobs.

VIII. MULTI-LEVEL MODEL RESULTS

We used multilevel modeling (HLM) to incorporate group-level variables into a contextual analysis. This allows us to capture information not provided by individual-level data. HLM also helps us understand the outcomes for individuals while accounting for similarities within work units. By constructing the model in steps, we see how each set of independent variable(s)--downsizing rate, downsizing process--is associated with the physical health, mental health, and organizational outcomes and how each operate when job strain and other individual and work focused co-variates are added. As mentioned in Section VI, outcomes are grouped into physical health outcomes, mental health outcomes and outcomes related to organizational functioning and each group contains three scales or indices.

In this section we briefly discuss individual characteristics (demographics and job characteristics) included in the model as potential confounders. We present the results for each of the independent and other key variables. We then provide findings about conceptually interesting co-variates, specifically those related to organizational climate and job characteristics. This overview focuses on the full model (step 7 of the hierarchical linear model) and comments on how key variables function differently in earlier steps of the model. At the end of this section we discuss results related to the fourth hypothesis regarding the way in which seven variables modify the impact of downsizing on health and functioning. We summarize the overall findings and interesting issues in the discussion (Section IX) and conclude with recommendations based on these findings.

Scores for all continuous scales were standardized and have a possible range of zero to100. We report mean and standard deviation for variables and, in the tables, present the effect size (beta coefficient) and note the p value when a variable is significantly associated with an outcome. Complete results for each of the nine outcomes are attached as Appendix P and a summary of how core variables perform throughout the seven steps of the model, for each of the nine outcomes, is presented in Appendix Q.[33]

VIIIA. Individual Level Controls

- **Associating demographic variables with outcomes provides important information.**

Five of the demographic variables measured in the survey[34] were characteristics possibly associated with some of the nine outcomes and were therefore controlled for in the model: age, race / ethnicity, gender, marital status, and having a child(ren) under six years of age at home. As expected, increasing age was significantly associated with several of the health outcomes (decrease in PCS and more Medical Conditions) as well as with greater job insecurity. Age was also associated with higher MCS and less likelihood of poor work performance.

Job characteristics including pay status (bargaining unit / non-bargaining unit), tenure at site, matrixing, and job category,[35] emerged from interviews and focus groups across sites as being differentially impacted by workplace changes. These job characteristics were seen as important co-variates and therefore entered in the final model.

It is interesting to note that pay status remained significant when all variables were included in the final model for two mental health outcomes and one organizational related outcome. Bargaining unit employees reported higher mental health scores and lower perceived stress and, perhaps surprisingly, greater job insecurity, than non-bargaining unit employees.

The scale on matrixing focuses on the individual experience of the employee, assessing the experience with this job format (e.g., adequacy of supervision, connection to group, etc.) but it is also clearly tied to work structure. A higher score indicates a more negative experience with matrixing. The more negative experience as a matrixed employee (e.g., inadequate supervision, low connection to group, etc.) was not associated with more medical conditions, higher survivor syndrome and job insecurity at INEEL and emerged as most important at LANL (associated with six outcomes).

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[33] For additional information, see Table 7 above for descriptive statistics for all scales and Appendix M to understand how to interpret scale scores.

[34] Other individual level variables measured but not included in this model were: income, second job, and health insurance. These variables were cut as we attempted to create a leaner model.

[35] Some of the job characteristics in the survey were excluded from this model because of lack of variability in responses. The variables excluded were: shift, number of overtime hours worked, management level and the number of days per week worked outside of one's main work group.

We also controlled for tobacco and alcohol use. Surprisingly, tobacco use was not significant for any of the health outcomes but was correlated with lower perceived stress[36] as was the number of drinks consumed per week. A higher score on the alcoholism index, however, was significantly associated with more medical symptoms, worse mental health status (on all three measures) and to more examples of poor work performance.

VIIIB. Downsizing

Our study hypothesis assumes that downsizing and health outcomes are associated. Individuals in work groups with higher downsizing will have more adverse health outcomes than individuals in groups with lower downsizing. In addition, higher downsizing rates will be associated with poor organizational functioning as measured by scales on work performance, job security, and morale, and by sick leave and accident rates.

Again, the downsizing variable is calculated for each organizational unit or level 3 at the site as the average of the annual rate for each study year from 1991 through 1998.[37]
At INEEL, the three downsizing events since 1995 (the start of the LMITCo contract) were included in the hierarchical model while prior reductions, including those during the transition to a single main contractor we could not have in this model. The downsizing rate is applied to each individual in the level 3.

At INEEL, the downsizing rate variable ranged from 0% to 13.4% across the 31 level 3s in the model with a mean of 0.46 and 90% of the observations with a rate below 5.6%.

- **Downsizing rate is not statistically related to any outcome variable.**

As Table 8 demonstrates, downsizing rate was not significantly related to any of the nine outcomes at INEEL. This held true even when downsizing rate was the only variable in the model in step 2 (see Appendix Q.)

[36] The variable may not have been sensitive as finally measured. While we included information about start and quit years in the survey, in this analysis people are divided into those who have never used any form of tobacco and those who have ever or currently use any form of tobacco.

[37] At each site, we averaged annual rates for the number of years that data were available: INEEL and LANL since 1995 both experiencing three downsizing events; Oak Ridge since 1991 with six downsizing events between 1991 and 1995 and several events each year from 1996 through 1998; Pantex, since 1991 with one downsizing event; and NTS since 1996 with three downsizing events. Details regarding rate calculation are in Appendix H. At INEEL and NTS there was a change of prime contractor that meant the previous records of downsizing were at a site-wide level (not by level 3). At LANL, the University of California restructured extensively in 1995 and, again, previous records were not traceable to a level 3 measure.

TABLE 8: Hierarchical Linear Modeling Results for Downsizing Rate and Process Measures

	Downsizing Rate	Fairness	Downsizing Experiences
Outcome (N)	***B*** estimate	***B*** estimate	***B*** estimate
Physical Health			
SF-12 Physical Component (PCS) (1251)	15.99	0.04	-0.03*
Medical Conditions (1252)	15.92	-0.10*	0.06**
Medical Symptoms (1258)	-75.78	-0.17*	0.14***
Mental Health			
SF-12 Mental Component (MCS) (1251)	-43.46	0.13**	-0.04*
Survivor Syndrome (1222)	20.81	-0.11**	0.02
Perceived Stress (1258)	26.08	-0.09*	0.00
Organizational Health			
Job Security (1229)	4.35	-0.11**	0.10***
Work Performance (1264)	-23.60	-0.03	-0.00
Morale (1262)	-37.42	0.11*	-0.00

where: *p≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001

We examined the possibility of a non-linear effect of downsizing using the Oak Ridge data as a test case. We included a quadratic term in each model testing for its impact on each outcome. This term was only significant for PCS indicating that as downsizing increases, PCS also increases but this effect diminishes for the highest levels of downsizing. This result--the same association found for downsizing rate--suggested that it was not critical to test this alternate version of downsizing at the other four sites.

Surprisingly, downsizing was only significantly associated with six outcomes at the four other sites, with three of the significant outcomes at Pantex, the site with the fewest people laid off and only one downsizing event. Higher downsizing was oddly associated with better health (PCS) at two sites (NTS and Oak Ridge) and associated with the MCS in the expected direction at Pantex (higher downsizing leading to lower mental health scores).[38] At two sites the downsizing rate was associated with job security, but in opposite directions.

VIIIC. Downsizing Process

Study Hypothesis 2 states that in a context where downsizing was a given, how the downsizing was carried out would influence the health and organizational outcomes. Specifically, greater worker involvement, more extensive communication about plans, timing and implementation, a higher rate of voluntary layoffs, and a downsizing process that employees perceived as fair would all result in a more cohesive workforce with fewer negative health, safety, and organizational functioning outcomes. We thought that some of these factors might vary within site (between work groups) as well as between sites.

[38] Higher scores on the outcome scales can mean better or worse outcomes as follows. A higher score on these outcomes mean better health and functioning: PCS, MCS, morale. A higher score on these outcomes means worse health and functioning: medical conditions, medical symptoms, survivor syndrome, perceived stress, job security (higher=greater insecurity), work performance (higher=more instances of poor work performance). Review Appendix M for more information on interpretation of scales.

Hypothesis 2 also posits that the extent to which an individual personally experienced downsizing would influence health outcomes.

Downsizing process was discussed extensively in interviews and focus groups. We included three measures of downsizing process in the final hierarchical model: fairness or justice of the downsizing, individual experiences of the downsizing, and the rate of voluntary layoffs in a given organizational unit (voluntary departure or early retirement programs). We did not include another measure of process, the goals of the downsizing events and whether they were achieved as too many responses missing.[39]

C1. Fairness

The fairness scale (E6 in the survey, Appendix F) asks employees to respond to 14 questions regarding the most recent downsizing event at their site. The scale includes items about interactional justice and formal procedures,[40] communication, timing, and worker involvement. Higher scores on the fairness scale correspond to perceptions of a more fair and open downsizing process. At INEEL, scores on the fairness scale ranged from 20 to 88.6 with a site mean of 55.1 and standard deviation of 10.7.

- **Perceived fairness is statistically significantly related to health.**

Fairness was significantly related to seven of the nine outcomes (see Table 8, above). The higher the perceived fairness, the healthier the person as measured by indices of medical symptoms ($p \leq 0.02$) and chronic medical conditions ($p \leq 0.03$). Greater fairness was associated with better mental health status, including higher MCS ($p \leq 0.001$), fewer survivor syndrome symptoms ($p \leq 0.002$) and less perceived stress ($p \leq 0.05$). With respect to organizational outcomes, the more fair the downsizing, the less job insecurity expressed ($p \leq 0.003$) and the higher the reported morale ($p \leq 0.02$).

For the two outcomes where fairness was not significant in the final model (PCS and work performance), it was significantly related to the outcome through step 6 in the model. This suggests that organizational climate and job characteristic variables added in step 7 are confounding the association with fairness and these two outcomes (Rothman and Greenland, 1998).

Fairness was associated with less job insecurity at all five sites, and with lower survivor syndrome scores at four of the five study sites. It appears that, across site, people report fewer health problems (symptoms and/or conditions) the more fair they perceive the downsizing process.

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[39] Either people did not understand the question (E1) or they did not feel qualified to comment on the goals of the downsizing.

[40] The justice questions were adapted from a procedural justice scale developed by Niehoff and Moorman, 1993. Some of the language was changed in this section to refer directly to a downsizing event rather than to general perceptions of procedural justice at a workplace. A general justice scale is included in the survey (C7) but was not included in the final model as it was highly correlated (.44) to this scale.

C2. Voluntary layoffs

- **Rate of voluntary layoff shows no statistically significant relationship to outcomes.**

We hypothesized that voluntary and involuntary downsizing processes reflect distinct levels of worker involvement and worker control over the outcome and therefore would have different impacts on employee health. The three layoff events for which we had level 3 data were all voluntary. A separate term for voluntary rate was therefore not included in the model since the range is the same as the range of downsizing rate overall (0 to 13.4%).[41] The rate of voluntary layoffs was only significant for two outcomes at the three sites where it was included in the models, both times in an unexpected way; a higher voluntary rate was associated with more job insecurity at Los Alamos and lower MCS or poorer mental health at the Nevada Test Site.

C3. Individual experiences of downsizing

We created an index to count the ways in which someone had experienced the event(s), with a range from no effects to seven possible impacts, such as being laid off and later rehired, participating in RIF planning, handing out layoff notices or having a friend laid off. Scores on the downsizing experiences index at INEEL ranged from zero to 100 with a mean of 21.6 (lower than the all site mean of 25.2) and a large standard deviation (20.2), meaning that employees at INEEL were less likely than the All Sites population to have experienced several aspects of downsizing personally.

- **Findings suggest that downsizing negatively impacts physical and mental health and may leave employees less secure about job future.**

The downsizing experiences index was significantly related to five outcomes, including the three physical health outcomes (see Table 8, above). We found that more personal experiences with the downsizing was correlated with a worse mental health status (MCS) at all five sites. At four sites (all except Pantex) the more aspects of downsizing an individual experienced directly, the more insecure about job future he or she felt and the more medical symptoms were reported. Interestingly, the index was not significantly correlated with morale at any site. Also surprising was that the individual experiences of downsizing index was rarely associated with survivor syndrome (only at LANL). This suggests that research into survivors needs to delve deeper and look at differences within the group of remaining employees.

[41] We were only able to include this variable in the site models for LANL, Oak Ridge, and Nevada Test Site. All layoffs at Pantex and INEEL were voluntary and thus the rate was the same as the downsizing rate. We did not include this variable at those two sites to avoid co-linearity problems.

VIIID. Strain

We assume that job strain is associated independently with the outcomes. We also believe that there may be a moderating effect between job strain and downsizing, a hypothesis we discuss below in the section on interactions (see Section VIIIF).

Strain consists of a job demands dimension (defined by how fast and hard one works and whether one has sufficient time to get the job done) and a control dimension (defined by the ability to use skills on the job as well as the decision-making authority available to the worker). The job strain model emphasizes the relationship between demands and control in causing stress: the greatest risk to physical and mental health from stress occurs to workers facing high psychological workload demands or pressures combined with low control or decision latitude in meeting those demands. In this study, we use the "quotient" model of job strain to create a continuous independent variable--demands divided by latitude.[42]

- **Qualitative data indicates that downsizing worsens job strain.**

It is clear that downsizing may worsen job strain--either or both as an increase in job demand and a decrease in job control—although we could not test this relationship in this cross-sectional model. A recent study found that physical demands increased and autonomy and skill discretion (control) decreased in major as compared to minor downsizing (Kivimaki, et. al., 2000). Study respondents, in written and verbal comments, spoke extensively about work demands as well as the inability to structure their work. "due to the reductions in force it seems that our biggest problem is the extra work applied to those who are left." This was supported by many while others felt that the real problem was the distribution of work among employees ("work much more sporadic than before--sometimes too much to do sometimes not enough"; "reorganize to reduce redundancy"; "too many without work"). This is consistent with the findings of Vahtera and colleagues (Vahtera and Pentti, 1999) who reported that worse health outcomes after downsizing were seen for those in job categories that had been significantly reduced (perhaps leading to work overload).

[42] The quotient term is nonlinear and tends to give more weight to latitude (the denominator) than demands. There are other formulations of job strain including one that dichotomizes strain at an arbitrary cut-point.

TABLE 9: Hierarchical Linear Modeling Results for Job Strain

	Outcome (N)	Job Strain *B* estimate
Physical Health		
	SF-12 Physical Component (PCS) (1251)	-0.11
	Medical Conditions (1252)	0.21**
	Medical Symptoms (1258)	0.51***
Mental Health		
	SF-12 Mental Component (MCS) (1251)	-0.52***
	Survivor Syndrome (1222)	0.34***
	Perceived Stress (1258)	0.53***
Organizational Health		
	Job Security (1229)	0.33***
	Work Performance (1264)	0.31***
	Morale (1262)	-0.44***

where: *p≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001

- **Greater job strain is predictive of negative outcomes for eight of nine dependent variables.**

At INEEL, scores on the job strain scale ranged from nine to 67 with a mean of 24.1 (standard deviation = 5.9), similar to the five site mean (23.9 and standard deviation=5.9). A higher score is indicative of more strain. Strain was significantly associated (see Table 9) with all outcomes at INEEL (p =0.01 or stronger) with the exception of PCS (p=0.055). Greater strain is predictive of increased reporting of medical symptoms, an association seen at three other sites, more medical conditions, and worse mental health (all three measures). Greater job strain is predictive of lower mental health (MCS) scores and more perceived stress at all five sites, and of more survivor syndrome at all sites other than Oak Ridge.

Strain at INEEL is also associated with all three organizational / workplace related outcomes. Higher strain scores are related to greater job insecurity (beta=0.33, p≤0.001). Apparently, having less control over work affects how secure one feels in one's current job as well as one's perceptions regarding new job opportunities. In the same way, individuals reporting greater strain are more likely to report poorer morale (i.e., assessing the morale of yourself and your co-workers) (beta=-0.44, p≤0.001) and more instances of poor work performance (beta=0.31, p≤0.001). INEEL is the only site at which job strain is associated with either work performance or medical conditions.

Consistent with the study Hypothesis 3, job strain was a strong and consistent predictor of negative health and performance outcomes. Strain was significantly associated with 30 out of 45 outcomes across all sites. It is clear that high job strain is an important predictor of negative outcomes in sites that are experiencing downsizing events over time.

VIIIE. Organizational Climate

We hypothesize (Hypothesis 3) that one's immediate environment, as measured by management and operating style and group functioning, can affect health and functioning

in the workplace and may also influence how stressful events are experienced. HLM allows us to account for similarities within groups on these climate measures. In this section we discuss three groups of climate and operating variables. In Section VIIIF, we review how four of these factors interact with downsizing in the model.

E1. Organizational style

Four organizational style variables are included in the HLM model: violence, conflict resolution, DOE relations, and communication.[43] The violence and harassment variable is a three-item index (yes or no) that measures whether in the past 12 months the employee has been threatened, attacked, treated unfairly, or made uncomfortable by words or actions while on the job. A higher score indicates more experiences of threats or harassment. For the other three scales, a higher score indicates a more positive outcome, that is, better communication, more effective resolution of conflicts, and better working relations with the local DOE office.

TABLE 10: Hierarchical Linear Modeling Results for Organizational Style Measures

	Conflict Resolution	DOE	Violence	Communication
Outcome (N)	***B*** estimate	***B*** estimate	***B*** estimate	***B*** estimate
Physical Health				
SF-12 Physical Component (PCS) (1251)	0.01	0.01	-0.05***	-0.03
Medical Conditions (1252)	-0.05	0.00	0.09***	-0.01
Medical Symptoms (1258)	-0.19**	0.00	0.12***	-0.06
Mental Health				
SF-12 Mental Component (MCS) (1251)	0.13**	0.05	-0.04**	0.00
Survivor Syndrome (1222)	-0.08**	-0.04	0.01	-0.01
Perceived Stress (1258)	-0.08*	-0.05	0.02	0.01
Organizational Health				
Job Security (1229)	-0.08*	-0.04	0.04**	-0.06**
Work Performance (1264)	-0.11**	-0.04	0.06***	0.04
Morale (1262)	0.17***	0.05	-0.02	0.13***

where: *p≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001

[43] Other measures of organizational climate were considered conceptually important and were included in the survey but not in this model for one of three reasons: 1) they were highly correlated with another scale already in the model; 2) they had a low alpha coefficient; or 3) conceptually they can serve as a co-variate, an outcome or both. Variables that were dropped for these reasons are: role ambiguity, organizational commitment, skill loss, supervisor style, feedback quality, opportunity, procedural justice (general scale, not downsizing specific) and innovation. The survey question regarding site mission was not included because more than 8% of the sample did not complete it.

- **Of the four organizational measures studied, workplace conflict resolution and workplace violence or harassment are most frequently associated with negative health and functioning outcomes.**

Of the four organizational style variables, experience of violence and / or harassment and conflict resolution are predictive of six and seven outcomes respectively (see Table 10, above). At the five sites overall, violence is statistically significantly related to the outcomes twice as often as the other variables.[44] When examined as a group, one or more of these four organizational climate variables is significantly related to all of the nine outcomes at INEEL and 40 of the 45 outcomes across site.

The violence / harassment index is significantly associated with six outcomes including all three physical health outcomes, such that those who experienced more incidents report poorer overall health, and more chronic medical conditions and recent medical symptoms (all at $p \leq 0.0001$). Further, more experience of violence is correlated with a lower mental health score ($p \leq 0.007$), less job security ($p \leq 0.02$), and more instances of poor work performance ($p \leq 0.0001$). At the other sites, violence is also related most often to the physical health outcomes (associated with all three physical outcomes at both NTS and Oak Ridge but with none at LANL).

We included six items to measure conflict resolution within work groups and between contractors (C8, page 9 of survey). Better conflict resolution was significantly associated with seven outcomes at INEEL, including better organizational health (all three outcomes), stronger mental health (all three outcomes) and fewer medical symptoms. At the other four sites combined, it was significantly related to study outcomes six times, five of them either more poor work performance or better morale.

The DOE relations scale was not associated with any of the outcomes of interest. At other sites, good relations with DOE were most often significantly related to the mental health outcomes (lower survivor syndrome scores at three sites and lower MCS at two sites), to lower medical symptom and to better morale (at 2 sites each). This scale did not emerge as important at Nevada Test Site either (significant for one outcome) although employees at both INEEL and NTS did discuss these issues in the focus groups and interviews. A similar percent of INEEL employees compared to other sites offered survey comments relating to DOE oversight and relations with the contractor on the survey (N=132 comments or 17% of all comments).

Better communication was associated with less job insecurity ($p \leq .006$) and higher morale ($p \leq .0001$). At the other four sites better communication was also significantly related to higher morale ($p \leq .001$). It was associated with lower job insecurity at two other sites (NTS and LANL) and with fewer medical conditions at one site (Pantex).

[44] Violence is significantly related to 22 outcomes across the five sites (of a possible 45) with each of the other variables related to 13 or fewer: conflict resolution (13), DOE relations (11), and communication (9).

E2. Social support

Social support is a measure of work climate and has been examined as a modifier of job strain (Johnson and Hall, 1988). In our model, we hypothesize that strong support from one's supervisor or co-workers will be associated with better health outcomes and might serve to mitigate potential negative stress and health outcomes caused by downsizing. The mean scores (and standard deviations) for supervisor support and co-worker support are 72.1 (15.6) and 75.2 (11.2) respectively with higher scores indicating more support.

TABLE 11: Hierarchical Linear Model Results for Supervisor and Co-Worker Support Measures

Outcome (N)	Supervisor Support ***B*** estimate	Co-Worker Support ***B*** estimate
Physical Health		
SF-12 Physical Component (PCS) (1251)	0.01	0.04
Medical Conditions (1252)	0.06*	-0.03
Medical Symptoms (1258)	-0.02	-0.08
Mental Health		
SF-12 Mental Component (MCS) (1251)	0	0.06
Survivor Syndrome (1222)	-0.04	-0.02
Perceived Stress (1258)	-0.01	-0.05
Organizational Health		
Job Security (1229)	-0.05*	0.02
Work Performance (1264)	-0.01	-0.08*
Morale (1262)	0.16***	0.23***

where: *p≤ 0.05, **p ≤ 0.001, ***p ≤ 0.001

- **Social support associated with better employee morale at all five sites.**

At INEEL, as at the four other study sites, greater support from one's co-workers and supervisor were significantly related to higher morale (p≤0.0001 for both at INEEL). As shown in Table 11, supervisor support was also correlated with greater job security (p≤0.05) and, unexpectedly, more medical conditions (p≤0.03) (also seen at NTS and INEEL). Co-worker support was associated with fewer instances of poor work performance (p≤0.02) (seen at Pantex and Oak Ridge as well). At the other sites, it appears that support was more important when looking at mental health outcomes and organizational functioning outcomes than at physical health. Support was a particularly important predictor variable at the Oak Ridge site, with each type of support associated with five outcomes.

E3. Safety and health

We measured three health and safety factors in the workplace: general perceptions of the health and safety climate, perceived exposure to noise, and perceptions of exposure to toxic materials or environments. We hypothesized (Hypothesis 3) that feeling unsafe at work might be associated with negative health outcomes and poorer workplace functioning, as well as making one more vulnerable to stress effects. The health and safety scale is an eight-item scale; the mean score at INEEL was 77.2 with a standard deviation of 12.6 with higher

scores representing a more health and safety conscious work environment. The single item question on noise asks how loud one would have to talk to be heard by someone standing next to him or her from whisper (low score) to shout (high score). The mean score was 45.9 (standard deviation=14.5) and the mean score on the three-item toxic exposure scale was 45.9 (standard deviation=13.4) with a higher score indicating that one is exposed and that it is a "sizable or great problem."

TABLE 12: Hierarchical Linear Model Results for Safety Measures

	Safety	Toxics	Noise
Outcome (N)	***B*** estimate	***B*** estimate	***B*** estimate
Physical Health			
SF-12 Physical Component (PCS) (1251)	0.03	-0.03	0.04
Medical Conditions (1252)	0.03	0.04	0.00
Medical Symptoms (1258)	0.18**	-0.05	0.11*
Mental Health			
SF-12 Mental Component (MCS) (1251)	-0.08*	0.01	-0.03
Survivor Syndrome (1222)	0.00	0.00	-0.01
Perceived Stress (1258)	0.00	0.02	0.05
Organizational Health			
Job Security (1229)	0.04	0.07**	-0.03
Work Performance (1264)	0.00	0.00	-0.05
Morale (1262)	0.10**	0.02	-0.01

where: *p≤ 0.05, **p ≤ 0.01, ***p ≤ 0.001

- **Safety and health measure associated with three outcomes, twice in an unexpected direction.**

Oddly enough, the healthier and safer the workplace, the more medical symptoms reported (p≤.003) and the lower the mental health score (p≤.04). Yet, a safer work environment was also associated with higher employee morale (p≤.007). Toxic exposure and noise exposure were each significantly related to only one outcome (see Table 12, above), increased job insecurity and medical symptoms respectively. The relationship between toxic exposure and greater job insecurity was seen at two other sites as well (Oak Ridge and LANL).

At the five sites overall, one of the three safety variables was significantly associated with one third of the outcomes, most frequently at LANL (six of the 15 associations). When one of the variables was significant, it was most often an association with a physical health or organizational functioning outcome, particularly medical symptoms, job security and morale.

VIIIF. Interaction Effects

Hypothesis 4 states that the effect of downsizing may depend on the presence of moderating variables. For example, employees with high strain and in work groups with high downsizing might be more likely to have poorer health outcomes than individuals with low strain in the same group. Or, as another example, employees in two groups exposed to the same level of downsizing may demonstrate different outcomes depending

on the style and practices of their supervisors, the perceived fairness of the downsizing, or the level of social support they receive from co-workers and supervisors.

- **Interactions of downsizing with seven variables are not predictive of outcomes.**

We examined specific interactions of downsizing with strain, fairness, race, violence, conflict resolution, supervisor support and co-worker social support, using the Oak Ridge data. Of the 63 interaction terms tested (nine outcomes by seven potential moderators) only the interaction of downsizing with conflict was significant at the .05 level ($p=0.0267$). Considering the number of interactions tested and the magnitude of this effect, this result is likely due to chance alone. We therefore decided not to insert interaction terms into the models for INEEL or the other three sites.

IX. DISCUSSION

Our study--one of the few to examine survivor health and reactions in a post-downsizing work environment--has provided a tremendous opportunity to explore a newly emerging research area. Downsizing is an epi-phenomenon representing change in organizational structures, economic relationships, employee-employer expectations, generational characteristics and bargaining styles. However, this opportunity is also associated with significant, potential pitfalls. The theoretical and conceptual nature of downsizing, stress, and health has not yet been charted. Thus, researchers coming to this topic map out their models with a sense of trepidation as well as excitement.

Our research is the largest of its kind—in both scale and scope—to investigate the health and organizational effects of workplace restructuring. We have approached this study with great care. Ensuring that we have applied the most rigorous methods, we brought together the knowledge of various disciplines including public health, occupational health, organizational management and organizational psychology. In this section we discuss our findings in light of the four main study hypotheses:

1. Downsizing will have a negative effect on individual health and workplace functioning (i.e., employee morale, work performance and job security).
2. Employees are less likely to experience negative health effects and organizations are more apt to function normally the fairer the downsizing process and the fewer direct elements of downsizing the employee experiences.
3. During periods of organizational change, one's work and work environment, including job strain, organizational style, co-worker and supervisor support, and workplace safety will affect both individual health and workplace functioning.
4. Workplace factors including job strain, organizational climate, and the employee's perception of the fairness of the downsizing process can moderate the impact of downsizing on health and organizational outcomes.

IXA. Does Downsizing Negatively Affect Health?

The finding that the level of downsizing is not associated with any outcomes at INEEL and with only six at the remaining study sites is at odds with our expectations and with the observations of other researchers of this topic. Similarly, the lack of findings of any significant interaction effects between downsizing and seven key variables on our outcomes was surprising. Even in the absence of a statistical association, qualitative data emphasized the strong impact of both downsizing and the fear of downsizing on employees. Many factors may account for these findings.

- **Methodological and data constraints must be considered to interpret statistical significance.**

Researchers explored methodological explanations for why downsizing rate did not emerge as a predictor of negative health outcomes while downsizing process and other work and organizational factors were clearly associated with the outcomes in our study. Limitations to the data that may have obscured the ability to observe a potential effect fell into three categories.

Researchers collected downsizing data and calculated downsizing rates. There are possible limitations in the exposure term that we created and in our ability to compare level 3s.

- Downsizing exposure was not highly variable within each site (across level 3s).
- The range of downsizing rate was smaller than for other key variables and may have been too small to demonstrate an effect (e.g., downsizing rate 0-15, fairness 21-93, downsizing experiences 0-100, and job strain 11-76).
- Downsizing data from early study years were attributed to current day level 3s and, given the extent of organizational changes, may have been incorrectly assigned, resulting in non-differential misclassification of exposure data. In essence, this reduced the ability to demonstrate a relationship between exposure and outcome.

Downsizing happened at these sites at the same time that other organizational changes were being implemented. It is possible that we did not capture the best measure of change and how it affects individuals and the workplace.

- The variable chosen may not be the best to measure downsizing.
- Decisions about the rate of layoffs and the type of layoffs for any given Section 3161 event are made on a site-wide basis and therefore, differences between level 3s may be statistically significant but not conceptually meaningful.
- We did not measure directly organizational changes other than downsizing (e.g., restructuring, outsourcing, work stoppages, downsizing by means of attrition)[45] in the model.

Elements of the study design and the relationship between exposure and outcome influenced the potential to see significant effects.

[45] A recent study by Amabile and Conti (1999) measured downsizing using three self-report measures. They found that anticipated downsizing and workgroup stability were more likely to be associated with the outcomes of interest (creativity) than the reported rate of completed downsizing.

- The cross-sectional design used is less able to detect differences in outcome measures than a longitudinal study examining impacts over time.[46]
- Unlike the study of many acute and chronic occupational diseases, in studying downsizing we do not know the shape of the relationship between exposure and effect, the latency period if any between exposure and effect, and the most important outcomes to characterize.[47]
- Our model assumes a linear relationship between downsizing exposure and outcome: the greater the downsizing, the greater the outcome. It may be that this is an incorrect assumption and that the true exposure-outcome relationship is captured by a non-linear relationship.[48]

In summary, it was not clear at the start of the study how intertwined downsizing and organizational restructuring were. This real world problem posed significant methodological issues that we have attempted to address. However, we recognize that, though broad, our choice of measures and models may not be the most comprehensive way to disentangle the complex relationship between downsizing and change. Since downsizing is a change existing within a complex network of events, more work is needed to determine how best to measure it as an independent variable. Downsizing represents one kind of organizational change (in this case used as a means to increase efficiency and respond to reduced budgets) and it may be important to measure the concomitant organizational changes such as departmental restructuring and contract changes.

It remains to be determined whether downsizing rate was generally not significant because there is indeed no effect on health or because the metric we used to capture downsizing may have been ill suited in this case. In the words of one INEEL employee it is clear that people do not distinguish between the type of change: “It seems every six months there is an upset of some kind which gives the feeling of unknown security”. At INEEL, site future emerges as a big concern as do contract issues between LMITCo and DOE. Employees wrote about job and site security: “The general future of the INEEL is very much in question. This uncertainty results in a great deal of dissonance among employees” and, according to another, it impacts employee morale. At INEEL, particularly during the earlier site visits, the new contractor and the merging of multiple contractors were significant issues; employees commented about the lack of trust and caring and respect from the newer managers. Other studies that have found an association between rates of downsizing and health similarly report that changes in work characteristics including increased work load / demand, decreased job control and decreased support account for a large portion of the effect size (Vahtera and Pentti, 1999).

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[46] The recent Kivimaki (2000) study examined downsizing and health data at three intervals during a five-year period. Their design enabled them to observe a relationship between downsizing rate and sickness absence as well as between downsizing and job strain over time.

[47] In conducting preliminary analyses we did explore other measures of downsizing rate. Yet even when we limited our analysis to the impact of downsizing events within the 12 months before the survey, no clearer picture emerged at Oak Ridge, the only site with annual events over the entire study period, or at other sites without recent events.

[48] When we tested a quadratic term for downsizing in the Oak Ridge model, we did not identify additional significant relationships. This may again reflect problems with how the downsizing data was defined or collected.

IXB. Does a Fair Downsizing Process Result in Fewer Negative Impacts?

- **Downsizing process variables emerge as significant predictors.**

While downsizing rate did not emerge as a significant predictor for the outcomes of interest, several of the downsizing process variables did. Both individual downsizing experiences and fairness were significantly related to more than half the outcomes at INEEL (five and seven outcomes respectively) and half the outcomes when looking at results from the five sites together.

It is possible that the nature of the downsizing for DOE contractor personnel--with national communication and guidelines (Section 3161) about the process--made process issues of paramount interest to the workforce. In essence, the employee experiences downsizing through the process, including fairness, justice, communication, interpersonal treatment and personal experiences of downsizing. The process is both perceived and felt more directly, giving it more meaning. Workers may believe that they have the ability to make positive changes to the downsizing process and to organizational climate whereas input into setting workforce numbers is not perceived as feasible. The outcomes used in our study are probably best suited to pick up these relationships as they are predominantly *self-reported, individual* measures.

- **A more fair downsizing process is associated with more outcomes (seven) at INEEL than at any other study site.**

Employees who perceived that they were respected and had an opportunity to participate in the downsizing process reported fewer health symptoms and conditions. These workers also reported higher employee morale, more job security (seen at all five sites), and less frustration, anger, sadness and depression.[49] In contrast, those who perceived a less just or fair process experienced a greater sense of sadness, guilt, and "aloneness" or survivor syndrome (seen at four of the sites).

According to Noer (Noer 1993), this latter group is more likely to experience negative effects on work performance such as less risk-taking and lowered productivity. Their sense of lessened job security and reduced organizational commitment may deleteriously affect other aspects of their work lives. Other studies have found that employees experiencing survivor syndrome have diminished trust with their co-workers, less job satisfaction, and increased conflict with colleagues. And, it is clear from our qualitative data as well as the downsizing experiences index that workforce restructuring touches everyone, not just those who are laid off. An organization may experience these employee effects in the form of reduced workforce cohesion and lowered productivity.

Across sites, people report fewer health problems (symptoms and/or conditions) the more fair they perceive the downsizing process. This may support other authors' hypotheses that in a setting with greater justice, stressful events (e.g., downsizing, restructuring) are less disruptive, potentially leading to fewer negative health outcomes. Our qualitative results

[49] The fairness variable was also significantly associated with the two other outcomes variables (higher PCS and more instances of poor work performance) through step 6 in the model.

indicate that there is a perceived relationship between increased reporting of health complaints, utilization of health care services and heightened insecurity and low morale, although the available EAP data do not permit us to test this association.

In our study, the justice questions relate to the fairness of rules, procedures and implementation: that is, a focus on interactional and procedural justice. We did not study distributive justice because separation benefits were similar across the DOE complex and generally perceived as generous or fair. For example, focus group participants did not discuss the adequacy of layoff packages offered to separated employees. While this focus is supported by others who emphasize the role of management in helping employees adapt to change (Dowd and Bolus, 1998), it may underestimate the importance of rewards (mentioned extensively in survey comments) and monetary support during times of change. A study by Brockner and others found that adequate compensation to those laid off reduced the survivor syndrome symptoms amongst remaining employees (Brockner, et. al., 1987).

The findings for justice / fairness are important for an organization that is considering downsizing. Employees' perceived lack of justice and fairness in the process can lead to negative mental and physical health affects as well as reduced efficiency and decreased group performance and morale. Conversely, we find the opposite in efficient, more open and fair organizational units. Developing mechanisms for employee participation, creating and adhering to organizational procedures, and open, timely, and honest communication can be major focal points for positive intervention. It is interesting that fairness emerged as significantly associated with outcomes, even though the DOE had well-defined policies to mitigate adverse impacts from downsizing, particularly by offering benefits to separated employees.

- **Workers who experienced more elements of downsizing reported negative health effects.**

The measure of an individual's direct encounters with downsizing was significantly associated with lower mental health scores (MCS) and with greater job insecurity at all five sites and with more medical symptoms at four sites. At INEEL, the downsizing experiences index was significant for five outcomes, the three just mentioned as well as the two other measures of physical health (lower PCS and more medical conditions). The index can be seen as an individual measure of downsizing. These employees represent a significant at-risk group: the six elements measured included implementing the RIF, changing jobs or departments, having close friends laid off, and being laid off and rehired.

In this era of chronic downsizing and restructuring, we need to pay closer attention to those on the front lines implementing, observing and experiencing the new policies. Site managers can examine each downsizing element to determine those most predictive of negative health and functioning outcomes and whose impact can be mitigated through interventions.

IXC. Do Work Environment and Job Strain Affect Health During Times of Change?

In this study of downsizing organizations, several measures of job control and organizational climate emerge as variables related to the health and organizational functioning outcomes. The organizational climate, which might best be thought of as the unspoken rules of conduct, appears to directly affect individual health and measures of workplace functioning. The employees' perceptions of management support, communication, and commitment to a vision and goals, are important aspects of the work environment. Where the environment is perceived as positive, employees report better individual and organizational health. Climate, as manifested by management policies and procedures, supervisor support and by a commitment to a safe workplace, is an area in which a relatively small investment can reap a large harvest of employee benefits. At INEEL, organizational climate measures--particularly job strain, workplace violence and harassment and conflict resolution--did emerge as important predictors of our outcomes of interest.

- **Job strain was developed as a key measure in this study of organizational change.**

We chose the Job Strain Model as the theoretical core of our analysis as it appeared to be directly applicable to the study of the effects of chronic strain in the DOE workforce. Job strain did emerge as a key theme in the focus groups and interviews, and survey results confirm that increased job strain is associated with poor health outcomes. We do not know what component of the strain is caused by the downsizing, although it is clear that as DOE's mission, budget, and contracting mechanisms change, there are fewer personnel and monetary resources. The possibility for greater demand, both on individuals and organizations, along with fewer resources to meet the demand, and less say in performing one's job may all lead to strain. The Job Strain Model captures the dimensions of organizational and work changes brought about by downsizing. Its content domains facilitate a study of the effects of chronic strain in the DOE workforce.

- **Qualitative findings point to lack of job control as a source of stress in the workplace.**

Our findings in interviews, focus groups and survey comments suggest that changes to the DOE mission along with reducing the workforce affect stress levels within the organization. In particular, it may be that increased job demand or a corresponding decrease in control has led to greater job strain within some organizational units.

he qualitative data shows that continued prospects of layoffs undermined workers' sense of control. Many respondents wrote about micro-management and how that affected their ability to carry out their jobs and the lack of a decision-making role for most employees. One employee wrote: "Trust. I have a job to do. I know how to do it but I am given the responsibility without the authority. When things don't go as planned nobody seems to take the hit because of the authority. Micro-management runs rampant." The lack of accountability and decisive leadership was a theme in the survey comments as were requests for "more authority to get work done" so that work does not become "so frustrating for them that they don't want to do the work anymore."

- **Study expands the traditional use of the Job Strain Model.**

Our findings highlight the relationship between strain and mental and physical health outcomes as well as between strain and morale and job security, expanding upon the documented relationship to cardiovascular disease and musculo-skeletal disorders. Schnall and Landsbergis, in a 1994 article, summarized the existing literature on this topic indicating increased risk of cardiovascular disease or all-cause mortality for individuals in high-strain occupations compared with subjects in other occupations. Others have shown that reduced control and significant workload pressure can inhibit creativity in the workplace (Amabile and Conti, 1999). Our study, however, examines how well strain predicts a variety of outcomes including physical health, mental health, and organizational outcomes.

Job strain proved to be an important predictor for outcomes in this study. INEEL employees with higher strain did less well on eight of the nine measured outcomes than those with lower strain scores, more than at any of the study sites.[50] Modifying job strain, either by reducing demand or increasing control, could improve employee outcomes. Prior to an intervention, further analysis could tease out which dimension of job strain should be altered, demand or control or both. However, we do need to consider some methodological concerns that have been raised in the literature. Hurrell and others (Hurrell, et. al., 1998 and Kasl, 1987) have discussed the problem with self-reported measures of job stress. Many researchers discuss the need to further identify and collect objective measures of job stress.

Although we were unable to utilize objective measures of job strain, we did collect objective measures of downsizing, and two objective outcome measures, used in the level 3 analysis. All of the outcome measures in our individual level model presented in this report as well as most of the co-variates come from self-report data. Hurrell also raises questions about the lack of predictive validity that self-report measures of strain have shown for morbidity (Hurrell, et. al., 1998). These concerns may be somewhat offset by the fact that many of these scales have been extensively used in similar research efforts and have standardized norms from large samples.

- **Employees value effective communication from management but it does not predict better health outcomes.**

Based on the qualitative findings and previous studies that document a link between downsizing and poor communication (Noer, 1993), it appeared that communication would emerge as an important variable in the survey. However, better communication was only associated with higher morale and greater job security at INEEL and with only nine outcomes across all five study sites. Employees discussed communication extensively in the focus groups: whether their own supervisors communicated effectively, whether there was good communication between upper management and middle management, when information about reductions were shared, and the impact of good and poor communication. One employee wrote that the major contributor to low morale was “that all workers feel they are left in the dark. We know things are going on and policies are being written, yet management just zips their mouths and won’t talk to us.” It is surprising that a

[50] Job strain was also associated with the physical health score (PCS) through step 6 of the model and was borderline significant at step 7 (p=.0552).

topic discussed so extensively in interviews and focus groups would not be statistically significant. The concept of communication, though, is covered in several items in the downsizing fairness/justice scale that was significantly associated with many outcomes.

- **Workplace violence and harassment is associated with worse health outcomes and job related factors.**

At INEEL, experience of violence and/or harassment was a predictor of worse health outcomes, worse mental health scores, less job security and more instances of poor work performance (statistically significantly associated with six of nine outcomes). Recent studies have suggested that organizational changes at work, including downsizing, may be associated with increases in workplace violence (Sauter, et. al., 1999). At present the nuances of the relationship are not clear but policy planners and implementers need to look closely at this possibility when instituting changes in work organization. Steps can be taken to ensure that monitoring of harassment and violent incidents is adequate and that employees and managers are equipped to prevent incidents and to handle them when they do occur.

- **Conflict resolution in the INEEL workplace is predictive of better outcomes.**

At INEEL, employees who believe that conflict is resolved effectively by supervisors and senior managers report better outcomes on seven of the nine outcomes, including all three mental health scales and all three organizational related measures. It appears important for management to invest resources into resolving conflicts between individuals, work units or contractors as a means of improving employee health. The conflict resolution was most often predictive of outcomes at INEEL and this was the only site where it was associated with the mental health outcomes.

- **Employees are concerned about tying safety to procedures and paperwork.**

Although none of three safety measures was significantly associated with more than three outcomes (overall health and safety scale with three and toxic and noise exposure each with one outcome), these issues were often discussed in the focus groups. Respondents believe that safety breaches are likely to increase as a result of increased workload, greater stress, and more workers in positions for which they are not properly trained. The creation of new safety procedures associated with extensive paperwork was a climate issue at INEEL and the other study sites. Fully 12% of survey comments discussed safety and paperwork requirements. One INEEL employee wrote: “One major contributor to inefficient operation is the excessive and complex system of procedures and directives. At the INEEL we are way past the point of diminishing value for both cost and safety.” There was unanimous belief that the procedures were cumbersome and did not improve safety. There is frustration and discouragement that that procedures are being counter-posed to “experience” thereby discounting employee expertise: “Upper management requires tons of paperwork to change a chart and can’t agree on the correct procedure but requires full procedural compliance or we can be fired.” Another employee writes that one cannot keep up with the changes “so one never knows if he is within the regulations or not.”

- **Matrixed employees often felt disconnected from a work team.**

In the survey, a worse experience with matrixing[51] contributes to job insecurity, more medical conditions and greater survivor syndrome. Concerns with the matrixed structure prominent at INEEL also emerged in survey comments. One employee made a connection between accidents and "ineffective systems and organizational structures" including matrixing of craft employees. Other problems associated with matrixing include: lack of familiarity with the facility in which you work, multiple bosses, decreased likelihood of being well evaluated or receiving recognition or raises, and time gaps between work assignments.

- **Support and concerns about management can guide change.**

Supervisor support and co-worker support were each independently related to two of the organizational health outcomes of interest. Combined, a supportive environment was associated with higher employee morale, better work performance and greater job security. At both INEEL and Oak Ridge we found that more supervisor support is associated with the reporting of more medical conditions. One reviewer suggests that it may be a case where the direction of the relationship is reversed and that employees with worse health get more supervisor support. Qualitative data reflects the importance of supervisor support and the impact of good management on work effectiveness. Approximately 17% of all survey comments related to evaluating management and employee-management relations, with a focus on two particular aspects of supervisor support that were felt to be missing: trust from supervisors and caring for employees and their jobs.

Employees commented on excessive layers of management, managers lacking either technical expertise or management skills to do a good job as supervisor, and a perceived lack of caring from the company. Some employees offered examples of good interaction with employees including visits from upper management and fair allocation of rewards, and suggested that this happen more often. Others acknowledged that managers, too, are being asked to “do too much”. There were multiple comments about the lack of planning and clear decision making. This may be related to the precariousness of LMITCo’s contract with DOE, and the lack of clarity about site mission.

These findings underscore the importance of looking at social support. Our study did not measure whether social support modifies the relationship between job strain and health outcomes as is hypothesized in the job strain literature. We can, however, link the quantitative findings (supervisor support associated with higher morale and job security) with the qualitative findings (criticisms of management, including what some employee’s saw as top-heavy management, too many layers of management, poor communication, and lack of trust). If these concerns with management and employee-management relations are widespread they may be contributing to poor morale and associated workplace impacts.

[51] This experience may include feeling unstable in ones job, receiving conflicting instructions from multiple supervisors, and inadequate connections with or knowledge of systems, co-workers and supervisor.

- **Findings for bargaining unit members may point to the importance of workers' involvement in downsizing and change processes.**

It would be interesting to look further at the differences between bargaining unit and non-union employees. At INEEL, for instance, being a union member was significantly associated with better mental health (i.e., higher MCS and lower perceived stress). perhaps surprisingly. Bargaining unit members often have a clearer sense of criteria for downsizing (as stipulated in the contract) and it is therefore surprising that bargaining unit members at INEEL were more likely to report job insecurity (an association not seen at the other four sites). These findings suggest that having more information and perhaps a voice in the process makes one less susceptible to stress-related health impacts. Organizations can reinforce worker voice and control by inviting employee groups into the process and giving them decision making power.

IXD. Does Downsizing Interact with Other Variables to Impact Employee Health and Well-Being?

We did not find statistically significant relationships to the study outcomes when we paired downsizing rate with other variables such as conflict resolution, supervisor support, job strain, fairness and race/ethnicity, using Oak Ridge data. In light of these findings, we did not test these interaction terms in models for INEEL or the other three sites. We believe that we were limited in our ability to detect the importance of these interactions by the same data limitations described with respect to the downsizing measure in Section IXA. Given that our measure of downsizing was rarely associated with the outcomes of interest on its own, we were not able to effectively test the hypothesized moderating effect of these other variables on the impact of downsizing on individual health and functioning at work (Hypothesis 4).

X. SITE-SPECIFIC FINDINGS, RECOMMENDATIONS and NEXT STEPS

The workplace and its employees exist in a complex and interdependent social structure. Worker health, as a function of physical and social-psychological factors found in the work environment, can be affected when that environment is disturbed. Downsizing and restructuring represent departures from the homeostasis typical of workplaces as little as ten years ago. While downsizing rate as measured here had few statistically significant effects at INEEL or the other study sites, the manner in which the workplace and its management and workers respond to change has significant impacts on health as found in this study. In addition, elements of the work environment can be seen to influence health (e.g., a matrix structure or patterns of communication and conflict resolution), particularly when these structures appear inadequate to the specific work environment or do not adapt successfully during times of change.

In our study of employees of the INEEL and four other DOE sites, each at its own stage of downsizing, we found that job strain, organizational climate, methods of implementing change and direct experience with downsizing are, in fact, associated with employee health

and organizational functioning. While this cross-sectional study could not elucidate the natural history of downsizing and its impact over time on employees, we did identify opportunities for change within downsizing organizations that can improve employee health and organizational well-being. In the DOE complex, these are areas that may be more amenable to positive change than the actual downsizing rate.

Several of the major findings at INEEL and the study overall are fruitful to examine in light of potential interventions. The variables that were related to employee health may suggest possibilities for workplace interventions to mitigate the negative impacts on employee health and workplace functioning.

XA. Findings at the Idaho National Engineering and Environmental Laboratory

- **Employees who perceived that downsizing was implemented with clearly explained reasons, worker input, open respectful, truthful and unbiased communication with employees, and consistent and fair rules experienced fewer negative health effects.**
    - A process perceived as just and fair was associated with fewer reported medical symptoms and conditions.
    - Greater fairness was associated with better mental health status (MCS), fewer survivor syndrome symptoms and less perceived stress.
    - The more fair the downsizing, the less job insecurity was expressed and the higher the reported morale.

- **Employees who reported more direct experiences of the downsizing performed worse on five of the nine outcome measures.**
    - A higher score on the downsizing experiences index was associated with more medical symptoms and conditions and with a lower overall health score (PCS).
    - These employees had lower mental health scores (MCS).
    - The more downsizing elements experienced, the greater the job insecurity.

- **Employees who experienced greater job strain reported an increase in adverse individual and organizational functioning outcomes.**
    - Workers with higher job strain reported a greater number of medical symptoms and medical conditions.
    - Higher job strain was associated with poorer reported mental health status, more survivor syndrome symptoms and greater perceived stress.
    - Morale and job security were lower for employees who reported high strain and they reported more instances of poor work performance.

- **Employees who felt that INEEL managers and employees effectively resolve conflicts at the site, performed better on seven of nine study outcomes.**
    - Effective conflict resolution was predictive of fewer medical symptoms.

- A workplace that resolves conflicts is statistically associated with employees who have better mental health, less stress and fewer survivor syndrome symptoms.
- These employees also report higher employee morale, better work performance and greater job security.

- **Employees who experienced threats or acts of violence, harassment or discriminatory treatment have worse health outcomes.**
  - Employees who report more experiences of violence, harassment or discriminatory treatment report worse physical health (on all three measures).
  - INEEL employees who experienced more instances of violence or harassment reported worse mental health.
  - More violent or harassing experiences were statistically associated with greater job insecurity and more instances of poor work performance.

XB. Recommendations for Intervention

Together, these findings suggest possibilities for workplace interventions to mitigate the negative impacts on employee health and workplace functioning. In order to be most effective, an intervention design should address multiple levels of the organization and a variety of approaches.

- **Interventions can vary and should focus on a variety of targets for change.**

We identified prime areas for intervention and possible activities based on the findings at INEEL and the five sites overall. Our recommendations incorporate information from new research on prevention and reduction of workplace stress. Ganster has identified the importance of identifying and targeting multiple levels of organizational intervention. Interventions can target policies or structural changes, procedures or group functioning, or the individual (Ganster, 1999).

Our recommendations are grouped by the level of the organization on which they focus.

Policy / structural

1. Develop more mechanisms for employee participation and involvement in decision making to address problems identified by our study (associated with limited job control and low involvement in downsizing or other decision making). Sites can use existing employee groups and bargaining unit groups and can create new employee involvement teams as needed.
2. If future downsizing or other significant organizational changes are anticipated, devote even more resources to developing processes and policies that emphasize clear and consistent procedures, and open, timely, and honest communication.
3. Prepare and train managers who must plan or implement a downsizing or restructuring.

4. Engage employees in planning any future organizational change to provide information, help create plans and assist in implementing decisions. Again, existing and new employee groups can be utilized.
5. Develop flexible work schedules to respond to employee concerns about workload, work demand and poor work-home balance.
6. Review and, if necessary, work with existing systems to address employee-management problems, as well as complaints about unfair organizational or downsizing practices.[52]
7. Determine if workplace violence and harassment are prevalent, consider how to handle possible increases as a result of downsizing and enhance the policies regarding workplace violence (how supervisors should handle it, preventive programs, support for those who experience it, etc.).
8. Support programs and policies that promote effective resolution of conflict between individuals, work groups, contractors or between LMITCo and DOE.

Procedures / group functioning

1. Establish mechanisms to closely monitor work demands and elements of job control, particularly immediately following significant changes to a work unit or to the site.
2. Offer training for managers on: effective supervision, providing support, communication styles, communicating respect, and listening skills, etc.
3. Involve work groups in identifying stressors and ways to address them.
4. Offer programs intended to reduce factors that lead to violence, harassment and discrimination as a way to improve the health of survivors.
5. Provide employee training on workplace diversity and the impact of harassment or discriminatory treatment on individuals and the work environment.
6. Determine whether climate or other physical changes for a group will assist with an employee's ability to get his / her job done.
7. Establish programs that encourage employees to respond to workplace change openly (e.g., seminars that target survivor syndrome and other noted responses to change).
8. Implement regular reviews of organizational climate issues, with particular attention to management relations with the DOE, mechanisms to respond to perceptions of an unsafe work environment and conflict resolution.

Individual level interventions

1. Work with employees to analyze and, if needed, improve the design of jobs or workstations.
2. Implement stress reduction or exercise sessions.
3. Provide sessions for people who have to implement the downsizing.
4. Provide counseling sessions for those who have experienced workplace violence.
5. Allow individual allowances to design ones day and approach to work tasks.
6. Establish clear, non-discriminatory policies for EAP participants.
7. Offer incentives for employees or groups to resolve conflicts.

[52] While creating a dispute resolution system is a structural response to workplace issues, in its implementation it can either focus on the individual and single cases or cases can be viewed in their entirety as a way of understanding systems issues.

In addition to our research findings, many studies have documented the link between job strain and cardiovascular disease. A recent study looking at changes in psychological distress during a two year downsizing process identified co-worker support and job influence as protective factors and higher job insecurity, strain and role ambiguity as contributors to psychological distress (Woodward, et. al., 1999). This indicates, for example, why it is important to address those variables that contribute to job insecurity as they may also result in negative psychological health effects. Indeed, at INEEL we noted overlap in the variables that were predictive of job insecurity and one or more of the three psychological health outcomes, particularly fairness, job strain, conflict resolution and pay status.

On the policy level, a recent study documents that over the course of a downsizing event hospital personnel reported worsening perceptions of the quality of patient care and the hospital's commitment to quality care and quality improvement, as well as more negative perceptions about their employer and management-employee relations (Woodward, et. al., 1999). These findings suggest the importance of leadership and attention to management-employee relations during times of structural change.

- **EAP programs can do more to mitigate poor mental health outcomes.**

Information collected about the employee assistance program coupled with findings of vulnerability to stress during times of organizational change provide direction for EAP programs. Interventions aimed at mitigating poor mental health outcomes must:

- work with those implementing the downsizing to ensure that procedures and interactions are perceived as fair and consistent;
- target the susceptible employee population (and those with most direct impacts) including those implementing downsizing and work units that have been restructured or where people have seen many colleagues laid off;
- involve the at-risk worker population to develop and implement workshops; and
- introduce programs and workshops early on in the workplace change event.

A complicating factor in using EAPs as a resource during workplace change, particularly at DOE sites, is that employees may be reluctant to seek mental health services for fear of losing security clearance. Some sites, like Pantex and Y-12, have chosen to use off-site EAP providers to disassociate the service from the site (DOE will still go to the EAP to check mental health histories as threats to national security). It may be useful for DOE and contractors to clearly communicate the policies regarding seeking mental health services and renewing clearance.

XC. Next Steps

- **Boston University School of Public Health can develop intervention programs to address research findings.**

A workplace intervention project designed to reduce employee stress and improve health and workplace functioning can be approached in several ways. Boston University School of Public Health proposes to work with one of the study sites to develop such an

intervention project. The intervention will address key factors at the identified site that appear most related to negative health and organizational outcomes and will promote factors identified as protective to individual health and organizational functioning. The intervention will include comparison groups and have a strong evaluation component.

An intervention model that has been identified as particularly successful in achieving positive outcomes is the participatory model. Companies are increasingly turning to employee teams to address workplace concerns, acknowledging the high quality decisions and the likelihood of follow-through. Stakeholder involvement leads to greater commitment and therefore likelihood of higher participation as well as interventions that are more suited to a particular group given the participation of local experts (Lawler III, 1986; Israel, et. al., 1986; and May and Schwoerer, 1994).

In such a participatory model, teams of employees review the findings and help to create interventions and solutions best suited to their workplaces. An employee involvement approach may help a site to avoid the sense that they are simply trying to figure out ways to lay off individuals in a more efficient or cost-effective manner, but rather are trying to improve work quality of life, job control and health and safety.

Each intervention element must be: 1) grounded in research findings from this and other studies; 2) linked to a theoretical construct (with expected target behavior or perception identified); 3) specific in scope and target; and 4) coupled with expected changes and means for measuring those changes. It is possible that some structural or policy interventions will be developed outside the scope of these teams to be implemented in one or more of the experimental groups.

XD. Topics for Further Inquiry

Several areas for additional research emerged from our study. Some of the areas for further inquiry are listed here.

- **Theoretical**
  - Understand the natural history of the effects of downsizing and other organizational change on health using a longitudinal study design.
  - Understand the phenomenological issues of naming and classifying the elements of organizational change.
  - Explore the statistical relationships between perceived fairness of the downsizing process and health and organizational functioning in a longitudinal study.
  - Conduct further interaction analyses looking at whether the downsizing fairness scale (instead of downsizing rate) interacts with other variables in influencing the health and organizational related outcomes.

- **Methodological**
  - Develop new measures of downsizing and decisions about how to classify individuals who may, for example, retain a job but be shifted to a new employer (e.g., is this someone who has been downsized or a survivor?).
  - Develop ways to measure organizational restructuring and other changes.

- **Multi-level Intervention**
    - Test hypotheses about the importance of voice, control and communication and role of union membership using an intervention model.
- **Outcome Issues**
    - Test the impact of downsizing and other changes on usage of medical and EAP services and estimate the impact of these changes on employee psychological and family concerns.
    - Determine and understand barriers to using EAP counseling.
    - Develop a better way to identify and measure incidence of violence and harassment.
    - Develop and implement a monitoring program to identify discrimination.

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A. Section 3161 of the National Defense Authorization Act for Fiscal Year 1993

(Public Law 102-484, Oct. 23, 1992)

Subtitle E—Defense Nuclear Workers
SEC. 3161 DEPARTMENT OF ENERGY DEFENSE NUCLEAR FACILITIES WORK FORCE RESTRUCTURING PLAN

(a) **In General.**—Upon determination that a change in the work force at a defense nuclear facility is necessary, the Secretary of Energy (hereinafter in this subtitle referred to as the "Secretary") shall develop a plan for restructuring the work force for the defense nuclear facility that takes into account—

(1) the reconfiguration of the defense nuclear facility; and
(2) the plan for the nuclear weapons stockpile that is the most recently prepared plan at the time of the development of the plan referred to in this subsection.

(b) **Consultation.**—

(1) In developing a plan referred to in subsection (a) and any updates of the plan under subsection (e), the Secretary shall consult with the Secretary of Labor, appropriate representatives of local and national collective-bargaining units of individuals employed at Department of Energy defense nuclear facilities, appropriate representatives of departments and agencies of State and local governments, appropriate representatives of State and local institutions of higher education, and appropriate representatives of community groups in communities affected by the restructuring plan.
(2) The Secretary shall determine appropriate representatives of the units, governments, institutions, and groups referred to in paragraph (1).

(c) **Objectives.**—In preparing the plan required under subsection (a), the Secretary shall be guided by the following objectives:

(1) Changes in the work force at a Department of Energy defense nuclear facility—
(A) should be accomplished so as to minimize social and economic impacts; should be made only after the provision of notice of such changes not later
(B) than 120 days before the commencement of such changes to such employees and the communities in which such facilities are located; and
(C) should be accomplished, when possible, through the use of re-training, early retirement, attrition, and other options that minimize layoffs.
(2) Employees whose employment in positions at such facilities is terminated shall, to the extent practicable, receive preference in any hiring of the Department of Energy (consistent with applicable employment seniority plans or practices of the Department of Energy and with section 3152 of the National Defense Authorization Act for Fiscal Years 1990 and 1991 (Public Law 101-189; 103 Stat. 1682)).
(3) Employees shall, to the extent practicable, be retrained for work in environmental restoration and waste management activities at such facilities or other facilities of the Department of Energy.

(4) The Department of Energy should provide relocation assistance to employees who are transferred to other Department of Energy facilities as a result of the plan.
(5) The Department of Energy should assist terminated employees in obtaining appropriate retraining, education, and reemployment assistance (including employment placement assistance).
(6) The Department of Energy should provide local impact assistance to communities that are affected by the restructuring plan and coordinate the provision of such assistance with—
(A) programs carried out by the Department of Labor pursuant to the Job Training Partnership Act (29 U.S.C. 1501 et seq.);
(B) programs carried out pursuant to the Defense Economic Adjustment, Diversification, Conversion, and Stabilization Act of 1990 (Part D of Public Law 101-510; 10 U.S.C. 2391 note); and
(C) programs carried out by the Department of Commerce pursuant to title IX of the Public Works and Economic Development Act of 1965 (42 U.S.C. 3241 et seq.).

(d) **Implementation.**—The Secretary shall, subject to the availability of appropriations for such purpose, work on an ongoing basis with the representatives of the Department of Labor, work force bargaining units, and States and local communities in carrying out a plan required under subsection (a).

e) **Plan Updates.**—Not later than one year after issuing a plan referred to in subsection (a) and on an annual basis thereafter, the Secretary shall issue an update of the plan. Each updated plan under this subsection shall—
(1) be guided by the objectives referred to in subsection (c), taking into any changes in the function or mission of the Department of Energy defense nuclear facilities and any other changes in circumstances that the Secretary determines to be relevant;
(2) contain an evaluation by the Secretary of the implementation of the plan during the year preceding the report; and
(3) contain such other information and provide for such other matters as the Secretary determines to be relevant.

(f) **Submittal to Congress.**—
(1) The Secretary shall submit to Congress a plan referred to in subsection (a) with respect to a defense nuclear facility within 90 days after the date on which a notice of changes described in subsection (c)(1)(B) is provided to employees of the facility, or 90 days after the date of the enactment of this Act, whichever is later.
(2) The Secretary shall submit to Congress any updates of the plan under subsection (e) immediately upon completion of any such update.

B. Background Literature

Workplace stress

What is work stress?

In a 1992 survey by Northwestern National Life Insurance Co., four out of 10 employees (40%) indicated that their jobs were "very" or "extremely stressful." The report, along with numerous similar corporate and public opinion surveys, found that the workplace is a significant source of stress for working Americans. The causes of such stress range from the anxieties produced by corporate downsizing, to factors that result in physical disorders such as carpal tunnel syndrome, to harassment and violence in the workplace, to tensions from or between work and home.

Although there is popular recognition and acceptance that work stress adversely impacts a workforce, there is much less agreement about what stress is, how it operates to impact health, and what aspects of health are actually affected by it. There are also problems with definition and taxonomy. Stress has been considered as an environmental condition, as an appraisal of an environmental condition, as a response to an environmental condition, and as a form of relationship between environmental demands and a person's abilities to meet the demands. Although there is much controversy about the epistemology of stress, there is agreement that it is a complex phenomenon related to health, in which the psycho-physiologic pathways between stressors and health outcomes are uncertain.

Stressors refer to the experiences, physical and psychological, that give rise to stress and include both events and chronic strains (Pearlin, 1989). While events may have direct effects on stress outcomes, they also produce indirect effects, or strains, in a particular system. In considering workplace-related stress, one must recognize that stressors may occur on multiple levels. For example, stressors may act at the job or individual level. In this setting, schedule, work pace, the physical work environment, and job content all can affect the worker. Stressors, such as role ambiguity, organizational structure (hierarchy), and lack of employee involvement, operate at the organizational level affecting the individual. Extra-organizational stressors, such as a globalizing economy and resultant job insecurity or downsizing, affect the individual through the constant representation of economic transformation in the mass media and the reality of competitive markets. Lastly, the impact of non-work stressors on working individuals, such as home life, children, and working spouses, appears to be growing.

How does stress influence health?

Each of these "classes" of stressors influence the stress process. While there is concurrence that these factors affect health, there is little agreement as to the method of their effect, the mode of interaction with each other, and ultimately what each represents and how to measure them.

Work stress research has attempted to examine the issues of cause, relationship, mechanism, and outcome. Investigators have described many environmental factors believed to be stressors such as overtime, shift work, and unemployment as well as psychosocial concepts such as overload, role conflict, and role ambiguity. Kasl has attempted to characterize the essential elements of stressful work (Kasl, 1987). His taxonomy includes the following:
a) Tends to be chronic rather than intermittent.

b) There is external pacing of work demands by machines, payment mechanisms, or competition.
c) Habituation or adaptation to the chronic situation is difficult and some sort of vigilance or arousal must be maintained.
d) A failure to meet demands leads to adverse consequences.
e) There is a spillover from work role to other areas of functioning.

This classification does not clarify the etiologic and mechanistic dynamic of stress.

Much research has been oriented toward developing an integrated model of stress that is capable of identifying and predicting which characteristics of work are stressful. This research, conducted over the last 40 years, contains two similar but distinct theoretical models. These two theories have attempted to integrate stress models from cognitive psychology and physiology.

What are the models for studying stress?

The Person-Environment (P-E) Fit Model, was developed in the early 1970s. Its main premise is that strain develops when there is a discrepancy between the demands of the job and the abilities of the person to meet those demands (demand-ability dimension), or between the motives of the person and the environmental supplies to satisfy the person's motives (motive-supply dimension) (Caplan, et al., 1975). Dimensions measured include workload and job complexity. Motives include income, participation, and self-utilization. Supplies refer to job benefits such as income sufficient to satisfy the motives of the individual.

The model distinguishes the objective environment and person from the subjective environment and person, where subjective refers to the perceptions of the individual. Strain then arises due to poor fit between the subjective person and the subjective environment. The major emphasis of the P-E Fit model is on the subjective perception. The model does not acknowledge the role of objective workplace stressors other than their influence on a worker's perceptions. Some researchers have criticized the P-E Fit model because of its limited ability to predict what work conditions are likely to result in stress.

The Job Strain Model posits that strain results from the characteristics of work, rather than from subjective perceptions of the individual worker (Karasek, 1979). Job strain arises as the result of imbalance between demands and decision latitude (control) in the workplace, where lack of control is seen as an environmental constraint on an individual's response capabilities. The control dimension consists of two components that are usually highly correlated in job situations: personal control over decision making, and skill level and variety. In contrast to other models of job stress, the Job Strain Model emphasizes that psychologically demanding situations alone do not cause adverse reactions of being stressed. Instead, a major factor is whether the individual has control over his or her actions in meeting demands. The Job Strain Model recognizes that the essential characteristics of a stressful work environment are that it simultaneously places demands and creates environmental constraints on an individual's response capabilities (it is also known as the Demand-Control or Demand-Control-Support Model). The stressful work environment highlights the imbalance between the demand and the response that leads to strain.

The Job Strain Model characterizes jobs by their combination of demand and control. For example, jobs with high demand and low control (waiters, VDT operators, and machine-paced workers) have high strain. These jobs typically have a high division of labor and a de-skilling of tasks. Job Strain researchers have demonstrated that jobs with high demand and high control have low strain.

Karasek's Job Strain Model states that the greatest risk to physical and mental health from stress occurs to workers facing high psychological workload demands or pressures combined with low control or decision latitude in meeting those demands. Job demands are defined by questions such as "working very fast," "working very hard," and not "enough time to get the job done." Job decision latitude is defined as the ability to use skills on the job as well as the decision-making authority available to the worker. The job strain model emphasizes the interaction between demands and control in causing stress, and objective constraints on action in the work environment, rather than individual perceptions or "person-environment fit."

A number of computational forms of job strain have been used in the job strain / demand-control literature. (Schnall and Landsbergis, 1994). As will be described later, this study uses a quotient term (demands divided by latitude) to operationalize job strain.

Why study work stress?

The issue of job stress is of utmost importance to the public health community and working people. The economic costs of job stress in general (absenteeism, lost productivity) are difficult to estimate. As already mentioned, the health and financial impact of job stress has attracted the attention of corporate and public opinion researchers. A 1997 survey by Princeton Survey Research Associates found that “three-fourths of employees believe the worker has more on-the-job stress than a generation ago.” A 1992 report by the St. Paul Fire and Marine Insurance Company concluded: “Problems at work are more strongly associated with health complaints than are any other life stressor-more so than even financial problems or family problems.”

This study focuses on the health impacts resulting from a stressor’s (downsizing) effects on an organization and its employees and the resultant individual and organizational strain. The demand-control model of organizational stress is attractive because it is clearly defined compared to other organizational climate models. The Job Content Questionnaire (JCQ), the measurement tool for the model, includes scales for worker control (authority over tasks plus discretion over the utilization of skills), demands (psychological and physical demands), and social support (supervisor support and coworker support). These scales are included in this study as job strain (a compilation of demand and control), supervisor support, and co-worker support.[1]

The Job Strain Model is empirically applicable to study the effects of chronic stress and strain in the DOE workforce. Changes in the DOE mission and the reduction of the workforce bring into question the effect of chronic strain in the organization. In particular: Will decreases in resources within the DOE increase worker demands? Will the prospects of involuntary layoffs undermine the control of workers? What effects will the "flattening" of the organization, as part of the downsizing strategy, have on the availability of support?

[1] Other scales or items used from the JCQ include: noise, toxic exposure, and job security.

Given that chronic strain results from the interplay of demand, control, and support, these are serious questions.

Job insecurity and health

Ferrie and the Whitehall group (studying British Civil Servants in a longitudinal study for over twenty years) in a 1998 article examined changes in the health status of British civil servants whose employment security was threatened (Ferrie, et al., 1998). As part of the ongoing Whitehall study, these researchers measured self-reported morbidity and physiological risk factors among workers in departments threatened with reorganization and downsizing compared with those from other departments that were not threatened. This longitudinal study demonstrated an adverse trend in self-reported morbidity as well as for physiological measurements such as cholesterol and anginal pain. These changes were not explained by changes in health-related behaviors among the subjects. This article demonstrated that the anticipation of job loss was associated with significant changes in self-reported complaints and physiologic parameters.

Downsizing literature

Downsizing, or large-scale layoffs, has been adopted over the last decade as a management tool with the purported aim of strengthening a company by means of reducing budgets and personnel.

Initial studies indicate that there may be significant organizational repercussions after a downsizing. A study by the American Management Association showed that 40% of organizations responding reported that productivity had sagged after downsizing, and nearly one fifth reported that quality had suffered. This study also documented a decline in morale (reported by 58% of companies) and greater employee turnover (American Management Association, October 26, 1999). As the economy improves, retention will become an even bigger issue.

What are the effects of downsizing on employees?

Within the field of psychology, David Noer has looked at outcomes from downsizing, with a focus on individual responses. Major findings include fear, insecurity, frustration and anger, sadness and depression, sense of unfairness, reduced risk-taking, and lowered productivity. Noer and others call this compilation of symptoms "survivor syndrome," a syndrome originally identified in studies of survivors of Hiroshima / Nagasaki and the Holocaust (Noer, 1993). A follow-up study of organizations implementing layoffs found that many of these symptoms persisted for five years although employees had become resigned to the outcomes (Noer, 1993). Henkoff also reported fear and anxiety, as reactions to downsizing as well as employees' concerns that they may be the next to lose their jobs (Henkoff, 1994). Sommer and Luthans found a decrease in organizational commitment, in trust among coworkers, and in job satisfaction following a downsizing event at a health care organization (Sommer and Luthans, 1999).

A few studies (summarized in Sommer and Luthans, 1999) found negative personal and job outcomes associated with downsizing. One study (Cameron, et al., 1993) found significant associations between downsizing and decreased morale and between downsizing and

increased conflict in the workplace. Another study found negative impacts on interpersonal relationships, physical health, and emotional health (Kozlowski, et al., 1993)

Parker and colleagues studied the effect of strategic or planned downsizing on employee job satisfaction and job-related strain (Parker, et al., 1997). Employees in a company that had introduced planned employment changes were followed over a four-year period. Although measured demand increased, well-being and job satisfaction did not decrease. The authors concluded that the managed strategic downsizing actually improved employees' sense of control because of new work characteristics introduced as part of the reorganization. Therefore, the authors conclude, downsizing that is planned and not reactive and that includes employee involvement does not necessarily lead to adverse outcomes.

Finally, Woodward and colleagues measured changes in employee health and organizational function in a longitudinal study of a Canadian teaching hospital undergoing "re-engineering" and downsizing (Woodward, et al., 1999). The authors reported that measures of worker emotional health deteriorated, job demands increased and coworker support decreased, and work distress spilled over into the out-of-work lives of many of the study participants. These employees participated in many of the planning activities for the organizational changes and downsizing. However, in contrast to the Parker study, Woodward reports significant health impacts on employees resulting from the planned and strategic changes.

Joel Brockner writes of varying relationships between job insecurity and productivity, with mild levels of insecurity enhancing productivity (Brockner, 1988). He discusses survivor syndrome in terms of its impact on relationships and organizations. Brockner writes extensively about fairness and reports that how employees react to a downsizing event is related to their perceptions of how fair and justified the action was (Brockner, et. al., 1995).

Justice and fairness in the workplace

Research shows that perceptions of fairness are important in the workplace and should be considered as an independent variable when analyzing organizational functioning and health (Folger, 1987; Alexander and Ruderman, 1987; Fryxell, 1992; and Greenberg, 1990). Robert Folger discusses the cognition theory of justice in which employees are more likely to be resentful of an outcome if they believe there was a more fair or ethical way to achieve the outcome. Alexander and Ruderman found a significant association between perceptions of fairness and job-related attitudes of workers (Alexander and Ruderman, 1987). Both Fryxell and Greenberg see that justice is a complex concept and compare distributive and procedural justice. Distributive justice is concerned with the allocation of rewards and resources in an equitable manner (Niehoff and Moorman, 1993). Procedural justice focuses on whether employees believe that policies and procedures are determined and implemented in a fair and consistent manner (Niehoff and Moorman, 1993).

Greenberg cites a 1987 study by Sheppard and Lenicki in which managers describe fair and unfair treatment including items such as "providing adequate information before actions are taken" and "assigning challenging and meaningful work fairly" (Greenberg 1990, p. 405). This description sounds like another parameter of justice defined by Moorman and Niehoff as interactional justice (Moorman, 1991). The concept of interactional justice encompasses

how workers are treated by management, employee involvement in decision-making, voice, respect, and fairness.

Concepts from the literature are used in this study

The Demand-Control Model is empirically applicable to study the effects of chronic strain in the DOE workforce. Changes in the DOE mission and the reduction of the workforce bring into question the effect of chronic strain in the organization. In particular: Will decreases in resources within the DOE increase worker demands? Will the prospects of involuntary layoffs undermine the control of workers? What effects will the "flattening" of the organization, as part of the downsizing strategy, have on the availability of support? Given that chronic strain results from the interplay of demand, control, and support, these are serious questions.

This study focuses on the health impacts resulting from a stressor's (downsizing) effects on an organization and its employees and the resultant individual and organizational strain. The D-C Model of organizational stress is attractive because it is clearly defined compared to other organizational climate models. The Job Content Questionnaire (JCQ), the measurement tool for the model, includes scales for worker control (authority over tasks plus discretion over the utilization of skills), demands (psychological and physical demands), and social support (supervisor support and coworker support). These scales are included in this study as job strain (a compilation of demand and control), supervisor support, and co-worker support.[2]

Job security is one of the organizational outcomes used in this study. We use several physical and mental health measures as outcomes. We do not test the relationship between job security and health in this study.

Downsizing is the stressor that we studied. We constructed a model to examine the impact of both the magnitude of the downsizing (measured as a rate) and the approach to downsizing (four scales to measure type of layoffs, process and individual experience). The outcomes we examine are variables mentioned in previous studies including job security, survivor syndrome, morale and work performance. We incorporated other key concepts (e.g., conflict, job satisfaction, etc.) as co-variates in our model.

Our study utilized two fairness scales. One is a four-item procedural justice scale in which we chose two interactional justice and two formal procedure questions from a 12-item scale (Moorman, 1991). In the survey section focusing on downsizing at the site (survey section E), we included a 14-item scale on the downsizing process. This scale includes tested questions on justice (seven items measuring formal procedures and interactional justice) as well as questions to elicit perceptions about the fairness of the downsizing process (three items on employee involvement and communication) and the outcome of the downsizing (four items on efficacy, retraining, and frequency).

[2] Other JCQ scales or items included are: noise exposure, toxic exposure, and job security.

C. Qualitative Data: Importance and Use

The importance of qualitative data

Ethnographic data, or descriptive information, which uncover patterns of employee culture, provide an important research strategy for studying questions and populations that may be inaccessible using other research techniques. Ethnographic methods produce in-depth and detailed data through direct quotation and careful description of situations, events, people, interactions, and observed behaviors (Agar, 1980 and Spradley, 1979). Interviews with key informants, work-site observations, and focus group discussions permit the researcher to understand the world as seen by the respondent within the context of the respondent's everyday life. This information provides powerful insight about the dynamics of situations, experiences, and relationships.

The use of open-ended survey questions, interviews, and focus groups to elicit DOE workers' perceptions of downsizing, restructuring, organizational culture, health, and performance encouraged more explicit explanations than our ongoing parallel research activity of the close-ended survey. The questions tapped the variables of interest for the study: How do employees characterize the effects of downsizing? What are the employees' understandings of the impact of downsizing on the work demands, control, and social support? How do employees perceive their health and performance to be affected by workforce restructuring?

Ethnographic methods yield different types of information

- Individual interviews are helpful in detailing individual perceptions, as they provide the opportunity to go into depth in a one-on-one setting.
- Focus groups are an efficient way to gain a wide range of information. Group discussions prod individuals to remember shared experiences and to compare ideas in reaction to the statements of others. Semi-structured focus groups also permit greater attention to the themes of the study (i.e., characteristics of downsizing, organizational culture, health, and performance) and allow generic issues to surface around pivotal points.
- Open-ended survey questions provide an opportunity to capture employee-volunteered comments in response to a broad request for 1) additional information regarding concerns not addressed in the close-ended survey questions and 2) thoughts on improving their work life. We will utilize responses to the second open-ended question in crafting an intervention project.
- Direct work site observations (tours) provide researchers with a context for employee perceptions and the means by which to interpret the correspondence between stated beliefs and behavior.

How qualitative data is summarized and analyzed

Qualitative research can produce a large volume of information that must be organized thoughtfully so as to take advantage of the breadth and depth of the data. The qualitative

data analysis process requires careful methodology; it has to be systematic and goal-oriented, reducing the qualitative information in such a way that it becomes distilled to its essentials, rather than simply diminished in volume, and leading to a result that others can accept as representing the data. This organizing scheme for extracting essentials is known as classification (Tesch, 1987). The outcome consists of the reduction or condensation of these data to a description that extracts the most important features of the phenomenon under study and explicates the patterns that are discovered. Ethnographic material has proved invaluable in improving instrumentation and scale reliabilities in other research that considered similar study variables (McNeely, 1994).

Programs for computer-assisted classification and analysis of text can be extremely useful tools for the management of qualitative data. We created custom-designed Filemaker Pro and Microsoft Access databases to assist us in housing, classifying, and analyzing qualitative data from the focus groups and open-ended survey questions. The analysis of the interviews was conducted by hand.

The use of qualitative data was particularly valuable for this study, where the intent is to understand the employee experience of downsizing and then develop an approach to downsizing resulting in dynamics that preserve the health and productivity of workers. The qualitative data, including interviews, focus groups, observations, were used in several ways:

- as a source of preliminary information on issues and dynamics at each site (interview data);
- to paint a more complete picture of each of the study sites (focus group data);
- to identify key constructs and themes for the quantitative survey instrument and, later, to refine questions;
- to prioritize the items for the survey and the statistical model; and
- to understand relationships uncovered in the survey and archival data.

The integration of the qualitative and quantitative data was particularly important, as it provided insights for answering our research questions.

D. Data Collection: Methods and Evaluation

Site selection

The initial step in the study was to select Department of Energy sites to include in the study. A letter of introduction was sent to regional DOE offices describing the study. During this time, DOE was designing a generic research protocol for notifying sites about research projects, which included getting approval from each site's human subjects review board. Applications were made to the human subjects review board of NIOSH, Boston University, and sites that had a functioning board.

An initial list of sites subject to 3161 downsizing was compiled. We wanted to include sites that differed on key variables including:

- site mission
- facility type (laboratory, production, clean-up site)
- site size and location.
- rate of union membership
- downsizing rate and experience
  - rate of exposure
  - number and content of support programs for surviving and displaced employees
  - level of worker participation in the process

Important organizational considerations included a willingness to allow salaried and non-salaried employees to participate, availability of data, and management representatives open to an extensive research protocol including surveys and focus groups. We were only interested in sites that had or were expecting to experience downsizing.[3]

We attempted to collect demographic, work organization, and downsizing data from DOE headquarters and the site. Some data were either unavailable or not available for the population of interest. Phone interviews were conducted with stakeholders at the potential study sites. The purpose of these inquiries was to determine the feasibility of conducting the study at each location and to narrow the sample selection based on that information. We also completed a profile of the union activity / membership at each and made contact with all major bargaining units prior to site visits.

Funding for this study began September 30, 1995. At the end of June 1996 we delimited our sample to five sites: Pantex, Idaho, Nevada, LANL, and Rocky Flats. Subsequently, Rocky Flats was dropped from the study sample (issues of access and site cooperation) and the Y-12 Plant on the Oak Ridge Reservation was re-added, offering an example of a site with significant downsizing and other organizational changes (split contracts, new contractors, and outsourcing).

[3] The Pantex Plant in Amarillo, Texas was initially selected as a control site. Our first visit to Pantex was in November 1996. At that time, it was clear that they were going to have a downsizing event (which subsequently was carried out in early 1997).

Instrument development

We developed focus group guidelines as well as questions for site record review and preliminary phone interviews. We wrote an interview instrument with targeted questions for informants from different organizational areas (budget, safety, medical, employee assistance, etc.). The interview instrument was refined prior to each site visit to incorporate feedback and to include site-specific issues.

Site visits

The initial research efforts were site visits to collect the preliminary qualitative data. Generally, two to three research personnel attended each site visit and were often accompanied by personnel from NIOSH and/or DOE headquarters.

The goals of the visit were: 1) to develop on-site relationships; 2) to appreciate first hand the conditions in the environment that people connect with stress; 3) to collect via individual and group interviews current accounts of stress and downsizing; and, 4) to identify ways of measuring health and performance effects in the historical record.

In order to meet these goals, we undertook the following over the course of one five-day or two three-day visits:

- interviews with top and middle management for the prime contractor and major subcontractors, particularly in divisions or departments of primary interest to this project (safety and health; occupational medicine; security; outplacement; public relations; and human resources, including benefits, compensation, staffing and diversity, among others);
- meetings with data collectors and managers in the divisions of interest;
- interviews with key DOE field or operations office personnel who work with the contractor on safety and health or personnel issues;
- interviews with representatives of major unions and community groups;
- focus groups of employees, divided by job category and representative of the job breakdown at the site (not at the Nevada Test Site); and
- a community meeting to allow family members, former workers, and other community members the opportunity to contribute to the study.

Interviews

Interviews were used to gather information about:

- the structure of the site;
- processes and policies related to downsizing, personnel or other issues;
- data availability; and
- individual perceptions of downsizing.

Some of the interviews were with individuals responsible for managing the data that was important for our study. We collected sample records to determine the format and availability of records from 1991 through June 1998. We also collected policy statements and reports related to study issues.

Community meetings

Community meetings allowed us to disseminate information about the study more widely and to collect perceptions, ideas and critiques from family members, former employees and the general community. We sponsored community meetings in four of the study communities (Oak Ridge, Tennessee; Los Alamos, New Mexico; Amarillo, Texas; and Idaho Falls, Idaho), each attended by 15-30 people. No meeting was organized in Las Vegas but a meeting was scheduled with some former workers.

Focus groups

As described in the body of this report, focus group research was a key data element in this study. We conducted focus groups at four of our five sites: INEEL, Pantex, Y-12, and LANL. We did not conduct focus groups at NTS as the initial (and only) site-visit for qualitative data collection was in March 1998, just prior to administering the completed employee survey. In place of a focus group, the site visit team held a discussion group with representatives of the Southern Nevada Building Construction and Trades Council (SNBCTC). See Appendix E for specific sampling parameters, groups by job category, and numbers of invitees and participants at this site, as well as general information about sampling procedures, focus group content and how the groups were conducted.

Worker communication and notification

Discussed in the body of the report.

Evaluation of initial research and data collection

There were extensive process evaluation measures throughout this research protocol. All steps were clearly documented, the rationale for decisions and changes to the protocol was recorded, and participation levels at each stage were summarized. The project managed the funds allocated to this study in an efficient manner. We used a participatory evaluation methodology. Formal and informal feedback from site contacts, study partners, and study participants was always solicited and was of critical importance. Our protocols and instruments were designed collaboratively with input from people at each site during the design process so that the research would be relevant to the concerns and interests of the affected population.

Site contacts (contractor management, local DOE management, and union leadership) made suggestions about how best to approach their employees, language and methods that would be more or less successful at their site, and constructs pertinent to their work experiences. Site Institutional Review Boards, medical directors, and others in upper management reviewed the employee survey and plans for administration. Our research partners and funders--NIOSH and the DOE--offered input throughout the process and the human studies review boards of both entities reviewed the study protocol annually.

The greatest challenges during this phase of the research were to meet deadlines and establish site participation and access agreements. While DOE expects contractors to

participate in DOE-related health studies, some contractors were unclear as to how to fit these requirements into their contracted work.[4] Timelines were continually pressed because of the number of contacts needed to finalize plans and competing work demands on our points of contact. Conducting a study in a high-security environment is challenging, particularly, when study personnel do not have government security clearance.

Our status as outsiders in this system had contradictory effects. On the one hand, it made some contacts wary of sharing data while on the other it encouraged greater honesty from some as we were perceived as neutral. Other structural hurdles at some sites were getting access to human resources personnel given that our central contacts were environmental safety and health professionals, and educating our contacts about this non-traditional exposure study.

Overall, this research yielded the information needed to develop and edit the employee survey and to proceed with further archival data collection and the data analysis. Some specific challenges and actions taken during this phase of the project are highlighted below.

- Some contractors were not receptive to the study and the incumbent commitment of resources.

  We dropped one study site after almost a year of attempting to secure cooperation and replaced it with Oak Ridge. Oak Ridge/Y-12 Plant under the leadership of LMES was perhaps the easiest site at which to arrange access and participation, because contractor management were receptive and contractor and local DOE study contacts were exceptionally helpful.

- No obstacles were encountered in conducting interviews or focus groups.

  At the five sites, attendance at focus groups of invited employees ranged from 20% to 50%. We attributed this mainly to unexpected changes such as shift in work schedule, conflicting work requirement, or sick time. While we recognize that self-selection for participation influences the outcome, participants had a wide variety of work experiences and opinions about the downsizing process and researchers used summaries of the groups to identify themes rather than relying on each voice as objective finding.

[4] We began this study while a new DOE protocol for human studies was being developed; copies were then distributed to sites but the information did not filter down to all study contacts.

E. Focus Groups

Focus group sampling

Researchers were interested in hearing from a range of people at each site--spanning job categories, management level, gender, and race / ethnicity. We conducted a stratified random sample of all employees to select invitees for five focus groups. The goal was to have 8 to 12 people in each of six groups (one for the subcontractor employees). We assumed a 20% response rate and so requested a sample of 350 names. We used 50 names form the list to invite to pilot-test the employee survey.

We gathered information on the following variables to assess the demographic profile of the employee population at INEEL: gender, ethnicity, job series, education, pay status, management / non-management, full-time / part-time, age and length of service. Based on these demographics, decisions were made as to the makeup of the groups.

Job categories were pooled based on similar hierarchical level in the organization. Selected employees were grouped by similar job type and management level to promote easy flow of conversation without concern for judgement or consequence. Often, job classifications break along gender, race, bargaining / nonbargaining, exempt / nonexempt lines. Management level employees were grouped together, across job categories.

Focus group content

The discussion groups allowed the researchers to hear about common concerns and to understand labor and management perceptions about the changing nature of work. This setting invites employees to consider issues related to downsizing together. Lead researchers, with input from NIOSH and an experienced facilitator, developed a focus group guide to frame these sessions, covering the areas of downsizing, stress, job issues, and workplace functioning. Questions about the organization focused on job demands, control over work, job security, social support, workplace safety and accidents, performance, and physical and mental health issues.

How groups were conducted

Focus group discussions required rooms to ensure privacy, paid leave time for each attendee (approximately 1.5 hours) and management support for employee leave. We tried to minimize the distance between the discussion group location and the job site.

One researcher served as facilitator for each group and the other as recorder. The facilitator utilized the focus group questions and was responsible for discussing confidentiality, getting informed consent, and following standard procedures to collect information. The focus group recorder took written notes, recorded the discussion on audio tape, and collected the written materials (consent form, data points form, and surveys) participants were asked to fill out. After each site visit, transcripts were reviewed and a report of themes was written.

Appendix E

Group Composition at INEEL

A total of 53 people participated in the six focus groups. Groups 1-3 were conducted with employees located at the site facility. Groups 4-6 were conducted with town employees.

Group 1: Laborers / Crafts 9
Group 2: Mid-managers 10
Group 3: Engineers / Scientists. 9
Group 4: Administrative staff. 8
Group 5: Supervisors / Managers. 11
Group 6: Engineers / Scientist. 6

Demographic information was collected anonymously (on data point sheets) by focus group attendees and is not distinguishable by group. The data sheets provide information on tenure at INEEL and other demographic variables. Attendees represented a wide range of work experience at INEEL. Of the participants who provided information on tenure, 33% had worked at INEEL for at least 15 years, 50% had worked at least 10 years and 15% had worked 5 years or less.

F. The Boston University Workplace Survey

Sections and scales, summarized

1. Job information
   - management level, job category, site and job tenure
   - shift, pay / union status, hours worked
   - work with other groups, second job
2. Job characteristics
   - job demand, role ambiguity, feedback quality
   - job security, violence at work, toxic & noise exposure
   - job control (skill discretion, decision authority)
3. Organizational factors and climate
   - supervisor and co-worker support, morale
   - innovation, mission, organizational commitment
   - justice, conflict resolution, communication
   - DOE relations, safety
4. Individual experiences (of the workplace)
   - work performance, matrixing structure, workload dissatisfaction
   - job satisfaction, perceived stress, stress index
5. Organizational change
   - goals of the downsizing, opportunity
   - skill loss, survivor syndrome
   - downsizing experience, downsizing process / fairness
6. Health information
   - medical conditions, medical symptoms
   - general health inventory (SF-12, physical and mental health components)
   - health behaviors (drinking, tobacco use)
7. Demographics
   - gender, race / ethnicity, age group, marital status
   - spouse's work life, # of children
   - income, health insurance status

G. Survey Sampling and Administration Protocols for the *Boston University Workplace Survey*

Survey Sampling

1. Sample size

The survey was conducted at five sites, sampling employees from six prime contractors and two subcontractors at the five sites.[5] We initially set the sample size at 10,000.[6] Based on the total population at the five sites we set the sampling fraction at 42%. The number of employees sampled at each site, by contractor, is listed below.

Site	Contractor	Sample size/(%)	total # of employees
Pantex	Mason & Hanger	1,180 (44.5%)	2,861
	Subsample: BSI	94	
LANL			
	University of CA. Regents	2,793 (42.7%)	6,535
	PTLA	206 (47.9%)	430
	JCNNM	529 (44.0%)	1,203
INEEL	LMITCo	2,368 (42.3%)	5,596
NTS			
	Bechtel Nevada	921 (45.1%)	2,092
	Wackenhut	113 (55.1%)	205
Oak Ridge	LMES	2,442 (42.6%)	5,733
TOTAL	5 sites/ 8 contractors	10, 646 (43.2%)	24,655

2. Database for sampling and tracking/mailing

We requested that each contractor send us a database of all their current employees and include the following fields: name, address (building and / or mail stop), level 3 (name of division or department), level 2 (name or code for work group), gender, race / ethnicity, age, and phone number. Some contractors did not include demographic information and

[5] A third subcontractor, the MK Ferguson company at Oak Ridge, was not included in the survey sample because more than 60% of their employees are seasonal and / or contractual employees. We decided to not include MK Ferguson in the survey because 1) as a construction subcontractor their organizational structure and work force were significantly different from the other eight contractors and 2) we would not be able to adequately ensure confidentiality given the small pool of permanent employees (170).

[6] Subsequently, we altered the parameters of employees to be included at the Oak Ridge site, increasing the pool from employees affiliated just with Y-12 operations to all Lockheed Martin Energy Systems employees. This increased the pool of people to be sampled from ~3,500 to 5,733 with a sample of approximately 1,000 more employees than initially anticipated.

instead provided us with summary data for the site for gender, race/ethnicity, age groups, and percent of work force that is unionized. Most files were dbf or Excel files. After we drew a sample, the sampled names were entered into the Access Database used to send mailings and monitor returns.

3. Sampling process

a) Deciding on functional units for analysis

We analyzed data using a hierarchical linear model, in order to look at findings on multiple levels including individual, organizational, and contractor/site. At each site, we determined a suitable organizational level for sampling, referred to as level 3. We looked for a level wherein most of the units would have at least 20 employees.

Level 1 is the individual, level 2 is similar to a workgroup (reporting to only one supervisor), and level 3 is usually comprised of several workgroups or sections (called division, department, directorate). Given that each contractor uses different organizational language, we employ the term level 3 for the sampling unit. The survey questions are generally geared at level 1 (individual) or level 2 (group) with some referring to the whole site.

b) Exemptees

Prior to sampling, names of employees to be exempted were removed. Employees not eligible to take the survey included:

1. those who had taken a pilot test of the survey during one of our visits to the site;
2. points of contact and those who had signed the cover letter and/or reviewed the survey for approval (IRB contacts, general managers, union leaders, etc.); and
3. at Pantex, those who had previously participated by taking the BSI survey were removed from the general pool as we planned to mail surveys to them separately under a different protocol.

c) Merging level 3s

Prior to sampling, level 3s with fewer than 20 employees were merged to create a larger unit wherein we could better protect confidentiality. Merges were based on one or both of the following parameters:

- Selected level 3s report to the same higher group or manager.
- Selected level 3s have similar functions.

The first step was to merge level 3s with fewer than 20 employees. When that was not possible, or to accomplish the parameters listed above, we merged a small level 3 into a level 3 with more than 20 people.

d) Sample

We sampled approximately 42% of employees with each of the eight contractors (exact fractions are listed above). The number to be sampled from a given contractor was determined and the sample was then drawn by level 3 according to the following rules:

- if level 3=20, take all employees
- if level 3>20, take a fraction of employees (or 20 if fraction <20) (fraction was determined based on the number of employees at the site, the number to be sampled, and the number and size of level 3s)
- for level 3s that have <20 employees
  -group smaller level 3s (see above)
  -sample the appropriate number based on rule 2 (fraction of merged group)

4. Organizational codes and survey labeling

The organizational code is the code to identify the sampling unit and it is labeled on the outside of the survey and then becomes part of the unique identifier. The organizational code is comprised of up to six characters. To maintain confidentiality, we assigned a letter to each level 3. The code includes the site-specific level 3 organizational name (i.e. Department, Division, Section, Directorate) followed by an alphabetical character (A-YY), unique for each level 3. For example, human resources division would be labeled Division A (or DIVA). Level 3s that were merged were labeled with the same code. In addition, the organizational code identifies the level 2 only if more than 13 people were sampled in a given level 2; in this case a number is appended to the level 3 label (e.g. Division A01), otherwise the spaces are held by "ZZ" (e.g., DIVCZZ).

When surveys were returned, an individual identifier was assigned and entered into the survey database with all other data. When a postcard was returned, the mailing database was updated. There is no way to connect the mailing database and the survey database. The full organizational identification code identifies the organizational unit but not a person. It consists of 12 characters:

1 first initial of site (P, L, I, N, or O) and

2 first initial of contractor (M, U, J, P, L, B, W, or L)

3-8 org code (letters and numbers) from one to six characters as described above
-If ORGCODE< 6 characters, "Z" will be used at end to hold remaining places
-if an individual removes the org code from their survey, it is coded "ZZZZZZ"
-the letter (and number) is preceded by (DIR, DEP, SEC or DIV)

9-12: individual identifier 0001-9199 with numbers assigned by site.

PANTEX	0001-0999
And BSI	9001-9199
LANL	1000-3999
INEEL	4000-5999
NTS	6000-6999
Y-12/OR	7000-8999

e.g. code:
ILDIRK065137
INEEL (I), Lockheed Martin Idaho Technologies Company/LMITCo (L)

5. The INEEL Sample

There are 45 directorates

There are 31 sampling units (19 level 3's with < 20 employees)
We created six merged sampling units (+ one level 3 with 25 employees) based on similarity of organizational level and functional similarity.
Sample size = 2369, Returns=1681

Merge A (33 employees): 6 directorates with executive functions reporting directly to the President's office.
Merge B (29 employees): 5 directorates, all executive level operating functions who report to org A000 (VP Operations).
Merge C (24 employees): 4 directorates, all business management functions reporting directly to the President's office.
Merge D (32 employees): 2 directorates reporting directly to org BOOO, President of Research and Development.
Merge E (20 employees): 2 high level directorates within org 4000.
Merge F (101 employees): 7 directorates all at the same organizational level within org 4000.

Survey administration

The Boston University Workplace Survey was administered to contractor employees at our five DOE study sites, and subcontrator employees at Los Alamos National Laboratory (Johnson Controls Northern New Mexico (JCNNM) and Protection Technology of Los Alamos (PTLA)) and the Nevada Test Site (Wackenhut Security Inc. (WSI)). Administration began July 1, 1998 and was completed in November 1998.

We presented management with three options for administering the survey (March 1998.) Balancing issues of cost, confidentiality, and response rates, management from all sites decided upon a survey that would be mailed to employees at work for completion during work time.

Survey packets were boxed and shipped to a designated site contact and distributed to employees via internal mail. The survey packet consisted of the following:

- Cover letter --signed by contractor and subcontractor managers, DOE Operations Office manager, site medical director, and union leaders
- Informed consent form
- *Boston University Workplace Survey*
- Tracking postcard (business reply mail)
- Return envelope (business reply mail)

Participants were instructed to mail the survey in the envelope provided and to send the tracking postcard separately. An employee's name and study ID# were printed on the tracking postcard and was the sole means for determining whether an individual returned the survey.

All tracking postcards were logged into the tracking database within one day of being received. Reasons for not completing the survey (communicated on the tracking postcard, in letters or on returned surveys) were also recorded in the database.

Reminders sent to increase response rates

A series of three follow-up mailings were used to increase response rates. The mailings were staged 10 days, four weeks and seven weeks from the initial mailing. The content of each follow-up mailing is described below:

Mailing 2: Reminder / Thank you postcard
Mailing 3: Same contents as original mailing with new cover letter
Mailing 4: Reminder Letter

Mailings #3 and #4 were only sent to individuals who had not returned their tracking card indicating a returned survey. Because the tracking card was our primary method to indicate a returned survey, anyone who 1) returned a survey without also sending the tracking card, 2) included the tracking card with their survey, or 3) whose postcard was lost in the mail, also received a follow-up mailing.

Survey mailings to INEEL employees

- Mailing #1: August 14
- Mailing #2: August 27
- Mailing #3: September 21
- Mailing #4: October 16, 1998

Survey publicity and promotion

In addition to the follow-up mailings, a series of employee notification methods were used to publicize the survey in and around the time of the first mailing. Increasing employees' awareness of the study and reminders were thought to boost participation. Methods used at each site varied slightly based on available mediums and are described in detail in the site-specific administration section. The general content of the publicity protocol and rationale for each piece is listed below:

1. *Press Release in site newsletter, one month prior to first mailing*
   Purpose: To provide an update on the status of the project and to inform employees of the up-coming employee survey.
2. *Updates to union leaders about survey*
   Purpose: To keep union leaders apprised of the survey status and ask that they encourage their members to participate.
3. *Press Release in site newsletter, one to two weeks prior to mailing #1*
   Purpose: To announce the survey mailing and staff site visit
4. *All employee e-mail , one day prior to employees receiving mailing #1*
   Purpose: To notify employees that surveys should be in their mail boxes and provide location and times of project staff's site visit.
5. *Local press news release, day of site visit*
   Purpose: To inform the general community about the study and to emphasize the importance of employee participation in the survey.
6. *Site Visit, two to five days after employees received the first mailing*
   Purpose: To be available to address employee questions and concerns, and collect completed surveys.
7. *Bulletin board announcements posted, one week after mailing #1.*
   Purpose: To provide a visual reminder to employees to fill out and return the survey

Publicity Methods at INEEL

- Star press release #1, June 9
- Star press release #2 August 4
- All employee email re: survey and site visit, August 19
- Bulletin Board Announcements, August 21-25
- Site Visit: August 25 (Lew)

H. Archival Data Collection, Rate Calculation and Evaluation

Purpose and process for collecting archival data

During the first few site visits to Pantex and INEEL, we reviewed extensive records to determine those "objective" organizational data that would be useful for the study. We were interested in archival records that were relatively complete in paper or electronic form for the study period (1991-1998), that were considered to be well kept by the record keepers, and that might shed light on health and safety changes related to organizational change. The records we reviewed[7] had numerous limitations.

Based on the model for analysis and contractor responses to data availability requests (sent spring 1998), we established guidelines for selecting data sets to pursue:

- summary data must be available from (or attributable to) the level 3 work unit (and ideally at level 2) utilized in the survey sampling protocol;
- data sets must be available at all five sites;
- monthly or quarterly data must be available (preferably monthly);
- data should be available for the entire study period (January 1991-June 1998) or for as many years as possible.

From the original list of data sets, we eventually pursued these five areas from the contractors:

1. sick time / paid time off data[8]
2. overtime usage
3. downsizing data
4. accident and illness data
5. employee Assistance Programs information and data

The specific data elements, reason for inclusion, and intended use of each data type are described below. Based on results of the initial research into this organizational outcome data, we chose not to pursue data on employee concerns (including labor relations / union grievances) or absenteeism. Regional economic indicator data was also pursued from publicly available sources.

Defining, collecting, and preparing data sets

We solicited organizational outcome and other archival data from the main contractor at each site, plus a total of three other sub- or additional prime contractors: Johnson Controls Northern New Mexico (JCNNM) and Protection Technology Los Alamos (PTLA) at Los Alamos National Laboratory (LANL), and Wackenhut Security (WSI) at the Nevada Test Site. Data was requested for January 1991 through June 1998. In some cases the entire

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[7] Records reviewed during initial visits were: medical records, health claims data, worker compensation claims, sick leave data, safety and regulatory affairs data, employee assistance program data, employee grievances, EEO records, outplacement data, procurement records, human resources data including employment levels and attrition, and downsizing data (reports, numbers, support program information, outplacement program data).

[8] At two sites, sick time is part of a paid leave or paid time off policy. We collected paid time off data when no sick leave information was available. While these raw numbers measure different phenomena, we felt we would be able to utilize the data for within site analyses although not for comparison with other sites.

period was not available as contractors had changed or data storage systems were not comparable throughout the study period.

Four data sets (sick time, overtime, accidents, and downsizing rates) were collected by level 3 and the data was stored in a separate database for each contractor by month (or quarter) and year for each level 3. The mechanism for tracing data and assigning it to a present day level 3 is described in the body of the report. Employee Assistance Program (EAP) and economic indicator data are site-wide.

Below is a brief summary of each data element and how rates were calculated from the raw data. For all data sets, we obtained information on policies, policy changes, and organizational restructuring changes for use with data mapping and interpretation.

Overtime and sick time data

These data sets were identified as possible outcome variables describing the health and productivity of the organization. In addition to a summary of the number of sick time (paid leave) and overtime hours used monthly, by level 3, we requested monthly employment figures at the same level (to enable us to derive rates). We also collected information on overtime and sick time policies and changes in organizational structure. The structural and policy information was necessary for data mapping and interpretation.

Sick time rates are included as an outcome in the five-site, level 3 analysis. The average per capita sick time rate is for a one-year period from July 1997 through June 1998. Overtime rates were not used as an organizational outcome as the data is only available for nonexempt employees.

Sick time (ST) or paid time off	Sick time or paid leave rate (per person), for the year ST Rate = (# hours sick leave for 12 month period)/ (# people in level 3)

Accident and illness data/CAIRS

CAIRS is a national database used to collect and analyze DOE and DOE contractor reports of injuries, illnesses, and other accidents that occur during DOE operations. The principal investigator worked with staff at the Department of Energy to access the national CAIRS database to obtain injury and accident data for the contractors in this study. We solicited monthly accident/injury data by department, all without personal identifiers. Only personal accident/injury data was processed; all property and vehicle damage records were excluded from analysis.

Each CAIRS recorded incident identifies the department involved. We used this department identifier to map the cases to the appropriate level 3. Data for the five study sites for the period 1991-1998 were sent to the project in April 1999. From the more than 30 variables collected, we chose to use only total recordable cases (TRC) in the preliminary analysis. As with sick time rates, the period of interest for this outcome variable was July 1997 through June 1998.

CAIRS	Total recordable cases (TRC) rate (per person), for the year TRC Rate = (# cases summed)/(# people in level 3)

Appendix H

Downsizing data

We began with a review of all information collected regarding exposure to downsizing. This included interviews, company policies and protocols, written reports and numbers of individuals who left contractor employment. Requests were made to the DOE Office of Worker and Community Transition (OWCT) personnel at each site for complete records on the number and types of downsizing and other restructuring during the study period (1991-1998). As the principal area of study, we chose to collect both quantitative data (i.e., number of people laid off and type of separation) and qualitative data (including downsizing process, communications to employees, employee involvement information, and services provided to separated and retained workers).

Downsizing data was culled from contractors at each site, local DOE offices, and the federal Office of Worker and Community Transition. OWCT data was available only at the site level. We relied on contractor data for downsizing numbers and types (voluntary, early retirement, involuntary) by level 3. The level 3 data was summarized and used as two of the primary exposure variables in both the individual and level 3 models. The two variables are the downsizing rate and the rate of voluntary layoffs. Both are first calculated as an annual rate for each level 3 and then the rates are averaged over the study period.

Downsizing (DS)	Downsizing rate per level 3 for the study period DS Rate = average of annual downsizing rates by level 3 Where annual DS rate for each level 3 = (total # people downsized for the year) / (# people in level 3 at start of year)
Downsizing type	Rate of voluntary layoffs per level 3 for study period Voluntary Rate = average of annual voluntary rates by level 3 Where annual voluntary rate for each level 3 = (total # voluntary layoffs for the year) / (# people in level 3 at start of year)

EAP data

Telephone interviews were conducted with EAP directors and / or counseling staff to acquire qualitative descriptions of the types of services offered, trends in employee complaints, office procedures, and diagnostic trends and to assess the availability of archival data on utilization. We then requested the following monthly data elements for the entire study period:

- number of employees utilizing service
- presenting problem during intake
- number of intake sessions (% of total that is spouse or dependents)
- number repeat sessions (% spouse / dependents)
- number of workshops offered

We intended to collect budget information to assess dollars spent per capita on EAP programs but none of the contractors was willing to provide this information.

Site climate data

A variable of interest is the economic health of the region in which the defense facility is located. It was hypothesized that downsizing might affect people differently if they lived in a region where securing comparable employment seemed possible. Site climate data collected included:

- county level unemployment data
- per capita income by county and
- local housing data (average house price, changes over time)

Data was collected from the US Census Bureau and state departments of labor. This data is used only for background information but was not included in the cross-site model because there were too few observations in the model.

Evaluation of quantitative data collection process

Appropriate steps were taken to solicit input into the development of the survey instrument. We believe (and received feedback) that the survey covered the most important issues related to downsizing and health as specified in the literature and identified by site participants.

Response rates for mailed surveys can be quite low, yet it was the only administration method acceptable to site management at the five sites. We developed a system where employees used work time to complete the survey as a mthod of increasing participation. We also included systems to preserve anonymity of responses as well as several rounds of follow-up to non-responders to achieve our goal of a 50% response rate.

Overall, we attained a response rate of 54% with nearly 60% at three of the sites. The response rate was lowest at Oak Ridge (48%). The low rate may reflect the fact that Oak Ridge was the only site in the middle of restructuring activities at the time of the survey (both a contractor change and downsizing). The immediacy of the issues had the potential to lead to greater participation or lower participation as people are more preoccupied with their work and the changes around them. We received comments from employees as to why they or others would not complete the survey. Reasons mentioned included: feeling "over-surveyed", concerns about confidentiality despite assurances from researchers, fear of ones supervisor hearing or seeing the responses and potential repercussions, particularly during a period of downsizing.

It appears as though communication strategies to publicize the study and survey reached the intended population, although we did not conduct a formal assessment of notification methods.

There were significant challenges regarding the collection of archival data at study sites. These are sites that have and continue to undergo tremendous change. These changes have an impact on continuity of data, continuity of staff, and the amount of time our contact people have to assist us on this project. We made final determinations about which data sets to collect based on what was of greatest relevance to the study and what we could collect electronically,[9] for some period, at all five sites.

The contractor changes at two of the five sites meant that organizational outcome data was not available in a consistent format across the study period for those sites (INEEL and NTS). At Y-12, restructuring and shifting of some employees to a new contractor had similar results: the 1998 LMES population is not easily traceable back in time as it includes

[9] It was not feasible, given a limited budget and personnel, to review paper records.

employees who were previously at a central administrative branch that served several operations besides Y-12 and are now part of Y-12.

Specific challenges included:

- Data collection, particularly data from 1991-1995, took longer than anticipated to retrieve.
- It was difficult to trace data from defunct organizational units to the current organizational structure. Research staff worked with site experts to determine how to further aggregate or dis-aggregate data, tracing departments that had been merged, renamed or phased out.
- Some data sets that we chose to collect have complicating issues. Researchers made decisions about how to use data that were not comparable across site or study period. For example, the two sites offering "paid leave" or "paid time off" were excluded from the model that examines sick time rates as an outcome (presented in the *Five-Site Final Report)*.

I. Exposure and Outcome Data Fields and Data Mapping

We obtained exposure and outcome data from the five sites for 1991-June 1998. The data sets included: sick time, overtime, CAIRs and downsizing data. A request for CAIRs data for all prime contractors operating at the five study sites during 1990-1998 was submitted to DOE Headquarters, Office of Occupational Safety and Health. The remaining three data sets were requested from each contractor's Human Resources (HR) office.

Details regarding actual data received from INEEL and our ability to process the data by our designated level 3s (survey sampling groups) are reviewed below.

Paid Leave data (which combines sick time and vacation time), were available for LMITCO employees quarterly from 4th quarter 1994 - 2nd quarter 1998 broken down by level 2 (departments). Data fields submitted in the paid leave data file include:

- level 2 code, quarter, year, # employees in level 2 unit, # hours of paid leave used.

We were able to aggregate level 2s into level 3s (directorates) and ascribe the proper survey label using LMITCo organizational charts from 1995-1998,. For this time period, we were able to match 95% to a survey label, accounting for 98% of the total reported paid leave hours.

Sick time data were only available for EG&G employees for 1991-1994. Other prime contractor employees who worked for WINCo or PTI and were later merged under the LMITCo contract were not included in these sick time figures. No resources were obtained to help link current organizational codes to past codes. Therefore, none of these data were matched to a survey label.

Overtime data were obtained for the time period under LMITCo 4th quarter 1994 - 2nd quarter 1998 broken down by level 2. Data fields in the overtime file include:

- level 2 code, quarter, year, # employees in level 2 unit, # hours of OT used, # employees in that unit responsible for OT

Level 2s were aggregated into Level 3s using the same process as described for the paid leave data. We were able to match 95% of the level 3s to a survey label, which accounted for 97% of the overtime hours reported. As with sick time data for 1991-1994, overtime data was only available for EG&G employees and 0% was matched to a survey label.

CAIRS data were provided for 1990-1998, which included records for all contractors at INEEL. Because of the difficulty in linking our level 3 to the "department" field in the CAIRs database, only October 1994 – June 1998 data for injuries were processed. The “department description” field in the CAIRS database was used to identify our level 3. However, there were no standardized reporting mechanisms in the CAIRs system when listing an individual's department. Job titles, office room numbers, department codes and names as well as directorate codes and names were all listed. We therefore used INEEL OSHA 200 logs to validate the department for each CAIRS incident reported. By using this system, we were then able to ascribe a survey code to 98% of the CAIRS records for October 1994 – June 1998.

Appendix I

Downsizing data for the three downsizing events which occurred under LMITCo were collected. The following fields were submitted in the data file:

- level 2 code (departments), and # employees RIFed in that level 2

Like sick time and overtime, we aggregated level 2s into their appropriate level 3 and assigned the survey label. We were able to match 97% of individuals downsized to a survey label.

J. Site Visits to the Idaho National Engineering and Environmental Laboratory (INEEL)

Summary statistics of each visit

Visit: _1_
Dates of visit: _9/23-27/96_
# of staff attending: _4_
Research staff attending:
BU: Dr. Eileen McNeely, Project Director, Jody Lally, Project Manager, Libby Samaras, Focus Group Consultant,
DOE: Dr. Gerald Petersen of DOE Headquarters, Marilyn Balcombe, OWCT Consultant
Number of participants this visit:
Interviews: _36_ interviews with _33__ employees (_11_ female)
Meetings:
Opening Meeting: _12_ LMITCo and DOE employees (no consent)
Town Meeting: _18_ attending (no consent)
Closing Meeting: _8_ employees (no consent)
Focus Groups: _53_

Visit: _2_
Dates of visit: __8/11-13/97__
# of staff attending: _1_
Research staff attending:
BU: Miriam Messinger, Project Manager
NIOSH: Drs. Soo-Yee Lim and Marty Martin
Number of participants this visit:
_13_Interviews with _15_ employees (4 female)
Groups
_1_ focus groups _1_ employees (_1_ females)
_2_ pilot testing groups _33_ employees (_11_ females)

Visit: _3, Survey Administration
Dates of visit: _8/19-20/98_
Summary: One staff person, Dr. Lew Pepper, was available to answer employee questions about the survey and to collect completed surveys.

K. Overview of Employee Assistance Program Data

EAP data requested

Organizations use Employee Assistance Programs (EAPs) to help assist employees in resolving their personal problems with the intention of improving organizational productivity. Of primary interest to our study was the role EAPs play in mitigating the psychological impacts that workplace changes have on employees. We collected both qualitative and quantitative data at the five study sites to characterize the content of these programs and describe how often they are used,. Telephone interviews were conducted with EAP directors and / or counseling staff to acquire descriptions of the following:

- types of services offered
- referral patterns to the EAP
- standard office procedures
- outreach programs
- staffing levels
- diagnostic trends observed during times of downsizing

Formal requests to obtain utilization statistics were sent to the EAP Director. We requested the following monthly data elements for the entire study period along with fiscal EAP budgetary statistics:

- number of employees utilizing service
- presenting problem during intake
- number of intake sessions (% spouse / dependents)
- number of repeat sessions (% spouse / dependents)
- number of workshops

Budgetary information which provided a means to assess a site's commitment in providing EAP services was not obtained from any of our sites. Only one site offered a reason for not sending this information: "It's none of your business."

EAP Services at the Idaho National Engineering and Environmental Laboratory

We interviewed EAP personnel at INEEL and reviewed EAP utilization data. Trends, observations and recommendations based on the analysis follow.

INEEL uses an on-site EAP which falls under the auspices of the Occupational Medicine Department. The program has operated throughout our study period and provides services to any employee associated with INEEL including LMITCo, DOE-ID, Argonne West and subcontractors. LMITCo employees are the primary program users. Most users (80-90%) are self-referred and there is no official cap on the number of sessions before an outside referral is made. With 3 counseling staff, the program has 120-200 contacts / month averaging 40 new cases / month.

The EAP has an office at both the "site" and "town" locations in order to make the program accessible to a wider employee population. The office conducts outreach by working closely with the outplacement center, publishing articles in the bi-weekly INEEL site newsletter, sending newsletters to all supervisors once a month, "walk-abouts" where staff talk directly

to employees in their work setting and by conducting workshops every month on a number of topics.

The dominant presenting problem for employees visiting the EAP during the 1995 and 1996 downsizing events was stress brought on by work-life changes and the subsequent impact on family and relationships. The consolidation under Lockheed Martin and the downsizing that followed required employees to confront dramatic changes in their work environment. Employees questioned whether they were going to have a job and, if they were eligible, whether to take the early retirement. During our first site visit interview with EAP, the office noted an increase in substance abuse cases and an increase in domestic violence as reported anecdotally by local law enforcement.

EAP counselors conducted workshops related to the consolidation in October 1994 (workshop titled: "Coping with change") and the 1995 downsizings (workshops titled: "Downsizing and Violence", "Effects of Downsizing", and "Up in Downsizing?" "Dealing with job uncertainty"). The EAP scheduled the workshops so as to proactively confront issues concerned with the consolidation and, later, issues characteristic of survivor syndrome. At question is whether enough employees had the opportunity to attend such workshops. Half of the downsizing workshops offered were directed solely to managers and there were typically no more than 10 workshops offered per topic averaging 20 employees per workshop. It appears that INEEL's EAP aptly anticipated areas for improving employee well-being but lacked sufficient resources to reach a large number of employees.

The INEEL EAP data coordinator provided monthly utilization reports for the entire study period though data elements are not consistently reported throughout the study period. Thus, our analysis of utilization patterns as it relates to times of workplace changes was limited. From the data we do have, it appears there was an increase of new cases from 1995-1996 even though the EAP office lost 1 counselor. From 1994-1996, the EAP saw an increase in employees visiting the EAP for substance abuse and occupational reasons. However, it's impossible to discern from this data whether or not the trends can be ascribed to the effects of downsizing at the site.

L. Description of Survey Scales and Alpha Coefficients

Measure	Description
Psychological Job Demand	A 9-item Karasek scale (α= 0.79) measures the psychological demands of one's work (part of Job Strain Model) (1, Strongly Disagree - 4, Strongly Agree).
Role Ambiguity	A 4-item Caplan scale (α= 0.89) examines how clearly job expectations and responsibilities are understood (1, Never - 4 Always).
Feedback Quality	A 3-item NIOSH scale (α= 0.87) asks about the quality and timing of information necessary to do one's job well (1, Never - 4, Always).
Job Security	A 6-item scale (α=0.72) with items from Karasek's job insecurity scale and newly constructed items. Measures how secure one feels in his or her current job as well as perceptions regarding new job opportunities (1, Not at All True - 4, Very True).
Toxic Exposure	3 Karasek items (α=0.76), measures one's perceived threat from environmental work conditions including chemicals, air pollution and disease pathogens (1, Not Exposed - 3, I am Exposed, and it is a sizable or great problem).
Noise	1 Karasek item that measures one's perceptions of exposure to noise at work (1, Whisper - 4, Shout).
Skill Discretion	This 6-item Karasek scale (α= 0.77) captures the spectrum of skills used in one's job. First of two "Decision Latitude" or control scales that form the Job Strain Model. (1, Strongly Disagree - 4, Strongly Agree).
Decision Authority	A 3-item Karasek scale (α= 0.79) measures decision-making authority in one's job. Second of two "Decision Latitude" or control scales that form the Job Strain Model. (1, Strongly Disagree - 4, Strongly Agree).
Macro Decision Authority	2 Karasek items (α= 0.43) that measure one's influence over work group decisions and whether decisions are made democratically (1, Strongly Disagree - 4, Strongly Agree - 9, I work alone).
Workplace Violence	An index of 3 items taken from a scale developed by Mangione measures hostility in the workplace (1, Yes - 2 No).
Supervisor Social Support	A 5-item Karasek scale (α= 0.88) asks respondents whether their supervisor provides personal support and facilitates productivity (1, Strongly Disagree - 4, Strongly Agree).
Co-worker Social Support	A 6-item Karasek scale (α=0.84) measures the degree to which co-workers are perceived as competent, cooperative, understanding and supportive (1, Strongly Disagree - 4, Strongly Agree).

Measure	Description
Morale	A 2-item Lim scale (α= 0.88) rating personal and co-worker morale at work (1, Very Low - 5 Very High).
Innovation	A 5-item Industry / Corning scale (α= 0.83) asks how supportive one's work environment is to new ideas and open dialogue (1, Strongly Disagree - 5 Strongly Agree).
Organizational Involvement	Part of Cook and Wall's (1980) Organizational Commitment scale (α= 0.68) which measures how involved one is in the work place (1, Strongly Disagree - 5, Strongly Agree).
Organizational Identification	Part of Cook and Wall's (1980) Organizational Commitment scale (α= 0.82) which measures how closely respondents identify with their employer (1, Strongly Disagree - 5, Strongly Agree).
Mission	A new BU 3-item scale (α= 0.63) inquires about one's understanding and opinions regarding the site's mission, as well as if one's work contributes to the mission (1, Strongly Disagree - 5, Strongly Agree).
Procedural Justice	A 4-item scale (α= 0.91) truncated from Moorman & Niehoff measures the justice in decisions and procedures used by supervisors (1, Strongly Disagree - 5, Strongly Agree).
Conflict Resolution	A 6-item Industry scale (α= 0.81) asks how problems are addressed within work groups and between contractors (1, Strongly Disagree - 5, Strongly Agree).
Organizational Communicat	A 3-item BU scale (α= 0.86) asks how strong communication is between management levels in the organization (1, Strongly Disagree - 5, Strongly Agree).
DOE Relations	A 4-item BU scale (α= 0.82) examines employee perceptions of the DOE and how well they interact with the site (1, Strongly Disagree - 5, Strongly Agree).
Safety	An 8-item Murphy / NIOSH scale (α= 0.90) measures safety and health practices (1, Strongly Disagree- 5, Strongly Agree).
Perceived Stress	A 4-item truncated scale (α= 0.76) from Cohen (1981) measures the degree to which situations in one's life are appraised as stressful (1, Never - 5, Very Often).
Coping / Stress Index	A 4-item Industry scale (α= 0.90) quantifies work stress in addition to the degree to which work stress is managed by the organization (1, Strongly Disagree - 5, Strongly Agree).
Work Performance	A 6-item scale (α= 0.53) (Mangione) measuring concepts of absenteeism, poor work habits, confrontations, and injuries (1, Never - 6 or more times).

Measure	Description
Job Satisfaction	A 4-item Caplan scale (α= 0.84) measures elements of job satisfaction including job training and decision involvement (1, Never - 4, Always).
Workload Dissatisfaction	A 3-item Caplan scale (α= 0.85) measures the satisfaction with the amount, pace and type of one's workload (1, Never - 4, Always).
Matrixing	A new 8-item Mangione scale (α=0.80) asks matrix employees to comment on issues such as divided loyalties, no home work group, not knowing co-workers, being a "generalist" rather than a "specialist," conflicting instructions, and supervisors being unable to thoroughly review the employee's performance (1, Not at All True - 4, Very True).
Restructuring Goals	A BU index of 8 potential goals for the latest restructuring. Respondents are asked to choose what 3 primary goals were and check whether or not those goals were achieved.
Opportunity	A 7-item Lim and Martin scale (α=0.91) measures the type of opportunities that emerged in one's job after restructuring (1, Much Less Often - 5, Much More Often).
Survivor Syndrome	A 6-item Lim scale (α=0.83) measures the adverse psychological effects experienced after downsizing(s) (1, Much Less Often - 5, Much More Often).
Skill Loss	2 items created by Murphy which ask respondents to recall the frequency that co-workers who left after the most recent restructuring had key knowledge and/or skills which were not replaced (1, None -4, 6 or more).
Downsizing Experiences Index	A BU index of 7 possible ways the respondent was affected by restructuring during 1991-1998 (possible scores 0-6).
Fairness or Downsizing Process Perceptions	A BU 14-item scale (α=0.87) measures perceptions of the processes used during the last major restructuring (1, Strongly Disagree - 5, Strongly Agree)
Medical Conditions	An index of medical conditions and whether each condition was diagnosed by a physician and if it was bothersome in the last six months (scored as 0-8, 1 point for each condition ever experienced).
Medical Symptoms	An index of medical symptoms experienced in the last 30 days (scored as 0-10, 1 point for each condition ever experienced, with symptoms grouped into five physical systems).
Short Form Health Survey (SF-12)	A 12-item version of the Short Form Health Survey (1996) comprised of two component scales: physical health (PCS) (α=0.57) and mental health (MCS) (α=0.69).

Measure	Description
Medical Assistance	2 items that inquire whether or not employees feel reluctant to seek medical or psychological support (1, Strongly Disagree-5, Strongly Agree).
Drinking	2 items which inquire whether the respondent drinks and if so, the number of days per week and the number of drinks consumed per day.
Alcoholism	4 items which are symptomatic of alcohol abuse, scored as an index (possible score 0-4, 1 point for each yes answer).
Smoking	An index of the type of tobacco product used, when use started, the average number used per day and the age when quit habit.

M. Variables Collected: Description, Scale Scores and Use in Model

Independent Survey Variables Included in HLM and Level 3 Models (ST and TRC)

Variable Name	Survey #	Scoring Equation and Interpretation
Downsizing Experiences Index	E5	Index of # of ways directly affected by the downsizing from 0-6. Scored as percentage: [(# impacts 0-6) / 6] x 100 High score is worse = more experiences
Fairness or Downsizing Process Perceptions	E6	Reverse score items "1" and "n" then sum all fourteen items. High score is better = a more fair process

Co-variate (control and mediating) Variables Included in the Hierarchical Linear Model (HLM) and (when indicated) the Level 3 Models

Variable Name ("+" indicates also included in Level 3 model for Sick time outcome; "~" indicates also included in Level 3 model for TRC outcome)	Survey #	Scoring Equation and Interpretation
Job category	A2	10 DOE categories summarized in 6 groups.
Years at site	A3	Continuous, High score = longer tenure
Pay Status + ~	A7	4 categories summarized into dichotomous term: 0= non bargaining unit; 1= bargaining unit employee. Interpret findings for bargainii unit members.
Psychological Job Demand + ~ (part of job strain)	B1	B1a + B1b – B1c – B1d – B1f + B1g + B1e + B1h + B1I High score is worse = more demand
Toxic Exposure ~	B4	B4a + B4b High score is worse = exposed & concerned
Noise	B5	High score is worse = noisier
Skill Discretion + ~ (part of control element of job strain)	B6	[B6g + B6i + B6a + B6e + B6f + (5 – B6h)] x 2 High score is better = more skill discretion
Decision Authority + ~ (part of control element of job strain)	B6	[B6b + B6c + (5 – B6d)] x 4 High score is better = more decision-making
Workplace Violence and Harassment	B7	Sum "yes" responses High score is worse = more experiences of Violence or harassment.
Supervisor Social Support + ~	C1	C1a + C1b + C1c + C1d + C1e High score is better = more support
Co-worker Social Support + ~	C2	C2a + C2b + C2c + C2d + C2e + C2f High score is better = more support
Conflict Resolution	C8	C8a + C8b + C8c High score is better = better at resolving Workplace conflicts
Organizational Communication	C9	C9a + C9b + C9c High score is better = better communication
DOE Relations	C10	C10a + C10b + C10c + C10d High score is better = better relations

Co-variates in HLM Model and Level 3 Models (continued)

Variable Name	Survey #	Scoring Equation and Interpretation
Safety & Health	C11	C11a + C11b + C11c + C11d + C11e + C11f + C11g + C11h High score is better = safer and healthier
Matrixing	D6	D6b + D6c + D6d + D6e + D6f + D6g + D6h + D6I High score is worse = more challenging experience as a matrixed employee
Drinking +	F11-F12	Multiply (F11) * (F12) to get Number of drinks per week High score presumed worse = more drinks
Alcoholism	F13	Create a cage / index. No = 0 and Yes = 1, rang 0-4 (0 = Not affected) High score is worse = more symptoms
Smoking +	F14	Dichotomous: never vs. current and former smokers
Gender	G1	1= female 2= male Interpret findings for females
Race / ethnicity	G2	6 categories; in model scored as 1=Caucasian, 2=person of color Interpret findings for non-whites
Education level	G3	7 categorical responses; summarized as continuous # of years of education High score = more years of education
Age	G4	Categorical High score = older
Marital Status	G5	5 categories summarized in dichotomous form: 1=never / prior marriage, 2= married Interpret findings for married respondents
Children	G6	Summarized in dichotomous form: children at home yes or no Interpret findings for people With children at home

Outcome Variables included in HLM

Variable Name	Survey #	Scoring Equation and Interpretation
Job Security	B3	B3.i – B3.a + B3.b + B3.d + B3.g + B3.h High score is worse = more insecure About job future
Morale	C3	C3.a + C3.b High score is better = better employee morale
Perceived Stress	D1	D1.b and D1.c reversed score then… D1.a + D + D1.c + D1.d High score is worse = more stress
Work Performance	D3	D3.a + D3.b + D3.c + D3.d + D3.e + D3.f High score is worse = more instances of Poor work performance
Survivor Syndrome	E3	Sum all 6 items (all in same direction) High score is worse = more symptoms
Medical Conditions	F1	No = 0, Yes = 1 (range 0-8) High score is worse = more conditions Reported (self- or doctor- diagnosed)
Medical Symptoms	F2	Sum within each body system: No = 0, Yes = 1 High score is worse = more symptoms reported
SF-12 (MCS and PCS are two subscales)	F3-F9	Score according to SF-12 manual High score is better = better physical or mental health

Archival Data (see Appendix H for rate calculation)

Variable Name	Source	Variable type	Model or reason for exclusion
Downsizing Rate	Contractor	Independent	HLM and Level 3 model High score presumed worse = more Downsizing in the level 3
Voluntary Rate	Contractor	Independent	HLM and Level 3 model High score presumed better = more Of the downsizing in the level 3 is voluntary
Overtime Rate	Contractor	(considered as outcome)	Excluded because data not collected for exempt employees High score = more overtime hours Taken per capita in the level 3
Sick time Rate	Contractor	Outcome	Level 3 model (No sick time data Available for NTS or INEEL —combined within paid leave) High score = more sick time hours Taken per capita in the level 3
Total Recordable Cases Rate (TRC)	DOE	Outcome	Level 3 model High score = more accidents (cases) Per capita in the level 3

Variables Excluded from Analysis in HLM and/or Level 3 model

Variable Name	Survey #	Reason Not Used*	Scoring Equation
Management level	A1	4	3 categories
Tenure in current job	A4	1	Similar to tenure at site
Shift, time in shift, overtime hours, days with other groups	A5, 6, 8, 9 a 11	5 (low variability	A5 categorical A6, 8, 9, 11 continuous
Role Ambiguity	B2	1 (morale .4)	B2a + B2b + B2c + B2d
Feedback Quality	B2	4 and 1(borderlin w / fairness)	B2e + B2f + B2g
Macro Decision Authority	B6	5 (alpha=.43)	B6j + B6k
Innovation	C4	1 (with many)	C4a + C4b + C4c + C4d + C4e
Organizational Involvement	C5	6	(reverse score C5a) + C5b + C5c
Organizational Identification	C5	1 (morale .58)	(reverse score C5f) + C5d + C5e
Mission	C6	2	If "yes," then… C6b + C6c – C6d
Procedural Justice	C7	1 (.44 fairness)	C7a + C7b + C7c + C7d
Coping / Stress Index	D2	1 (perceived stress -.54)	D2a+ D2b+ D2c+ (reverse score D2e)
Job Satisfaction	D4	6	D4a + D4b + D4c + D4d
Workload Dissatisfaction	D5	1 (job satisfaction)	D5a + D5b + D5c
Restructuring Goals	E1	2	1) percent choosing each goal 2) of those choosing a given goal, percent saying "yes" it was achieved
Opportunity	E2	6	E2a + E2b + E2c + E2d + E2f + E2g
Skill Loss	E4	4	Kept as separate items
Medical Assistance	F10 a, b	4	Two items summed

Several single (or 2) item concepts were dropped (including A10, 13, 14, C4f, D5d, B1j,B3e, B3 c / f, D2d, C7e / f, G6, G8, G9) because of ranking of conceptual importance and / or because they were not validated scales.

*Reason not used where: 1= correlated to another variable (.4 or greater)
2= >8% missing
3= Collection not consistent across site
4= lower conceptual priority due to limited space in model
5= low variability / range of responses or low alpha
6= variable type unclear (functioned as either co-variate or outcome)

N. Outcome Measures Compared to National Data Sets
Results of One-Sample T-Test

	Total Sample		Females		Males	
Outcome Variable	**INEEL**	**All Sites**	**INEEL**	**All Sites**	**INEEL**	**All Sites**
SF-12 PCS						
Sample size	1604	5520	462	1651	1128	3816
Mean Difference	2.48***	2.17***	2.87***	2.41***	1.68***	1.42***
Standard Deviation	7.15	7.19	7.65	8.01	6.88	6.76
SF-12 MCS						
Sample size	1604	5520	462	1651	1128	3816
Mean Difference	-4.14***	-2.43***	-3.97***	-2.72***	-4.60***	-2.7***
Standard Deviation	10.83	10.38	10.64	10.57	10.91	10.28
Perceived Stress						
Sample size	1660	5741	469	1703	1172	3969
Mean Difference	0.61***	0.18***	0.96***	0.62***	1.25***	0.79***
Standard Deviation	2.86	2.86	2.82	2.87	2.88	2.85

where ** = $p \leq 0.01$, *** = $p \leq 0.001$

O. Survey Comment Analysis Categories

Category	Sub-category
Relationships / Management	employee-employee relations employee-supervisor relations employee-management relations middle-upper management relations evaluation of management evaluation of supervisor(s)
Security / Future	personal future at site personal future beyond site recent job change interest in job change site mission and site future
Union	contractor-union interactions and issues personnel issues relative to union and non-union statu
DOE	DOE oversight and involvement at site DOE and contractor DOE and government funding
Physical work environment	worker comfort and accommodations infrastructure upkeep / maintenance
Workplace changes (other than downsizing)	hiring externally versus promoting from within military personnel influx contractor changes subcontracting outsourcing
Job demands	physical requirements workload work schedule
Human Resource Issues	sick leave policy health insurance benefits salary / pay issues overtime handling of personnel issues (ex: firing people)

Survey	comments on survey instrument personal info about responses (for example, responses related to accident)
Health	personal health issues stress Medical Department
Safety	hazards reporting safety concerns and DOE compliance dynamic between safety and productivity
Downsizing / restructuring	communication about downsizing personal impact impact on site process / implementation perceptions / fairness history / previous experiences
Organizational factors	program implementation / project completion procedures / regulations / paperwork security breaches / waste / fraud / abuse (include drugs and alcohol) training and support
Climate / Psychological work environs	morale conflict resolution innovation employee accountability professional atmosphere feedback / rewards teamwork / isolation

P. Hierarchical Linear Modeling Results at INEEL

Results presented for each of nine outcomes

Step 7: Medical Conditions

Effect / Variable	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	10.689	7.8148	30	1.37	0.1815
Ratio Downsizing	15.9207	29.7013	1191	0.54	0.5920
Downsizing Experiences Index*	0.0566	0.0187	1191	3.03	**0.0025**
Fairness*	-0.1016	0.0459	1191	-2.21	**0.0272**
Strain*	0.2083	0.0749	1191	2.78	**0.0055**
Gender	-1.8215	0.9429	1191	-1.93	**0.0536**
Race	-0.081	1.6516	1191	-0.05	0.9609
Education	-0.4449	0.2153	1191	-2.07	**0.0390**
Age	0.1393	0.0463	1191	3.01	**0.0027**
Married	-1.0123	1.0449	1191	-0.97	0.3329
Kids	-0.0528	0.8351	1191	-0.06	0.9496
Smoking	0.4516	0.8099	1191	0.56	0.5772
Drinks / week	0.0247	0.0912	1191	0.27	0.7865
Alcoholism*	0.0117	0.028	1191	0.42	0.6749
JOB Craft/Service	-3.9229	1.6526	1191	-2.37	**0.0178**
JOB Laborer / Gen Ser /	0.5652	1.8366	1191	0.31	0.7583
JOB Mgmt	-3.8674	1.551	1191	-2.49	**0.0128**
JOB Oper / Tech	-2.5966	1.3773	1191	-1.89	0.0596
JOB Prof / Admin	-0.478	1.0888	1191	-0.44	0.6607
JOB Scient / Eng	0	.	.	.	.
Site years	0.4406	1.3224	1191	0.33	0.7390
Pay Status	-0.4725	1.4167	1191	-0.33	0.7388
Matrix*	0.0343	0.0147	1191	2.34	**0.0194**
Conflict Resolution*	-0.0483	0.0392	1191	-1.23	0.2180
DOE*	0.004	0.0284	1191	0.14	0.8869
Safety*	0.0326	0.0379	1191	0.86	0.3904
Violence*	0.0871	0.0157	1191	5.56	**0.0001**
Supervisor Support*	0.0631	0.028	1191	2.25	**0.0245**
Co-worker Support*	-0.0289	0.0373	1191	-0.77	0.4386
Toxic*	0.0442	0.0302	1191	1.46	0.1439
Noise*	-0.0041	0.0306	1191	-0.14	0.8926
Communication*	-0.0117	0.0257	1191	-0.46	0.6482

*scales standardized

Step 7: Physical Component Scale (PCS)
Of the Short Form Health Survey (SF-12)

Effect / Variable	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	73.7552	6.0122	30	12.27	**0.0001**
Ratio Downsizing	15.9864	22.8751	1190	0.7	0.4848
Downsizing Experiences Index*	-0.0285	0.0144	1190	-1.97	**0.0487**
Fairness*	0.0363	0.0355	1190	1.02	0.3073
Strain*	-0.1109	0.0578	1190	-1.92	0.0552
Gender	1.774	0.7288	1190	2.43	**0.0151**
Race	1.3167	1.2628	1190	1.04	0.2973
Education	0.177	0.1656	1190	1.07	0.2856
Age	-0.1877	0.0356	1190	-5.27	**0.0001**
Married	0.132	0.8028	1190	0.16	0.8695
Kids	-0.6704	0.643	1190	-1.04	0.2973
Smoking	-0.0813	0.6248	1190	-0.13	0.8965
Drinks / week	0.0165	0.0704	1190	0.23	0.8144
Alcoholism*	0.0124	0.0215	1190	0.58	0.5632
JOB Craft / Service	-0.5925	1.2673	1190	-0.47	0.6402
JOB Laborer / Gen Ser /	-1.4684	1.4132	1190	-1.04	0.2990
JOB Mgmt	2.3727	1.1972	1190	1.98	**0.0477**
JOB Oper / Tech	-0.0488	1.0633	1190	-0.05	0.9634
JOB Prof / Admin	0.3969	0.8406	1190	0.47	0.6369
JOB Scient / Eng	0	.	.	.	.
Site years	-0.4899	1.0072	1190	-0.49	0.6268
Pay Status	-0.9145	1.094	1190	-0.84	0.4034
Matrix*	-0.0076	0.0113	1190	-0.67	0.5018
Conflict Resolution*	0.0124	0.0302	1190	0.41	0.6805
DOE*	-0.0087	0.0219	1190	-0.4	0.6905
Safety*	0.0306	0.0293	1190	1.04	0.2968
Violence*	-0.0464	0.012	1190	-3.85	**0.0001**
Supervisor Support*	0.0115	0.0216	1190	0.53	0.5949
Co-worker Support*	0.0406	0.0288	1190	1.41	0.1583
Toxic*	-0.0326	0.0233	1190	-1.4	0.1627
Noise*	0.0374	0.0236	1190	1.58	0.1141
Communication*	-0.029	0.0198	1190	-1.46	0.1444

*scales standardized

Step 7: Physical Component Scale (PCS)
Of the Short Form Health Survey (SF-12)

Effect / Variable	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	55.2979	8.2838	30	6.68	**0.0001**
Ratio Downsizing	-43.4596	31.5179	1190	-1.38	0.1682
Downsizing Experiences Index*	-0.0404	0.0199	1190	-2.03	**0.0422**
Fairness*	0.1266	0.0489	1190	2.59	**0.0098**
Strain*	-0.5223	0.0796	1190	-6.56	**0.0001**
Gender	1.1544	1.0041	1190	1.15	0.2505
Race	2.9691	1.7399	1190	1.71	0.0882
Education	0.1434	0.2282	1190	0.63	0.5301
Age	0.1009	0.0491	1190	2.06	**0.0399**
Married	-0.6921	1.1061	1190	-0.63	0.5316
Kids	-0.8241	0.8859	1190	-0.93	0.3525
Smoking	1.0167	0.8609	1190	1.18	0.2378
Drinks / week	-0.087	0.097	1190	-0.9	0.3699
Alcoholism*	-0.1547	0.0297	1190	-5.22	**0.0001**
JOB Craft/Service	3.5698	1.7461	1190	2.04	**0.0411**
JOB Laborer / Gen Ser /	-0.4798	1.9472	1190	-0.25	0.8054
JOB Mgmt	0.4925	1.6495	1190	0.3	0.7653
JOB Oper / Tech	0.1983	1.465	1190	0.14	0.8924
JOB Prof / Admin	0.8139	1.1582	1190	0.7	0.4824
JOB Scient / Eng	0	.	.	.	.
Site years	-0.261	1.3878	1190	-0.19	0.8508
Pay Status	3.1344	1.5073	1190	2.08	**0.0378**
Matrix*	-0.0209	0.0155	1190	-1.35	0.1781
Conflict Resolution*	0.1324	0.0416	1190	3.18	**0.0015**
DOE*	0.0464	0.0302	1190	1.54	0.1250
Safety*	-0.0828	0.0404	1190	-2.05	**0.0404**
Violence*	-0.0449	0.0166	1190	-2.71	**0.0069**
Supervisor Support*	0.0012	0.0298	1190	0.04	0.9670
Co-worker Support*	0.0632	0.0397	1190	1.59	0.1114
Toxic*	0.0089	0.0322	1190	0.28	0.7831
Noise*	-0.0331	0.0326	1190	-1.02	0.3099
Communication*	0.001	0.0273	1190	0.03	0.9722

*scales standardized

Step 7: Survivor Syndrome

Effect / Variable	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	70.1518	6.2363	30	11.25	**0.0001**
Ratio Downsizing	20.8097	25.4847	1161	0.82	0.4143
Downsizing Experiences In	0.0202	0.015	1161	1.34	0.1798
Fairness*	-0.1108	0.0365	1161	-3.04	**0.0024**
Strain*	0.3447	0.0605	1161	5.7	**0.0001**
Gender	1.3757	0.7564	1161	1.82	0.0692
Race	-5.6329	1.2977	1161	-4.34	**0.0001**
Education	-0.0977	0.1723	1161	-0.57	0.5709
Age	0.0509	0.0367	1161	1.39	0.1653
Married	-0.4256	0.8253	1161	-0.52	0.6061
Kids	-0.796	0.6633	1161	-1.2	0.2304
Smoking	-0.2579	0.6435	1161	-0.4	0.6886
Drinks / week	-0.0159	0.072	1161	-0.22	0.8247
Alcoholism*	0.0583	0.0221	1161	2.65	**0.0083**
JOB Craft / Service	-1.2268	1.3523	1161	-0.91	0.3645
JOB Laborer/Gen Ser/	-2.8918	1.4874	1161	-1.94	**0.0521**
JOB Mgmt	-0.483	1.2487	1161	-0.39	0.6989
JOB Oper / Tech	-0.4475	1.1178	1161	-0.4	0.6890
JOB Prof / Admin	-0.4458	0.9104	1161	-0.49	0.6244
JOB Scient / Eng	0	.	.	.	
Site years	1.2782	1.0447	1161	1.22	0.2214
Pay Status	1.4012	1.1545	1161	1.21	0.2251
Matrix*	0.0347	0.0122	1161	2.84	**0.0047**
Conflict Resolution*	-0.0838	0.0313	1161	-2.68	**0.0075**
DOE*	-0.0376	0.0227	1161	-1.65	0.0983
Safety*	-0.0036	0.0302	1161	-0.12	0.9054
Violence*	0.0107	0.0126	1161	0.85	0.3949
Supervisor Support*	-0.039	0.0225	1161	-1.73	0.0838
Co-worker Support*	-0.021	0.0299	1161	-0.7	0.4832
Toxic*	0.0006	0.0241	1161	0.02	0.9805
Noise*	-0.0104	0.0244	1161	-0.43	0.6707
Communication*	-0.0135	0.0206	1161	-0.66	0.5121

*scales standardized

Step 7: Medical Symptoms

Effect / Variable	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	33.0804	12.4689	30	2.65	**0.0126**
Ratio Downsizing	-75.7764	47.4652	1197	-1.6	0.1106
Downsizing Experiences Index*	0.1354	0.0298	1197	4.54	**0.0001**
Fairness*	-0.1717	0.0734	1197	-2.34	**0.0195**
Strain*	0.5149	0.1197	1197	4.3	**0.0001**
Gender	-3.9866	1.5073	1197	-2.64	**0.0083**
Race	1.6483	2.6416	1197	0.62	0.5328
Education	-0.6944	0.3435	1197	-2.02	**0.0434**
Age	0.0914	0.0738	1197	1.24	0.2157
Married	3.0054	1.6624	1197	1.81	0.0709
Kids	1.8314	1.3289	1197	1.38	0.1684
Smoking	-1.0817	1.291	1197	-0.84	0.4023
Drinks / week	-0.1009	0.1455	1197	-0.69	0.4881
Alcoholism*	0.1244	0.0445	1197	2.79	**0.0053**
JOB Craft / Service	-5.0751	2.643	1197	-1.92	0.0551
JOB Laborer / Gen Ser /	5.1125	2.9229	1197	1.75	0.0805
JOB Mgmt	-2.8678	2.4666	1197	-1.16	0.2452
JOB Oper / Tech	-2.3086	2.2001	1197	-1.05	0.2943
JOB Prof / Admin	-0.0051	1.7377	1197	0	0.9977
JOB Scient / Eng	0	.	.	.	.
Site years	0.7217	2.0911	1197	0.35	0.7301
Pay Status	-3.0132	2.2674	1197	-1.33	0.1841
Matrix*	0.0225	0.0234	1197	0.96	0.3368
Conflict Resolution*	-0.1864	0.0625	1197	-2.98	**0.0029**
DOE*	-0.0017	0.0454	1197	-0.04	0.9696
Safety*	0.1824	0.0605	1197	3.01	**0.0026**
Violence*	0.1223	0.025	1197	4.89	**0.0001**
Supervisor Support*	-0.021	0.0447	1197	-0.47	0.6389
Co-worker Support*	-0.0789	0.0596	1197	-1.32	0.1863
Toxic*	-0.0477	0.0483	1197	-0.99	0.3236
Noise*	0.1104	0.0489	1197	2.26	**0.0242**
Communication*	-0.063	0.041	1197	-1.54	0.1249

*scales standardized

Step 7: Work Performance

Effect / Variable	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	29.9353	7.211	30	4.15	**0.0003**
Ratio Downsizing	-23.595	28.4653	1203	-0.83	0.4073
Downsizing Experiences In	-0.0013	0.0173	1203	-0.08	0.9388
Fairness*	-0.0262	0.0423	1203	-0.62	0.5353
Strain*	0.3092	0.0693	1203	4.46	**0.0001**
Gender	-1.2232	0.8713	1203	-1.4	0.1606
Race	-2.0632	1.5159	1203	-1.36	0.1738
Education	0.1231	0.1995	1203	0.62	0.5372
Age	-0.143	0.0425	1203	-3.36	**0.0008**
Married	0.4766	0.9579	1203	0.5	0.6189
Kids	0.8578	0.7668	1203	1.12	0.2635
Smoking	0.9573	0.7451	1203	1.28	0.1991
Drinks / week	0.1499	0.0841	1203	1.78	0.0748
Alcoholism*	0.0544	0.0257	1203	2.11	**0.0349**
JOB Craft/Service	-3.2696	1.5397	1203	-2.12	**0.0339**
JOB Laborer / Gen Ser /	-0.5164	1.7043	1203	-0.3	0.7620
JOB Mgmt	-3.8418	1.4397	1203	-2.67	**0.0077**
JOB Oper / Tech	-2.1466	1.2829	1203	-1.67	0.0945
JOB Prof / Admin	-1.1847	1.0313	1203	-1.15	0.2509
JOB Scient / Eng	0	.	.	.	.
Site years	0.201	1.2091	1203	0.17	0.8680
Pay Status	2.1492	1.3264	1203	1.62	0.1054
Matrix*	0.0204	0.0139	1203	1.47	0.1416
Conflict Resolution*	-0.1135	0.0362	1203	-3.13	**0.0018**
DOE*	-0.0368	0.0262	1203	-1.4	0.1607
Safety*	0.0036	0.0349	1203	0.1	0.9188
Violence*	0.0639	0.0144	1203	4.43	**0.0001**
Supervisor Support*	-0.0128	0.0259	1203	-0.49	0.6216
Co-worker Support*	-0.0839	0.0344	1203	-2.44	**0.0149**
Toxic*	0.0046	0.0279	1203	0.16	0.8694
Noise*	-0.0525	0.0282	1203	-1.86	0.0626
Communication*	0.04	0.0237	1203	1.69	0.0920

*scales standardized

Step 7: Perceived Stress

Effect / Variable	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	53.9612	8.2122	30	6.57	**0.0001**
Ratio Downsizing	26.0812	32.6585	1197	0.8	0.4247
Downsizing Experiences In	0.0016	0.0197	1197	0.08	0.9370
Fairness*	-0.0933	0.0482	1197	-1.94	**0.0531**
Strain*	0.5333	0.0789	1197	6.76	**0.0001**
Gender	-0.3129	0.9916	1197	-0.32	0.7524
Race	-3.0857	1.7249	1197	-1.79	0.0739
Education	-0.2907	0.2278	1197	-1.28	0.2020
Age	-0.0323	0.0484	1197	-0.67	0.5049
Married	0.5275	1.0938	1197	0.48	0.6297
Kids	1.5826	0.8743	1197	1.81	0.0705
Smoking	-2.0455	0.8497	1197	-2.41	**0.0162**
Drinks/week	-0.2019	0.0966	1197	-2.09	**0.0368**
Alcoholism*	0.1553	0.0294	1197	5.29	**0.0001**
JOB Craft / Service	-0.9654	1.7583	1197	-0.55	0.5831
JOB Laborer / Gen Ser /	3.8701	1.9423	1197	1.99	**0.0465**
JOB Mgmt	-0.226	1.6465	1197	-0.14	0.8909
JOB Oper / Tech	0.5752	1.4633	1197	0.39	0.6943
JOB Prof / Admin	-0.9599	1.18	1197	-0.81	0.4161
JOB Scient / Eng	0	.	.	.	.
Site years	1.0072	1.3758	1197	0.73	0.4643
Pay Status	-5.5067	1.5137	1197	-3.64	**0.0003**
Matrix*	-0.0206	0.0159	1197	-1.3	0.1952
Conflict Resolution*	-0.0799	0.0412	1197	-1.94	**0.0531**
DOE*	-0.0534	0.0299	1197	-1.78	0.0745
Safety*	-0.0024	0.0398	1197	-0.06	0.9527
Violence*	0.0248	0.0165	1197	1.5	0.1332
Supervisor Support*	-0.0126	0.0295	1197	-0.43	0.6701
Co-worker Support*	-0.0468	0.0394	1197	-1.19	0.2349
Toxic*	0.0188	0.0319	1197	0.59	0.5552
Noise*	0.0528	0.0322	1197	1.64	0.1013
Communication*	0.0069	0.0271	1197	0.25	0.7999

*scales standardized

Step 7: Job Security

Effect / Variable	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	48.764	6.4842	30	7.52	**0.0001**
Ratio Downsizing	4.3544	34.0446	1168	0.13	0.8982
Downsizing Experiences Index*	0.055	0.0154	1168	3.56	**0.0004**
Fairness*	-0.1131	0.0374	1168	-3.03	**0.0025**
Strain*	0.3258	0.0608	1168	5.36	**0.0001**
Gender	2.7968	0.7726	1168	3.62	**0.0003**
Race	-0.2595	1.321	1168	-0.2	0.8443
Education	-0.0884	0.1782	1168	-0.5	0.6198
Age	0.0721	0.0377	1168	1.91	0.0563
Married	0.193	0.8418	1168	0.23	0.8187
Kids	-0.3619	0.6755	1168	-0.54	0.5922
Smoking	0.7424	0.6581	1168	1.13	0.2595
Drinks / week	-0.1377	0.0733	1168	-1.88	0.0605
Alcoholism*	0.0092	0.0225	1168	0.41	0.6819
JOB Craft / Service	0.7844	1.4293	1168	0.55	0.5833
JOB Laborer / Gen Ser /	1.451	1.5431	1168	0.94	0.3472
JOB Mgmt	2.0473	1.2986	1168	1.58	0.1152
JOB Oper / Tech	1.6132	1.1571	1168	1.39	0.1635
JOB Prof / Admin	1.1322	0.9854	1168	1.15	0.2508
JOB Scient / Eng	0	.	.	.	.
Site years	-0.5716	1.0682	1168	-0.54	0.5927
Pay Status	4.9413	1.2444	1168	3.97	**0.0001**
Matrix*	0.0342	0.013	1168	2.63	**0.0086**
Conflict Resolution*	-0.0786	0.0323	1168	-2.44	**0.0150**
DOE*	-0.0417	0.0231	1168	-1.8	0.0715
Safety*	0.0375	0.0306	1168	1.22	0.2219
Violence*	0.0406	0.0127	1168	3.21	**0.0014**
Supervisor Support*	-0.0461	0.0228	1168	-2.02	**0.0434**
Co-worker Support*	0.0161	0.0303	1168	0.53	0.5958
Toxic*	0.0679	0.0246	1168	2.77	**0.0058**
Noise*	-0.0342	0.0247	1168	-1.38	0.1667
Communication*	-0.0581	0.0211	1168	-2.75	**0.0061**

*scales standardized

Step 7: Morale

Effect / Variable	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	-5.0277	7.9866	30	-0.63	0.5338
Ratio Downsizing	-37.4204	38.4533	1201	-0.97	0.3307
Downsizing Experiences In	-0.0029	0.0191	1201	-0.15	0.8779
Fairness*	0.1065	0.0464	1201	2.29	**0.0219**
Strain*	-0.4445	0.0759	1201	-5.86	**0.0001**
Gender	-1.9789	0.9544	1201	-2.07	**0.0383**
Race	2.1055	1.6584	1201	1.27	0.2045
Education	0.7411	0.2209	1201	3.35	**0.0008**
Age	0.0275	0.0466	1201	0.59	0.5552
Married	1.4603	1.0424	1201	1.4	0.1615
Kids	1.9069	0.8361	1201	2.28	**0.0227**
Smoking	-0.0335	0.8153	1201	-0.04	0.9672
Drinks / week	-0.0089	0.0916	1201	-0.1	0.9229
Alcoholism*	0.0352	0.0281	1201	1.25	0.2118
JOB Craft / Service	-3.3227	1.7452	1201	-1.9	0.0572
JOB Laborer / Gen Ser /	-2.0519	1.9022	1201	-1.08	0.2810
JOB Mgmt	-2.0886	1.6085	1201	-1.3	0.1944
JOB Oper/Tech	-3.0536	1.4273	1201	-2.14	**0.0326**
JOB Prof/Admin	-2.7043	1.2023	1201	-2.25	**0.0247**
JOB Scient / Eng	0	.	.	.	.
Site years	-1.7253	1.3237	1201	-1.3	0.1927
Pay Status	-2.8533	1.5147	1201	-1.88	0.0598
Matrix*	-0.0219	0.016	1201	-1.37	0.1702
Conflict Resolution*	0.1654	0.0399	1201	4.15	**0.0001**
DOE*	0.046	0.0288	1201	1.6	0.1109
Safety*	0.1034	0.0382	1201	2.71	**0.0068**
Violence*	-0.0161	0.0158	1201	-1.02	0.3094
Supervisor Support*	0.1633	0.0284	1201	5.76	**0.0001**
Co-worker Support*	0.2261	0.0376	1201	6.01	**0.0001**
Toxic*	0.0248	0.0306	1201	0.81	0.4179
Noise*	-0.0084	0.0307	1201	-0.27	0.7846
Communication*	0.1274	0.0261	1201	4.87	**0.0001**

*scales standardized

Q. HLM 7 Step Summary for Selected Variables

Physical Health Outcomes

Significance Level= *** ≤.001 ** ≤.01 * ≤.05

PCS (SF-12)

	MODEL STEPS					
	2	*3*	*4*	*5*	*6*	*7*
Variable			*B Estimate*			
Downsizing ratio	19.96			14.65	14.11	15.99
Downsizing Experiences		-0.05***		-0.04**	-0.03*	-0.03*
Fairness		0.10***		0.07*	0.07**	0.04
Strain			-0.26***	-0.18***	-0.20***	-0.11
Gender					1.98**	1.77*
Race					1.41	1.32
Age					-0.19***	-0.19***
Marital status					-0.47	0.13
Alcoholism Cage					0	0.01

Medical Conditions

	MODEL STEPS					
	2	*3*	*4*	*5*	*6*	*7*
Variable			*B Estimate*			
Downsizing ratio	9.47			9.51	12.43	15.92
Downsizing Experiences		0.07***		0.07***	0.06***	0.06**
Fairness		-0.20***		-0.13***	-0.14***	-0.10*
Strain			0.45***	0.32***	0.33***	0.21*
Gender					-2.64**	-1.82
Race					-1.53	-0.08
Age					0.10*	0.14**
Marital status					-0.05	-1.01
Alcoholism Cage					0.03	0.01

Medical Symptoms

	MODEL STEPS					
	2	*3*	*4*	*5*	*6*	*7*
Variable			*B Estimate*			
Downsizing ratio	-70.25			-59.77	-75.60	-75.78
Downsizing Experiences		0.16***		0.14***	0.13***	0.14***
Fairness		-0.47***		-0.31***	-0.29***	-0.17*
Strain			1.11***	0.79***	0.78***	0.51***
Gender					-6.51***	-3.99**
Race					1.55	1.65
Age					0.02	0.09
Marital status					2.51	3.01
Alcoholism Cage					0.13**	0.12**

Mental Health Outcomes
Significance Level= * ≤.001 ** ≤.01 * ≤.05**

Norm MCS(SF-12)

	MODEL STEPS					
	2	*3*	*4*	*5*	*6*	*7*
Variable	*B Estimate*					
Downsizing ratio	-16.68			-26.48	-23.89	-43.46
Downsizing Experiences		-0.07***		-0.05*	-0.04*	-0.04*
Fairness		0.34***		0.21***	0.19***	0.13**
Strain			-0.83***	-0.66***	-0.66***	-0.52***
Gender					1.73*	1.15
Race					2.30	2.97
Age					0.12*	0.10*
Marital status					-0.31	-0.69
Alcoholism Cage					-0.14***	-0.15***

Survivor Syndrome

	MODEL STEPS					
	2	*3*	*4*	*5*	*6*	*7*
Variable	*B Estimate*					
Downsizing ratio	14.97			13.42	14.71	20.81
Downsizing Experiences		0.04**		0.03*	0.02	0.02
Fairness		-0.34***		-0.25***	-0.23***	-0.11**
Strain			0.61***	0.43***	0.46***	0.34***
Gender					2.04**	1.38
Race					-5.00***	-5.63***
Age					0.04	0.05
Marital status					0.20	-0.43
Alcoholism Cage					0.07***	0.06**

Perceived Stress

	MODEL STEPS					
	2	*3*	*4*	*5*	*6*	*7*
Variable	*B Estimate*					
Downsizing ratio	24.96			15.10	13.31	26.08
Downsizing Experiences		0.03		0.01	0.01	0.00
Fairness		-0.28***		-0.16***	-0.16***	-0.09*
Strain			0.75***	0.64***	0.64***	0.53***
Gender					-1.16	-0.31
Race					-2.08	-3.09
Age					-0.01	-0.03
Marital status					0.30	0.53
Alcoholism Cage					0.12***	0.16***

Organizational Outcomes
Significance Level= * ≤.001 ** ≤.01 * ≤.05**

Job Security	MODEL STEPS					
	2	*3*	*4*	*5*	*6*	*7*
Variable	*B Estimate*					
Downsizing ratio	-14.30			-11.71	-0.46	4.35
Downsizing Experiences		0.08***		0.06***	0.06***	0.05***
Fairness		-0.36***		-0.27***	-0.27***	-0.11**
Strain			0.67***	0.45***	0.49***	0.33***
Gender					3.36***	2.80***
Race					-0.56	-0.26
Age					0.03	0.07
Marital status					0.20	0.19
Alcoholism Cage					-0.00	0.01

Work Performance	MODEL STEPS					
	2	*3*	*4*	*5*	*6*	*7*
Variable	*B Estimate*					
Downsizing ratio	-43.96			-34.33	-33.18	-23.60
Downsizing Experiences		0.03		0.01	0.01	-0.00
Fairness		-0.23***		-0.14***	-0.12***	-0.03
Strain			0.54***	0.45***	0.44***	0.31***
Gender					-1.18	-1.22
Race					-1.80	-2.06
Age					-0.17***	-0.14***
Marital status					0.93	0.48
Alcoholism Cage					0.07**	0.05*

Morale	MODEL STEPS					
	2	*3*	*4*	*5*	*6*	*7*
Variable	*B Estimate*					
Downsizing ratio	-41.52			-52.05	-54.45	-37.42
Downsizing experiences		-0.01		0.02	0.01	-0.00
Fairness		0.69***		0.50***	0.48***	0.11*
Strain			-1.26***	-0.93***	-0.93***	-0.44***
Gender					-2.84**	-1.99*
Race					1.47	2.10
Age					0.03	0.03
Marital status					0.60	1.46
Alcoholism Cage					0.03	0.04*