

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 Pantex Plant

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

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 DOE Pantex plant. 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 1,274 workers at Pantex. Responses were returned from 62% (N=788 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 in departments or divisions having a higher downsizing rate reported more medical symptoms (e.g., headaches, shortness of breath, backaches), poorer mental health, and more job insecurity.
2. Workers who felt that the downsizing process was fair, and that communication was open and honest, reported less job insecurity.
3. 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 poorer mental health, and higher levels of stress

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 on-line 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)

- 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.
- Workers who reported good organizational relations with DOE had better mental health, higher morale, and lower stress.
- Focus group and interview data yielded several common themes:
 - workers reported satisfaction and trust in management
 - uncertainty about how the downsizing was to be accomplished created a lot of uncertainty and stress in workers
 - workers reported heavy workload, even before downsizing occurred
 - workers reported that the degree of worker decision-making authority had been reduced.

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:

- Implementing processes and policies that emphasize fair procedures, and open, timely, and honest communication to employees in all work units.
- Assessing workload demands following significant changes to a work unit or department.
- 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 Pantex 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, W. Mark Blackburn at (806) 477-3123. A copy of the complete report, [The Health Effects of Downsizing in the Nuclear Industry: Findings at the Pantex Plant](#), is available at the DOE Reading Room at Amarillo College, (806) 371-5400. 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

Pantex

Executive Summary

August 2000

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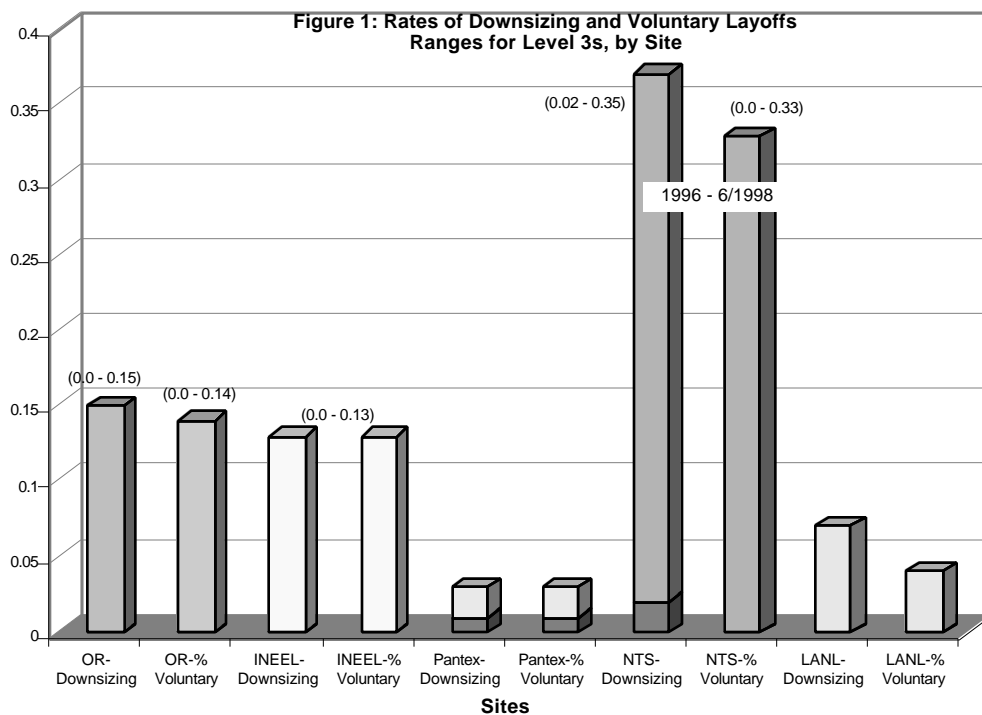
Copies of the complete report are available in the Pantex Plant Department of Energy Reading Room or contact John Campbell with Mason and Hanger (477-6616)

The Health Effects of Downsizing in the Nuclear Industry Pantex

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.

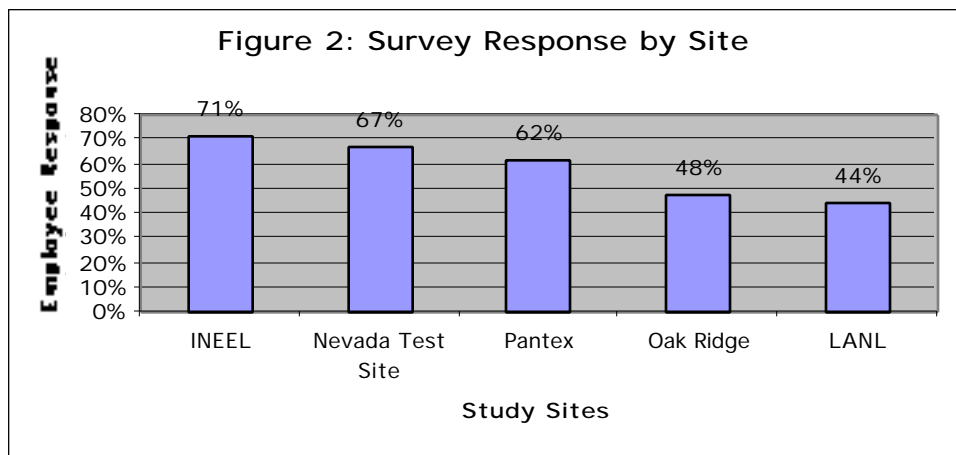
Boston University School of Public Health, with funding from the National Institute of Occupational Safety and Health (NIOSH), was selected to study and recommend ways to mitigate the impacts of workforce reductions on individual and organizational health.

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 Pantex Plant, 62% or 787 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 Pantex Demonstrate Need to Develop Interventions for Improved Employee Health.

No downsizing occurred at Pantex between 1991 and 1996. This was during a time when the DOE complex was under massive restructuring and downsizing was occurring at other facilities. In fact, the employee population grew 33 percent from 2,390 to 3,327 during this period (September 1991 to September 1996). It wasn't until 1996 that Pantex first confronted the pressure to downsize its workforce.

• **Definitions of terms**

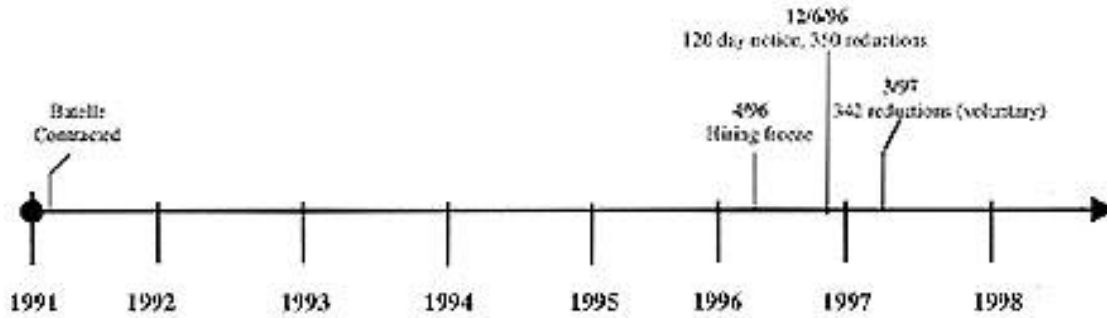
Job strain measures both the “demand” one experiences at work (physical and psychological) and the “control” an employee has over work tasks, where job control refers to the ability to structure your work, feel challenged and use your skills and training. Job strain is measured using three scales: the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

We chose the Pantex Plant as a study site for the following reasons: it is a medium sized site, it is located in a small city (Amarillo) and the DOE is the major employer for the region.

FIGURE 1: Timeline of Pantex Downsizing Events



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

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.
 - The more fair the downsizing, the less job insecurity was expressed.
2. Employees who reported more direct experiences of the downsizing performed worse on three of the nine outcome measures.
 - A higher score on the downsizing experiences index was associated with lower mental health score (MCS) and higher perceived stress.
 - The more downsizing elements experienced, the more instances of poor work performance.
3. Employees who have experienced greater job strain have reported an increase in adverse individual and organizational functioning outcomes.
 - Workers with higher job strain have increased reporting of medical symptoms.
 - Higher job strain was associated with poorer reported mental health status (lower MCS, and greater survivor syndrome and perceived stress).
 - Morale and job security were lower for employees who reported high strain.
4. A supportive supervisor and co-workers, good organizational relations and a safe workplace were associated with better employee health and organizational functioning.

Employees reporting greater support from their manager and co-workers have higher morale.- Employees reporting greater support from their co-workers report fewer instances of poor work performance, have better mental health status (higher MCS score) and less perceived stress.

 - Employees who perceive that their managers have good relations with DOE report fewer medical symptoms, a lower survivor syndrome score, and better mental health status (higher MCS score).
 - Employees who perceive exposure to a toxic environment report more medical symptoms.

5. Employees who experience 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 more medical symptoms, greater stress, and less job security.

6. Employees expressed some consistent concerns in employee discussion groups, interviews and comments written on the surveys. We heard that:
 - there was general satisfaction and trust in their supervisors and managers who they saw as accessible and involved.
 - there was general dissatisfaction towards upper management who were seen as being less visible and desensitized to the difficulties employees encounter than middle management.
 - notification and communication regarding downsizing were particular concerns with employees having experienced two extremes regarding downsizing notices: a single day in 1988 and a long period of mourning in 1997.
 - some employees expressed frustration with diminished control in their jobs related to shifting priorities, an excess of regulations and a hierarchy of approval necessary for change.
 - there was an increased safety climate at Pantex, partially due to an enhancement of the Voluntary Protection Program (VPP), and that some workers noted a strained dynamic between stop work authority and the productivity concerns of management.

Pantex 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. Surprisingly, unlike the other sites, the downsizing rate was associated with more outcomes than the other four study sites where it was only significantly associated with a total of three outcomes. Unlike the other sites, downsizing process variables at Pantex were associated fewer significant outcomes. High job strain had negative effects on employee health and organizational functioning at all of the study sites and at Pantex it was significantly associated with six of nine outcomes.

The experience of violence or harassment predicted increased health symptoms, greater stress, and less job security. Support from one's supervisors, and especially co-workers, was important at Pantex.

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 1,273 Mason & Hanger employees. We received a response of 787(62%) from Mason & Hanger employees. 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 the Pantex Plant: The Health Effects of Downsizing in the Nuclear Industry: Findings at the Pantex Plant.

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:

Pantex

October 2000

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Copies of the complete report are available in the Pantex Plant Department of Energy Reading Room or contact John Campbell with Mason and Hanger (477-6616)

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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 Pantex Plant, in Amarillo, Texas 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 Pantex Plant, the Idaho National Engineering and Environmental Laboratory (INEEL), the Los Alamos National Laboratory (LANL), the Nevada Test Site (NTS), and the Pantex 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 employees experience.
3. During periods of organizational change, one's work and work environment, including job strain¹, organizational style², co-worker and supervisor support, and workplace safety will affect both individual health and workplace functioning.
4. Workplace factors including job strain, organizational climate³, 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 Pantex Plant follow.

1. The higher the rate of downsizing in an employee's group, the more medical conditions and survivor syndrome symptoms he/she reported and the less secure an employee felt about job future.
2. The more fair employees rated the downsizing process, the fewer negative health and work functioning impacts they experienced including fewer medical symptoms and greater job security.

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 F).

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).

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 more negative health and work functioning impacts were seen, including lower mental health scores, higher perceived stress, and more instances of poor work performance.
4. Higher job strain was predictive of more medical symptoms reported, lower mental health scores, greater perceived stress, more survivor syndrome symptoms, and lower morale and job security.
5. Those who experienced more incidents of violence or harassment at work report more medical symptoms, greater stress, and less job security.
6. Support from supervisors and co-workers was associated with better overall mental health, less perceived stress, better employee morale, and with better work performance.

From our qualitative analyses we learned that employees report increased stress after the downsizing and that a focus on new safety procedures has not necessarily improved safety but rather reduced an employee's control over how to conduct work. Employees highlighted several major concerns in their work lives including poor or strained employee-management relations, a lack of trust in the organizational style, and increases in work demands. Pantex employees reported experiencing two extremes in communicating plans regarding downsizing: an early event with no advance notice and an event in 1997 announced nearly a year in advance.

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 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 DOE complex.

- **Many 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. At Pantex, special appreciation is due to our primary contacts John Campbell and Ken Meyers, as well as employees who provided us with site data, union representatives, and staff of the Pantex Pulse who publicized information and preliminary results. 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 their 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

⁴ Note: These overall employment levels and downsizing numbers are from Office of Worker and Community Transition. Later in this report, when we compare downsizing rates by site or

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: 1993 for Oak Ridge (Y-12 and other Lockheed Martin employees), 1988 at NTS, 1989 at LANL, 1991 at INEEL, 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 were voluntary separations.⁵ The percent of Section 3161 separations that were involuntary 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 1998⁷ (OWCT, 1999). At several sites, including the Pantex 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,⁸ have focused on the health, economic, or social consequences on those who are laid off. 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

organizational unit, we rely on data received from the contractors, broken down by department (numbers downsized and type of event).

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

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 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 the continual organizational change of this era. 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 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

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.

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, much less agreement exists 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. The literature on downsizing crosses 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 documents 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 (Lim/NIOSH) 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 measures 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 respondents within their everyday settings. 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 (such as the employee 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 that had 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, and 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: Pantex, Y-12, INEEL 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

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.

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 community meetings in four of the study communities including Amarillo, Texas; 15 to 30 people attended each meeting.

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. The *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 sites¹² and revised it based on

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

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.

- **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, division and sometimes department. This allowed us to account for a person's work unit as one important element in the analysis.

At the Pantex Plant, the study focused on the employees of Mason & Hangar, the prime contractor at the site. We randomly chose 1,179 Pantex employees (41.2% of the total workforce in May 1998) from a database of all employees (except those exempted)¹³ and invited them to complete the survey.

Pantex has 11 divisions ranging in size from 25 to 582 employees, with three divisions having fewer than 100 employees. Each division was a sampling unit and 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 (department or division).

Surveys were first mailed to sampled employees in September 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

might be unclear and asking for opinions about the overall survey and the likelihood that their colleagues would complete it.

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.

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.

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

During the first few site visits to Pantex and INEEL, we reviewed extensive records to determine those organizational data sets that would be useful for the study.

Unfortunately, records we reviewed¹⁴ 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 pursued with 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 also 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

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.

approach allows 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 took over 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 Pantex, 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 was 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.

C3. Brief Symptom Inventory (BSI) instrument

The Brief Symptom Inventory (BSI) is a short, self-administered psychological health assessment appropriate for non-patient adults. We elected to use this instrument at Pantex since our initial visit was taking place shortly before the site's first downsizing event. We intended to use the BSI to document the natural history of reactions to downsizing. Initially, we intended to use Pantex as the study's control site as there had not been any 3161 downsizing events (there was an event in 1988, prior to the post-Cold War downsizing) and the site's mission remained unchanged. We proposed using the BSI to measure the psychological state of Pantex employees before and after the downsizing event. This unique opportunity to measure psychological health over time makes it possible to understand the time course for the health effects of downsizing and to consider what effects occur acutely and what are chronic or long-term impacts.

The BSI consists of 53 items with 5-point rating scales. We added two questions regarding future career concerns at the Pantex Plant. A total of 12 scale-based

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.

assessments can be conducted using data gathered from the BSI (see Appendix J for details on the administration process and a list of BSI scales). We administered the BSI to 39 focus group participants during our first site visit in November 1996. We administered it a second time during a follow-up site visit in June 1997 (surveys were administered in a large group framework to a group of employees and added to the original sample and by mail to the original participants and others). A third administration, conducted entirely by mail, was sent to all those who had taken the survey at least once. These surveys were coded to enable us to compare individual responses over time. A distinct consent form was used for these participants as we requested permission to link their BSI and BUWS results. We analyzed the data of 57 Pantex employees who took the BSI two or three times and also completed the *Boston University Workplace Survey*.

V. SITE DESCRIPTION

VA. Site Characterization

A1. Site history

The Pantex Plant was originally established in 1942 as a conventional munitions plant during World War II. In 1951, 10,000 acres were reclaimed from Texas Technology and reopened by the Atomic Energy Commission (AEC). The AEC chose Pantex as the site for the expansion of its nuclear weapons assembly facilities. Procter and Gamble was the Managing and Operating (M&O) contractor for the Pantex Plant during the first five years of operation. After Procter and Gamble declined the renewal in 1956, Mason & Hanger-Silas Mason Co., Inc. (MHC) was awarded the contract. It has managed and operated the Pantex Plant since 1956.

Since 1975, the Pantex Plant has been the only DOE site with the principal mission of assembling and disassembling nuclear weapons. Its mission has included the following: fabricating chemical explosives for nuclear weapons, assembling nuclear weapons for the nation's stockpile, maintaining and evaluating nuclear weapons in the stockpile, and disassembling nuclear weapons retired from the stockpile. Pantex funding is primarily from Defense Programs. The closing of Rocky Flats in 1989 provided Pantex with the additional mission of the interim storage of plutonium pits.

Pantex has been a very stable site in terms of mission and contractor. Batelle was brought in as a partner on the M&O contract after a Tiger Team report in 1992 outlined some concerns regarding environmental issues. As of June 1998, there were 2,861 employees working for Pantex. Nearly fifty percent of the workforce is

unionized, the highest in the DOE complex. There are 12 locals comprised within the Metal Trades Council in addition to the International Guards Union of America Local 38.

A2. Site selection characteristics

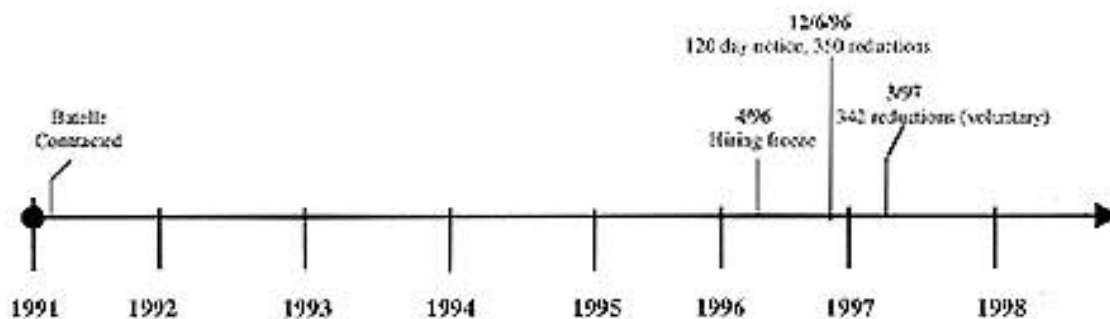
- **Reorganization and downsizing occur later at Pantex.**

The Pantex Plant was included in the study for several reasons: it is a medium sized site, it is located in a small city (Amarillo) and the DOE is the major employer for the region. An additional factor which made Pantex desirable to include is that it is the only site where we were able to gather health outcome data (BSI, see above) prior to the first downsizing event. The timeline below (see Figure 1) displays the downsizing events and other major organizational changes experienced at the Pantex Plant from January 1991 through June 1998.

- **Pantex's unique downsizing history made it important to include in this study.**

No downsizing occurred at Pantex between 1991 and 1996. At a time when the DOE complex was under massive restructuring and downsizing was occurring at other facilities, Pantex was somewhat immune because of a stable mission involving weapons disassembly. In fact, the employee population grew 33 percent from 2,390 to 3,327 during this period (September 1991 to September 1996). It wasn't until 1996 that Pantex first confronted the pressure to downsize its workforce.

FIGURE 1: Timeline of Pantex Downsizing Events



A3. Downsizing and restructuring history

- **Downsizing at Pantex begins in 1996.**

In April of 1996, MHC management was made aware of budgetary decreases that translated into a reduction of approximately 350 positions for fiscal years 1997 and

1998. In response to the funding cutbacks, MHC created and implemented a three-phase workforce restructuring plan. Part I included a hiring freeze and workforce planning and preparation of the 3161 plan; Phase II consisted of a Voluntary Separation Incentive Program (VSIP); and Phase III consisted of allowing approved VSIPs to use the career transition center and preparing for an Involuntary Reduction in Force (IRIF).

- **Planning for RIFs included steps to identify positions.**

The hiring freeze was instituted in April 1996. Between April 1 and December 6, 1996 Pantex reduced its population by 95 employees through attrition (129 employees left the payroll and 34 were hired as approved by the General Manager). Additional Phase I activities including identifying impacted positions, setting up a staffing plan and identifying vacancies, began in the late spring of 1996. The Workforce Transition Team (WTT), chaired by the Human Resources Manager and comprised of managers of other divisions including EEO/AA department as well as union leadership, was formed in March, 1996 to oversee the process and contribute to the DOE Workforce Restructuring Plan. Other bodies established to carry out this work were: The Workforce Steering Committee (WSC), The Workforce Planning Team (WPT) (both comprised of managers) and the 3161 Team (human resource and planning specialists; created when the WPT was finishing its work).

The WPT and division managers identified impacted positions by 1) determining the functions required to accomplish plant missions, 2) the number of employees required to carry out those functions and the necessary skill level, and 3) grouping employees with similar skill levels within specific plant functions into peer groups. Impacted positions were identified among various peer groups. As business needs allowed, division managers collapsed and integrated peer groups and functions aiming to make their divisions more efficient. Bargaining unit employees within the MTC were ranked in order of union seniority and considered for VSIP approval in a sequential order.

On December 6, 1996, DOE announced that 350 positions were to be eliminated and offered a VSIP. The VSIP included a cash incentive, extended medical benefits, educational assistance, and outplacement services. The application period began December 16, 1996 and ended January 24, 1997. A total of 441 applications were submitted (74 of these were withdrawn during the seven-day revocation period). Approval considerations for granting a request for voluntary departure included: 1) being part of an impacted peer group; 2) whether a qualified employee within the specific department or division was able to fill a non-impacted position; and 3) whether a non-impacted position was filled as a result of an internal Job Fair. In the end, 342 employees were approved for the VSIP with terminations effective March 1997. No involuntary downsizing was required since the number of voluntary separations was sufficient.

- **Mason & Hanger Corporation seeks communication and union involvement.**

The WPT analysis of downsizing events from other DOE facilities identified honest and open communication of information and inclusion of union representatives as essential to the restructuring process. Leaders from MTC and IGUA were invited to all meetings of the WTT and approved the process for granting VSIPs to bargaining unit employees. Letters from the General Manager discussing the planning process were printed on the front page of the employee newsletter (*The Pantex Pulse*).

Management reported that early in the process, they were instructed by DOE not to give specifics to employees (after the first announcements in early 1996); a product of a DOE "gag order." At least 11 written communications were distributed between December 2, 1996 and February 24, 1997 regarding impending deadlines, answers to commonly asked questions and updates on numbers of employees who had applied for the VSIP or for internal transfers. The written communications, video and employee packet each described aspects of the process.

- **Placement center provides testing and training to displaced workers and survivors.**

The Career Transition Center was subcontracted to Star Access, an out-placement firm. Opened on March 3, 1997, the center offered a full range of services that included free workshops on networking, resume writing, interviewing and financial planning. Computers, phones and copiers were made available to individuals for job searches. Career counselors were available for individual sessions. We are unaware of any specific job training/ retraining programs used for survivors.

- **Economic development programs not created.**

We are not aware of any economic development efforts related to the restructuring of the DOE complex.

- **Minor restructuring reported at Pantex.**

Mason & Hanger have managed the site for the entire study period with the exception of Batelle partnering with Mason & Hanger in 1992 to manage the environmental operations. The Pantex Plant underwent minor internal organizational restructuring in tandem with the 1997 downsizing event. Restructuring activities primarily consisted of consolidating the Quality Division into other extant divisions and eliminating or consolidating departments within divisions.

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 (11/96, 6/97, 7/98) to Pantex. These visits included interviews with union and management, meetings with employees in charge of data of interest, focus group discussions, pilot-testing of the employee survey, workplace observations, and a community meeting. During the first two site visits to Pantex, we conducted interviews with 49 people from a variety of unions and departments (health and safety, human resources, employee grievances, medical services, EAP) at the site. We toured those facilities that did not require special clearance. See Appendix K for details about the site visits.

Pantex was one of the last DOE facilities to experience downsizing associated with the restructuring of the DOE complex. The General Manager made an announcement early in 1996 that a reduction in force was to be expected, but was ordered by DOE not to delineate any details until a later date. The official announcement for the first downsizing was distributed to Pantex employees in November 1996, one week after our first site visit. During our interviews, we heard opinions about the upcoming downsizing, effects from the instituted hiring freeze, and changes in the work culture associated with the newly implemented standardized operating procedures.

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

A few interviewees conveyed the confusion and frustration felt by the employee population regarding the rationale for the upcoming downsizing. Workers felt that there was too much work and thus could not understand the need to downsize employees. Many bargaining-unit employees were reported to be in disbelief that their jobs could potentially be affected.

The early downsizing announcement by the Plant Manager left employees “in the dark” for an extended length of time. The uncertainty was said to have impacted morale and increased the personal stress level of employees. Some employees vividly remembered Pantex’s earlier downsizing which was experienced as somewhat traumatic with employees being escorted out by guards on the day they received their layoff notice. The experience left them with the lasting impression that management doesn’t care about employees; they are simply another number on the fiscal budget.

Employees discussed increasing workloads, particularly in support organizations, as staff size decreased by attrition as a result of a hiring freeze. One DOE employee called loss through attrition a “Brain-Drain”—stating that good people choose to leave because they have other, more stable opportunities. One manager’s method to survive short staffing and budget cuts was creating greater efficiencies, cutting overtime, better scheduling and refusing more DOE work.

Union leaders did not blame management for the possibility of future downsizing and resulting frustration, uncertainty and disappointment on the part of employees. Unions view management as simply implementing DOE directives. In recent years, because in part of new union leadership there has been more union-management collaboration on workplace issues. Both union and management commented on the effective elements of trust and communication in their working relationship.

A major issue at the Pantex Plant was the change in operations from an expert-based to a standardized procedures based system of operations. Supervisors from the Nuclear Navy were brought in to implement procedural changes and encountered intense resistance by production technicians. Workers resented the implication that the plant wasn't safe and that DOE proceeded to bring in a group with no expertise or institutional knowledge necessary to implement changes in their work procedures. Tremendous strain still existed between the nuclear navy recruits and technicians at the time of our site visits. The plant was regarded by all as a very safe facility, hailing their strict stop-work authority and their widespread participation in the Voluntary Protection Program (VPP).

A second workplace issue was the change in medical policies at the plant. A new medical director implemented stricter standards on workplace restrictions and a screening for drug and alcohol abuse. The sense of a medical "watch-dog" created greater fear in employees that their clearances, essential for job security at Pantex, could be revoked.

B2. Focus groups: methods and themes

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

A total of 39 employees participated in five focus groups held in November 1996. Focus groups conducted with Pantex employees captured employee concerns related to the workplace and organizational structure (management, safety, downsizing and procedures).

We developed a list of concepts from an initial reading of the focus group transcripts and concepts utilized in the employee survey. The concepts include job characteristics, health and safety, and restructuring/workplace changes. Comments from the focus groups were categorized (coded) in a database by concept. The comments under each concept were then described in a paragraph with supporting quotes. Reports of themes were written up by site followed by a cross-site analysis of themes to compare the various manifestations and dynamics of these issues at different sites. A qualitative summary of the dominant themes that emerged from the focus groups follows..

Management. Focus group participants expressed a general satisfaction and trust in their supervisors and managers. Explanations for their approval were based on

management making an effort to understand the nature of the employee's work in addition to interacting more often with employees rather than just when problems arise. What employees saw as successful management strategies among mid-level managers/supervisors parallels the dissatisfaction towards upper management. Limited upper management visibility translated into employees feeling as though upper-management is desensitized to the difficulties employees encounter, leading to a limited understanding of their workload and how to deal with problems effectively.

Safety. All focus groups commented on the increased safety climate at Pantex, partially due to an enhancement of the Voluntary Protection Program (VPP). Participants in focus groups conducted with operators, crafts people and technicians reported on the dynamic between stop work authority and productivity concerns of management as well as peer disapproval. While production technicians can stop work at any time for clarification or safety concerns, exercising this right is not perceived similarly among employees. Some workers feel free to exercise their work stoppage right, but other sense disapproval or pressure from peers for taking this action as well as the pressure of missing productivity goals and contract obligations which appear to be the primary concern of management. During the study period there was a highly publicized case charging unsafe work practices at the plant.

Downsizing. Seniority, union membership, proximity to retirement and possession of valued skills are perceived as potentially playing a role in reducing the uncertainty involved with downsizing. For those in a union, where layoffs are conducted by seniority, some of the fear and uncertainty is mitigated because of clarity about the process by which layoffs occur. Notification and communication regarding downsizing were particular concerns at Pantex. Employees have experienced two extremes regarding downsizing notices: a single day in 1988 and a long period of mourning in 1997. After experiencing both extremes, employees recommend that decisions regarding a downsizing take two months rather than being drawn out over a year and that the method of communicating information to the plant is improved. In terms of the process as a whole, participants approved of utilizing voluntary leave incentives and attrition as a means to "humanely" reduce the workforce.

Workplace changes other than downsizing were also noted. The influx of nuclear navy personnel was extremely difficult for some workers to adjust to. Differences in work culture were cited as well as some employees stating that the nuclear navy personnel are an affront to their knowledge and experience: "We've spent 30 years making weapons without the nuclear navy."

Procedures. Some employees expressed frustration with diminished control in their jobs related to shifting priorities, an excess of regulations and a hierarchy of approval necessary for change. An increased monitoring of breaks, lunchtimes and time away from work due to illness further impacts workers' perception regarding

the lack of control even in their general work environment. Workers stated feeling more pressure on the job and low morale which appears to be a combination of a lack of ownership and a lack of pride. Some employees did report having some ownership over their work even within a regulated workplace because of opportunities for input, an ability to set pace of work and a freedom to work independently. Taking pride in one's job and owning the work product were seen as related to opportunities to contribute to innovations and dynamic, challenging work.

Some of the themes appear relevant to all of the five DOE sites whereas others are unique to Pantex: the improved safety atmosphere; a history of an unpleasant downsizing event that is embedded in the institutional memory; and, as at Y-12, concerns about the presence of Nuclear Navy personnel and the shift to a proceduralized safety protocol. We tailored questions and lines of analysis for subsequent site visits based on these initial findings.

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 Pantex Employee Assistance Program (EAP) is attached as Appendix L.

C1. Workshops and services

- **Few sites offer targeted training for survivor syndrome.**

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 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 conduct formal assessments to determine whether sufficient workshops were offered. Employees were not as receptive to mandated workshops on change; these were seen as propaganda tools and not helpful.

We spoke with the previous EAP provider during our initial site visit to Pantex. We were able to identify existing employee concerns one month prior to the official downsizing announcement. According to the EAP coordinator at the time, depression was severe among employees who sought out the EAP. They expressed concern about their finances and the need for re-training. Employees who knew they wouldn't be downsized expressed sentiments of survivor guilt.

A few interesting issues emerged at Pantex about downsizing that differed from the other sites. Pantex was the last of our study sites to undergo a true downsizing. Its management and workforce saw itself as unique within the DOE complex. As one Pantex employee noted in an interview, "Pantex is the only site in the complex with an identified mission of assembly and disassembly of weapons - why downsize here? National security is at stake. The projections are all hypothetical, guesswork. The uncertainty takes people's minds off their jobs. We're the 'Last of the Mohicans' to downsize - why not use 'lessons learned' from other sites?" In Pantex's case, the lack of any history of downsizing contributed to a pervasive sense of uncertainty about the unknown.

The EAP reported employee concerns about finances and job training along with clinical concerns about depression are consistent with the rapidly changing economic world experienced by site workers. This may have been especially acute at Pantex since only one downsizing event occurred during the study period.

C2. Consistencies across sites

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

The interviews and questionnaires used with 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 Y-12 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. LANL staff expressed concern that recent espionage charges at the site might exacerbate these employee concerns.

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.

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 coefficients can be found in Appendix M). The scores for all composite scales were standardized, on a range of zero to 100, for ease of comparability.¹⁷ 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

¹⁷ Each scale in the analysis has its own scoring calculation and the scales have varying numbers 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

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 N contains a list of each variable collected, with information about scale scoring and construction 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.

1. Individual level co-variate blocks: *sociodemographics/SES, alcohol/tobacco use*
2. Job level co-variate blocks: *job strain, job characteristics*
3. 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:

- 2) **physical health outcomes:** *physical component scale of the SF-12, medical symptoms and medical conditions;*
- 3) **mental health outcomes:** *mental component scale of the SF-12, survivor syndrome and perceived stress; and*
- 4) **outcomes directly related to organizational functioning¹⁸:** *work performance, job security and employee morale.*

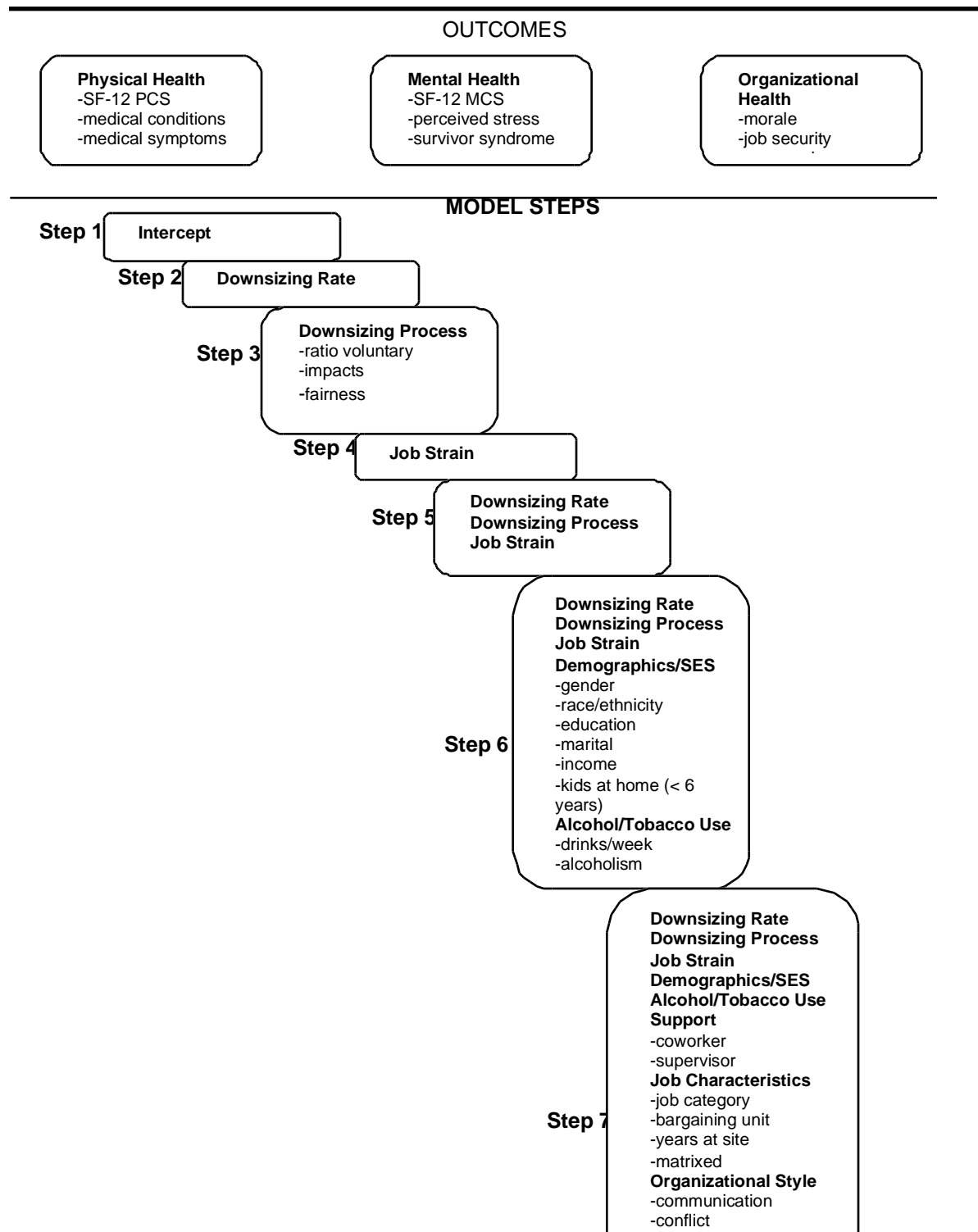
- **Statistical model offers a view of how variables function individually and in combination.**

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, with the variables for each step and the variable block names in bold print.

¹⁸ 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*.

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.¹⁹ These factors included strain, fairness, race, violence, conflict resolution, supervisor support and co-worker social support.

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.²⁰ 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 instead 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 (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.²¹

²⁰ 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).

²¹ 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.

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.

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 j th working group is the sum of an “intercept” (mean) for the employees’ working group and random error:

$$X_{ij} = \mu_{0j} + e_{ij}$$

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 j th working group is the sum of an overall mean and a series of random deviations from that mean:

$$\mu_{0j} = \mu_0 + q_{0j}$$

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

$$X_{ij} = \mu_0 + q_{0j} + e_{ij}$$

where μ_0 is a fixed effect that represents the average outcome in the population, q_{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. 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, and 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 (2,093) through June 1998 (2,901) was a gain of 808 employees according to data submitted from Mason & Hangar’s Human Resources office. From the highest employment point in 1996 (3,286) to the

end of the study, Mason & Hanger lost 385 employees or 11.7% of their population through downsizing and attrition.

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

At the Pantex Plant, 327 employees were laid off during one voluntary downsizing event during the winter of 1997.²² The annual downsizing rate, calculated as the number of people downsized divided by the population at the start of the calendar year, was 10% in 1997 and zero for all other years (see Table 1), with a study average of 1.3 percent.

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We collected downsizing data by level 3 including voluntary and involuntary layoffs from the current contractor. This data was collected for each study year, 1991 through 1998, for which there were layoffs and available data at this level. At Pantex we collected data from Mason & Hanger for the single downsizing event in 1997 and we were able to assign a level 3 to all of the data. Downsizing rates ranged from 5% to 17% across level 3s (see Table 2). Since all layoffs were characterized as voluntary, we did not include a separate term for voluntary rate in the model.

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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 1991 through 1998).

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 Pantex ranges from 0.7% to 2%, with a mean of 1.3% and 90% of the level 3s having a downsizing rate of 1.6% or lower. The voluntary rate is exactly the same. The rates at Pantex are the lowest of the five study sites, with smaller numbers laid off and only one downsizing event during the study period, more than one year prior to the survey administration.

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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). Table 3 shows the descriptive statistics for this data across level 3.

²² Please note that all figures regarding net employment change and downsizing in this section come from contractor data. OWCT numbers in their Annual Reports on Contractor Work Force Restructuring will differ slightly because of different methods of data collection or distinct criteria. OWCT records for the period September 1990 to September 1998 show a net change in employment of +347 employees, with a drop of 428 from the employment high in September 1996, and a total of 407 employees separated (65 through attrition) all in FY 1997.

The study-wide analysis of this data, using these two workgroup measures as outcome variables, will be presented in the *Five-Site Final Report*.

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VII B. Survey Data: Descriptive Tables

B1. Survey responders

- **High response rate is obtained.**

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 Pantex Plant 62% or 792 employees completed the survey. Response rates at the five sites are shown in Table 4.

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As seen in Table 5, the majority of the Pantex sample is male (69.6%), Caucasian/non-Hispanic (84.9%), and younger than fifty years old (67.8%). Responders are well educated: 43% have completed college or attained a degree beyond college and another 49% have completed some training or college beyond high school.

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- **Site has highest number of bargaining unit employees in study.**

The largest segment of responders is exempt, salaried employees (47%) and 35% are members of a bargaining unit. Pantex has a higher rate of bargaining unit members than other sites included in this study. As with most DOE sites, there is a tradition of long job and site tenure. Of those responding to the survey, the average site tenure is 12.8 years with 75% of employees at the site for at least five years. The average site tenure for the five-site sample was 14.5 years.

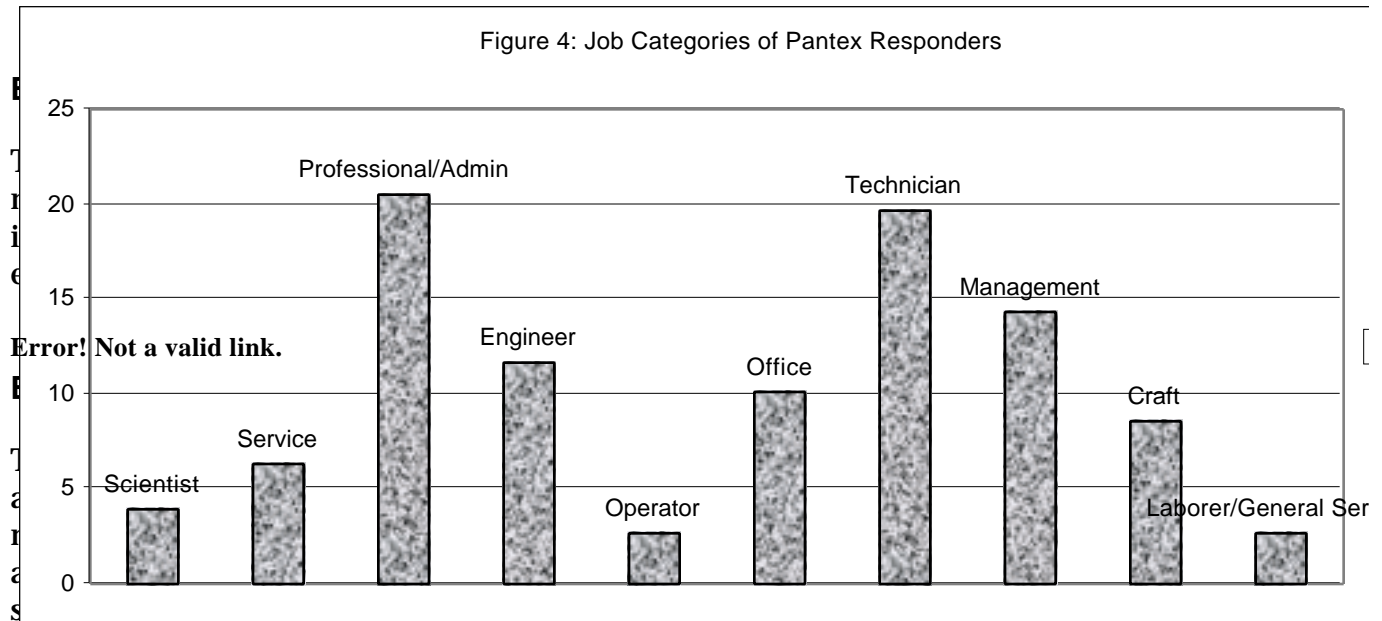
- **Responders were representative of the site but differ in some key respects.**

In Table 6, we compare Pantex responders with all site employees on demographic variables including gender, race, age, and union status. The group of responders were fairly comparable to the site overall, although responders had less non-white and union representation and slightly higher than representative responses from older employees and 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.²³

²³ Given that we did not know exactly who had returned a survey but only who had sent back a postcard, we could not separate responders from non-responders. The best comparison then was to the site demographics overall. No statistical comparison was possible since the groups are not mutually

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The Pantex Plant is an assembly/disassembly facility. This mission is reflected in the distribution of employees across job categories. The 10 job categories below (Figure 4) are taken from the Department of Energy's Common Classification System (COCS).



norms here because the international JCQ norms are reported by job category and those differ from what 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.²⁶ Because our demographic categories differed from the way in which 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

exclusive. In Table 6 we compare the overlapping groups on a few variables that were collected from the Human Resources department prior to survey sampling.

²⁴ 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 M and N.

²⁵ 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, job insecurity.

²⁶ 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., & Williamson, G. (1998). Perceived Stress in a probability sample of the United States. In S. Spacapan, & S. Oskamp (Eds.), *The Social Psychology of Health: Claremont Symposium on Applied Social Psychology*. Newbury Park, CA: Sage.

different among Pantex and the sample of all five sites combined (All Sites) compared to published, general population norms. We compared our data (both Pantex-specific and All Sites) with national norms for the total samples and by gender.

- **Comparisons to national norms reveal expected as well as unanticipated results.**

In summary, Pantex employees showed significant differences from the national population on the physical health scale (PCS) when compared overall and by gender to the national sample. The total Pantex sample scored 2.3 points higher and 1.8 and 1.7 points higher for males and females respectively, indicating better measures of physical health among the Pantex employee sample when compared to the general population. A similar trend was demonstrated for the All Sites sample as well. Both the Pantex population and the All Sites sample, when compared overall and by gender to the national data, demonstrated poorer mental health on both the MCS (lower scores) and the perceived stress (higher scores) scales. The only exception to this trend was among female Pantex employees who scored higher than the MCS norms.

In general, we might expect that a working population would be healthier than a general sample of US adults. This appears to be the case for the employees of Pantex and our All Sites sample. While one might also expect workers to have better mental health scores than the general population, we hypothesize that downsizing has an overall stress effect on employees. This hypothesis is born out by these numbers which show the Pantex and the five site populations with slightly lower mental health on the MCS and higher perceived stress than the normative data from a general population. However, only the difference in the perceived stress scores between the Pantex sample and the comparison group was statistically significant ($p \leq 0.0001$).

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 that were 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 P for coding themes). Frequencies were run on the categories for both open-ended questions to identify areas about which respondents most frequently commented (436 employees or 55% of respondents offered one or more comments).

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

The majority of the comments from Pantex employees most commonly fell into four general categories: organizational factors, job demands, human resource issues, and evaluation of management and employee-management relations. Within these

categories, employees documented a wide variety of concerns and, at times, conflicting opinions were expressed. A summary of the major points is presented here.

Most comments about organizational factors focused on a perceived lack of encouragement and opportunities for job-related training and education. With technology and job requirements constantly changing, employees feel that additional opportunities to update their skills would allow them to complete tasks more effectively and efficiently. Some employees expressed a need to cut down on unnecessary training. These respondents characterized over-training as repetitive, irrelevant, and counter-productive.

The most frequent comments indicated that employees feel overwhelmed by unnecessary and redundant bureaucratic requirements, in the form of mandatory meetings, paperwork, and rules. Respondents say that their “hands are tied” by red tape that often creates problems, rather than addressing the ones the policies were designed to solve. Such comments often took the form of a plea to management to allow employees more freedom and the opportunity to use more common sense rather than rely on directives.

Comments about job demands most frequently emphasized the desire for more flexible work schedules and a better balance between work and other life demands. Respondents indicated a preference for a four day 10 hour workweek and/or flex-time to allow workers to spend more time with family and perhaps reduce stress levels. Many employees say they are forced to carry the responsibilities of two or more full-time employees because coverage is often spread too thin. This makes it difficult to meet deadlines and to complete assignments effectively.

Employees reported frustration about personnel issues, particularly the disciplining of problem workers and the process by which promotions and advancements are awarded. Responders comments convey the sense that discipline is applied inconsistently and unfairly when rules are broken at Pantex. One respondent wrote: “Instead of punishing all employees because some disobey the rules, punish the ones that are at fault.” In addition, some responders felt that stricter enforcement is needed, otherwise there is “no motivation to follow the rules” and employees believe that the contractor is not acting for fear of being sued.

Respondents also suggest that the system for giving promotions is flawed, with favoritism and ethnic and gender discrimination playing a major role in determining who advances. As one employee stated, “it’s who you know, not what you know.” Individuals of varying racial, ethnic and gender groups felt that people in groups other than their own were receiving unfair advantages. Comments in this category most often stated the desire for rewards to be based upon performance or years of service.

Comments about management focus largely on a lack of proper communication between employees and their superiors, with rampant rumors often the result. Some workers feel left in the dark when it comes to information they see as crucial to their jobs. Another common complaint in this category is that management seldom solicits employee feedback on decisions that will ultimately affect workers. Employees want input, and, as one respondent stated, wish management would “listen instead of always turning a deaf ear to everything.”

Other comments regarding management address the view that they are largely inexperienced and ill-prepared for the duties bestowed upon them. One employee wrote: “Management are promoted by the ‘good ol’ boy’ system and therefore are not properly trained.” Others feel that, although many managers bring an array of technical skills to the job, they are incapable of leading.

VIII. MULTI-LEVEL MODEL RESULTS

We use 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 -100. We report mean and standard deviation for variables and present the effect size (beta coefficient) and p value when a variable is significantly associated with an

outcome. Complete results for each of the nine outcomes are attached as Appendix Q 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 R.²⁷

VIIIA. Individual Level Controls

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

Five of the demographic variables measured in the survey²⁸ 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. with better mental health on two of three measures (PCS and perceived stress) as well as with better work performance. Female employees reported fewer medical conditions and symptoms and fewer instances of poor work performance.

Job characteristics including pay status (bargaining unit/non-bargaining unit), tenure at site, matrixing, and job category,²⁹ 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.

Three of these variables were significantly associated with one or more outcomes. Being a member of a bargaining unit at this site with high union membership (nearly 50%) was associated with lower perceived stress. Employees with longer tenure reported lower morale, more medical conditions and greater perceived stress.

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. Matrixing was not discussed extensively by Pantex employees and was not statistically associated with outcomes at Pantex although it was at other sites. A more negative experience as a matrixed employee (low connection to group, inadequate supervision, etc.) was statistically associated with three outcomes at INEEL and with six at LANL.

We also controlled for tobacco and alcohol use. Surprisingly, tobacco use was not significant for any of the health outcomes.³⁰ The number of drinks consumed per

²⁷ For additional information, see Table 7 above for descriptive statistics for all scales and Appendix N to understand how to interpret scale scores.

²⁸ Other individual level variables that were 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.

²⁹ 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.

³⁰ 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

week was associated with overall health score in an unexpected direction with more consumption associated with better health (also seen at Oak Ridge). A higher score on the alcoholism index was surprisingly associated with greater job security and higher morale.

VIIIB. Downsizing

Our first 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 1998.³¹ Pantex was the site with the fewest people downsized and only one downsizing event during the study period. The downsizing rate is applied to each individual in the level 3. The individual experience of downsizing is discussed below in the section on downsizing process.

At Pantex, the downsizing rate variable ranged from 0.7% to 2% across the 11 level 3s in the model with a mean of 1.3 and 90% of the observations with a rate below 1.6%.

- **Downsizing is statistically significantly related to three outcome variables.**

As Table 8 demonstrates, downsizing rate was significantly related to three of the nine outcomes at Pantex (see Table 8). Higher downsizing was predictive of more medical conditions ($p \leq 0.01$), lower overall mental health ($p \leq 0.05$) and greater job insecurity ($p \leq 0.001$). The downsizing rate was only significantly associated with a total of three outcomes at the remaining four study sites.³²

used any form of tobacco and those who have ever or currently use any form of tobacco.

³¹ At each site, we averaged annual rates for the number of years that data was available: Pantex, since 1991 with one downsizing event; Oak Ridge since 1991 with six downsizing events between 1991 and 1995 and several events each year from 1996 through 1998; LANL and INEEL since 1995 both experiencing three downsizing events; 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 previous records were not traceable to the level 3.

³² Higher scores on the outcomes 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 N for more information on interpretation of scales.

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

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 Pantex or the other three sites.

Outcome (N)	Downsizing Rate B estimate	Downsizing Fairness B estimate	Downsizing Experiences B estimate
Physical Health			
Medical Conditions (574)	477.89**	0.17**	0.05
Medical Symptoms (577)	416.71	0.18	0.04
Mental Health			
Life Domains Component Summary (MCS) (566)	-379.83*	0.05	-0.07*
Survivor Syndrome (554)	9.18	-0.10	0.02
Perceived Stress (579)	326.57	0.02	0.07
Organizational Health			
Job Security (559)	562.26**	0.16	0.04
Work Performance (538)	2.06	0.06	0.06
Morale (578)	-53.42	0.06	-0.01

Surprisingly, downsizing was only significantly associated in three other cases at the other four sites. Downsizing was unexpectedly associated with better health (higher PCS) at Pantex sites (N=18) and NTS). Job security was associated with downsizing at the other site but in the opposite direction.

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

VIII.C. 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. 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 because too many responses were missing.³³

C1. Fairness

³³ Either people did not understand the question (E1) or they did not feel qualified to comment on the goals of the downsizing.

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,³⁴ communication, timing, and worker involvement. Higher scores on the fairness scale correspond to perceptions of a more fair and open downsizing process. At Pantex, scores on the fairness scale ranged from 22.9 to 92.9 with a site mean of 56.4 and standard deviation of 11.4.

- **Perceived fairness is related to only two outcomes at Pantex.**

Fairness was significantly related to only two of the nine outcomes (see Table 8, above). The higher the perceived fairness, the fewer medical conditions reported ($p \leq 0.01$) and the less job insecurity expressed ($p \leq 0.003$). It is not clear why at Pantex the downsizing rate emerged as more important than at the other sites while the downsizing fairness variable was statistically significantly associated with many fewer outcomes than seen at the other sites.

For six of the seven outcomes where fairness was not significant in the final model (medical symptoms, MCS, survivor syndrome, perceived stress 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 four outcomes (Rothman and Greenland, 1998). A summary of the seven steps, looking at a set of core variables for each of the outcomes is presented in Appendix R.

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 sites, people report fewer health problems (symptoms and/or conditions) the more fair they perceive the downsizing process.

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 rate of voluntary layoffs at Pantex was the same as the downsizing rate given the calculation method. The variable was only significant for two outcomes at the two other sites where it was included in the models,³⁵ both times in an unexpected way (greater voluntary

³⁴ 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.

³⁵ We were only able to include this variable in the site models for LANL, Oak Ridge, and Nevada

rate associated with more job insecurity at Los Alamos and lower MCS 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 Pantex ranged from 0 to 100 with a mean of 19.2 (much lower than the all site mean of 25.2) and standard deviation of 19.4, meaning that Pantex employees, on average, experienced fewer aspects of downsizing than their colleagues at other sites.

- **Findings suggest that downsizing negatively impacts mental health.**

The downsizing experiences index was significantly related to three outcomes including two of the mental health measures. We find that more personal experiences with the downsizing is negatively correlated with mental health (MCS) at all five sites: the more impacts experienced, the lower the average mental health score. At Pantex, as at the other sites, the more personal experiences with the downsizing the lower the average mental health score ($p \leq 0.02$). A higher score on this index is also predictive of higher perceived stress ($p \leq 0.03$) and more instances of poor work performance ($p \leq 0.02$).

At the other four sites (excluding Pantex) the more impacts an individual experienced, 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.

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 VIIF).

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

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.

making authority available to the worker). The job strain model emphasizes the interaction 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.³⁶

- **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 oral comments, spoke extensively about work demands as well as the inability to structure their work. One employee at Pantex wrote: “Jobs were cut a certain percentage over the entire Plant...There is not now enough personnel to get the increasing amount of work done in the areas of production, quality control, and lab work.” Others asked for variety in task, for work to be spread more evenly and for the ability to structure or pace the work tasks. 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).

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- **Greater job strain is predictive of negative outcomes.**

At Pantex, scores on the job strain scale ranged from 12 to 80 with a mean of 24.6 and a standard deviation of 6.3. A higher score is indicative of more strain. The five site mean on job strain was 23.9 (standard deviation=5.9).

Strain at Pantex is significantly associated with six out of nine outcomes (see Table 9, above). Greater strain is predictive of increased reporting of medical symptoms (beta=0.35, $p \leq 0.03$), and this association is only seen at three other sites. Strain is associated with the two other physical health measures at only one site (INEEL). Higher strain scores were associated with worse mental health outcomes (lower MCS, and greater survivor syndrome and perceived stress). This strong association with mental health functioning was seen at all five sites. Finally, strain is predictive of greater job insecurity (beta=0.28, $p \leq 0.0006$) and lower morale (beta=-0.51, $p \leq 0.0001$). Higher strain was predictive of these findings at four and three other sites respectively. Apparently, having less control over work affects how secure one feels in one's current job as well as perceptions regarding new job opportunities.

³⁶ 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.

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 VIIF, 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.³⁷ 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.

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- **Of the four organizational measures studied, violence is the most related to physical and mental health outcomes.**

Each of the four organizational climate variables is statistically significantly related to two or three outcomes. At the five sites overall, violence is a significant predictor twice as often as the other organizational style variables.³⁸ When examined as a group, one or more of these four organizational climate variables is significantly

³⁷ 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.

³⁸ 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).

related to seven of the nine outcomes at Pantex (see Table 10) and 40 of the 45 outcomes across site.

Those who reported more instances on the perceived violence/harassment scale also reported more medical symptoms ($p \leq 0.002$), greater stress ($p \leq 0.05$), and job insecurity ($p \leq 0.03$). At the other sites, violence is most often to the physical health outcomes.

The DOE relations scale was associated with three of the outcomes we were interested in. The better the reported relations with DOE, the fewer medical symptoms reported ($p \leq 0.002$), the lower the survivor syndrome ($p \leq 0.02$), and the better the MCS score ($p \leq 0.02$). Overall, 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 (two sites) and to better morale (two sites). This scale did not emerge as important at either INEEL or Nevada Test Site (significant for none and one outcome respectively) although employees at both those sites did discuss these issues in the focus groups and interviews. At NTS, fewer of the written comments offered on the surveys were related to DOE issues (10.3% of all comments compared to an average of 17% at the four other sites). Each of these findings was seen at two to three other sites. Contrary to what we discovered and expected during the course of interviews, focus groups and the review of individual written comments, the communication scale was only associated with a total of nine outcomes across the five sites. At Pantex and three other sites, better communication was significantly related to higher morale ($p \leq 0.001$). Again at Pantex, better communication was associated with fewer reported medical conditions. At three other sites (NTS, LANL, and INEEL), it was associated with less job insecurity. We included six items to measure conflict resolution within work groups and between contractors (C8, page 9 of survey). The variable was associated only with morale $p \leq 0.0001$ at Pantex. Across sites, it was significantly related to study outcomes 13 times, most often the three organizational outcomes and most frequently at INEEL (significant for seven of the nine outcomes).

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 75 (15.5) and 75.2 (12.1) respectively with higher scores indicating more support.

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- **Co-worker support is most important at Pantex and is associated with better mental health and organizational functioning.**

At Pantex, co-worker support was significantly related to four outcomes while supervisor support was only associated with higher morale ($p \leq 0.003$) as shown in Table 11. More support from one's colleagues was associated with better morale ($p \leq 0.0001$), fewer instances of poor work performance ($p \leq 0.02$), higher MCS score ($p \leq 0.02$), and less perceived stress ($p \leq 0.05$). Neither of the support variables was predictive of any physical health outcomes.

When we look at all sites, we see that both supervisor and co-worker support are always significantly related to morale ($p \leq 0.002$ at Pantex and $p \leq 0.0001$ at four other sites) and are more often related to the mental health and organizational functioning outcomes than to the physical health outcomes. Support was a particularly important predictor variable at the Oak Ridge site (each type of support associated with five outcomes) while supervisor support was important at NTS and co-worker support was important at Pantex (each associated with four outcomes). At three sites (NTS, INEEL and Oak Ridge), greater supervisor support is oddly associated with reporting of more medical conditions.

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 Pantex was 79.3 with a standard deviation of 13.1 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 47.2 (standard deviation=13.4) and the mean score on the three-item toxic exposure scale was 46.7 (standard deviation=14.5) with a higher score indicating that one is exposed and that it is a "sizable or great problem."

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- **Each safety measure relates to only one outcome.**

At Pantex, those reporting a workplace more concerned with health and safety also reported more medical symptoms ($p \leq 0.002$). As seen in Table 12, noise exposure was not significantly associated with any outcome while a feeling that toxic exposure was a big problem was predictive of more medical conditions. ($p \leq 0.005$). At the five sites overall, one of the three safety variables was significantly associated with one third of the outcomes, most frequently at LANL (five of the 15 associations). When one of the variables were 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 would 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 from the event 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 sixty-three 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 Pantex or the other three sites.

IX. DISCUSSION

Our study--one of the few to examine the impacts of downsizing on survivors--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).
1. 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.
2. 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.
3. 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 only associated with three outcomes at Pantex (medical conditions, lower mental health score (MCS) and job insecurity) and with three other outcomes 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.

It is interesting to note that it is Pantex--the site in this study with the lowest rate and number of downsizings--where the downsizing rate variable proved most important although the scale measuring fairness of the process was less likely to be predictive of our outcome. Even in the absence of more statistical associations, 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. Possible limitations exist in the exposure term that we created and in our ability to compare level 3s.

1. Downsizing exposure was not highly variable within each site (across level 3s).
2. 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).
3. 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)³⁹ in the model.

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

- The cross-sectional design used is less able to detect differences in outcome measures than a longitudinal study examining impacts over time.⁴⁰
- 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.⁴¹
- Our model assumes a linear relationship between downsizing exposure and outcome: the greater the downsizing, the greater the outcome. It may

³⁹ A recent study by Amabile & 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.

⁴⁰ 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.

⁴¹ 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.

be that this is an incorrect assumption and that the true exposure-outcome relationship is captured by a non-linear relationship.⁴²

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 Pantex employee it is clear that people do not distinguish between the type of change: "There's been a culture change here in the last three or four years... There's a resistance to the culture change - this is heightening the stress due to restructuring. Five years ago there was rapid upsizing - there was no place to sit, no place to park. There's cumulative stress." 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).

Pantex employees were clearly concerned that there were too few employees to complete required work safely and on time. 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 (Kivimaki, et. al., 2000).

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

⁴² 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.

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

Although downsizing rate was related to three outcomes at Pantex, it was not as strong a significant predictor for the outcomes of interest at Pantex or the other study sites as we expected. The index of individual downsizing experiences was significantly related to three outcomes at Pantex (mental health, perceived stress and work performance) and half the outcomes when looking at results from the five sites together. Workers who perceived the process to be more fair or just experienced fewer medical conditions and greater job security. The fairness variable was significantly related to six of the other outcomes through step six of the model, before organizational and job factors were added.

At other sites, the downsizing process variables did emerge as statistically linked to the outcomes. 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. It is not clear why these measures were less important at Pantex given that employees might be expected to pay greater attention to the downsizing process since there was only one event since 1990.

- **The rate of voluntary layoffs is not analyzed at Pantex.**

The rate of voluntary layoffs, which we have assumed measures levels of worker involvement in the process and worker control over outcome, was not used at Pantex as all layoffs were voluntary. It was included in the model for three sites (LANL, Oak Ridge, and Nevada Test Site) and was significantly related to only two outcomes, both times in the unexpected direction. One problem with this measure as it was ultimately derived is that it reports on the rate of voluntary downsizing but does not compare voluntary to involuntary downsizing within a level 3. For example, a level 3 may have a higher voluntary rate than another group and also have more involuntary layoffs than the comparison group (accounted for only by total downsizing rate).

- **A more fair downsizing process is associated with greater job security and fewer medical conditions.**

Employees who perceived that they were respected and had an opportunity to participate in the downsizing process reported fewer medical conditions. These workers at Pantex had more job security (seen at all five sites). At the other four sites

it was associated with lower survivor syndrome, which supports prior research wherein if the process is felt to be just or fair, survivors will have fewer feelings of guilt, anger, or sadness and less irrational or perhaps unfounded fear of losing one's job. Pantex employees also discussed the lack of fairness regarding promotions, hiring and evaluations. Across site, people report fewer health problems (symptoms and/or conditions) the more fair they perceive the downsizing process. This may relate to the stress and health models in that greater justice may mitigate how a stressful event (or exposure) is experienced, potentially leading to fewer negative health outcomes.

In contrast, those who perceived a less just or fair process experienced a greater sense of sadness, guilt, and "aleness" 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. 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. At Pantex, many employees commented on fairness in day-to-day management of the site, including several comments on discrimination (individuals listed bias against women, people of color, non-Navy people and those not part of "the old boys network").

An organization may experience these employee effects in the form of reduced workforce cohesion and lowered productivity. Our qualitative results indicate 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 considering downsizing. Employees' perceived lack of justice and fairness in the process can lead to negative mental and physical health effects 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 (not Pantex). At Pantex, as at some of the other sites, it was also significantly associated with greater perceived stress and worse work performance. The index can be viewed 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.

- **Job strain was designed 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 job strain as a source of stress in the workplace.**

Our findings in focus groups and interviews suggest that changes in 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. It appears that many workers felt lucky to still have a job, but in return faced constant uncertainty about the future. As one focus group participant expressed: "The confusion is over the fact that plant workload is increasing--how does this match with downsizing? There are technically competent younger people here with significant concerns about the future. We will have to give up technical improvements because of loss of staff--we're doing more with less."

Our assessment of the 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. The site's focus on new safety procedures was one aspect of this. One employee likened the new protocols to a catalyst for disharmony and identified them as a stressor: "There are hostilities from production technician through senior levels of management -- we spent 30 years making weapons without the nuclear navy, and now it is costing more to dismantle them. Before it was reasonably easy to make changes--they'd be okayed. Now, there is a hierarchy of approval."

- **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: employees with higher strain did less well on six of the nine measured outcomes than those with lower strain scores. Modifying job strain, either by reducing demand or increasing control, could improve employee outcomes. 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 fewer medical conditions at Pantex and only with nine outcomes across all five study sites. Employees raised the issue of communication in focus groups and survey comments with particular attention to perceived lack of communication and rumors about reorganizations and reductions. Many employees referred to the 1988 downsizing indicating that it involved no communication while, on the other hand, the 1997 event was announced too early with little information between the first announcement and implementation. One employee stated the following: " Back in 1988, 31 people were displaced -- blindsided-- at least now you've got some notice. ... lessons learned from the past--they won't behave in that manner." Another employee sounded a similar concern: " Black Wednesday--a lot of people think back to that dreading the dehumanized way people left rather than to the actual leaving." It is surprising that a topic discussed so extensively in interviews

and focus groups would not be statistically significant. We should note, however, that the concept of communication is covered in several items in the downsizing fairness scale that was associated with a few outcomes.

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

At Pantex, experiences of violence or harassment were associated with more medical symptoms and perceived stress (and oddly, with higher morale) while this variable was predictive of several negative outcomes at Y-12 (4), INEEL (6) and NTS (8). 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 relationships 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.

- **Employees are concerned about new safety procedures.**

Although the overall health and safety scale and the toxic exposure measure were each only associated with one outcome, the shift in approach to safety was discussed often in the qualitative data. Employees unanimously expressed a belief that the procedures are cumbersome and do not improve safety. They are posited as redundant, creating excessive paperwork ("useless forms") and undermining of employees' skills. One employee, commenting on the stated "safety first" policy, highlighted a perceived conflict: "Some of the pressure we feel as technicians and possibly the crafts as well is when the weapon system needs to be dismantled that we're told ...when we first get here...how to do it safely...and that we hold the keys to the process, we can stop at any time we need to get clarification...but if we exercise those things, people above us go into vapor lock...you can tell the people just above us and above them...are pressured...they want this thing to flow."

- **The importance of support and concerns about management guide change.**

Co-worker support was associated with four outcomes of interest: two of the mental health outcomes as well as higher morale and better work performance. These findings underscore the importance of examining 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 finding that supervisor support is associated with higher employee morale and the qualitative finding that many employees are critical of management, including what they see 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.

Supervisor support was predictive of only higher morale. Employees offered many comments about management and employee-management relations, mostly criticizing too many layers of management, upper management not being accessible and lack of effective or trained managers. One employee wrote: "Management pays lip service only to complaints or suggestions...[their] only concern is that there are no waves or that they are not to blame for anything."

- **Findings for Pantex bargaining unit members are not different than those for non-bargaining unit employees.**

At three sites, bargaining unit employees performed significantly differently than non-bargaining unit employees on several outcomes. However, this was not true at Pantex or NTS, two of the more heavily unionized workforces. Membership in a bargaining unit probably adds some sense of knowledge about how downsizing decisions will be made (as stipulated in the contract) and is indicative of greater worker voice or control leaving one less susceptible to stress-related health impacts. Organizations can, perhaps, reinforce worker voice and control by inviting employee groups into the process with decision making power.

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

We did not find significant relationships to the study outcomes when we paired downsizing rate with other variables such as conflict resolution, supervisor support, job strain or fairness 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 we were not able to effectively test the hypothesized moderating effect of variables such as job strain, support, race/ethnicity and fairness 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 Pantex 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, work structures 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 Pantex Plant and four other DOE sites, each at its own stage of downsizing, we found that job strain, organizational climate and methods of implementing change 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 Pantex 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 Pantex

- **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.
 - The more fair the downsizing, the less job insecurity was expressed.

- **Employees who reported more direct experiences of the downsizing performed worse on three of the nine outcome measures.**
 - A higher score on the downsizing experiences index was associated with lower mental health score (MCS) and higher perceived stress.
 - The more downsizing elements experienced, the more instances of poor work performance.

- **Employees who have experienced greater job strain have reported an increase in adverse individual and organizational functioning outcomes.**
 - Workers with higher job strain have increased reporting of medical symptoms.
 - Higher job strain was associated with poorer reported mental health status (lower MCS, and greater survivor syndrome and perceived stress).
 - Morale and job security were lower for employees who reported high strain.

- **A supportive supervisor and co-workers, good organizational relations and a safe workplace were associated with better employee health and organizational functioning.**

Employees reporting greater support from their manager and co-workers have higher morale.

 - Employees reporting greater support from their co-workers report fewer instances of poor work performance, have better mental health status (higher MCS score) and less perceived stress.
 - Employees who perceive that their managers have good relations with DOE report fewer medical symptoms, a lower survivor syndrome score, and better mental health status (higher MCS score).
 - Employees who perceive exposure to a toxic environment report more medical symptoms.

- **Employees who experience 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 more medical symptoms, greater stress, and less job security.

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 Pantex 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 (e.g., greater job strain associated with poorer morale). Sites should use existing employee groups and bargaining unit groups as well as creating new employee involvement teams.
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. Employees experiencing more downsizing elements had more instances of poor work performance.
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 should 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, with existing systems to address employee-management problems, as well as complaints about unfair organizational or downsizing practices.⁴³
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, and support for those who experience it, etc.).
8. Initiate or support existing programs that promote effective relations between Mason-Hangar and DOE. Employees who perceive that their managers have good relations with DOE report having better health status.

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.

⁴³ While 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 to understand systems issues.

2. Offer training for managers on effective supervision, providing support, communication styles, communicating respect, and listening skills, etc.
3. Involve work groups in identifying workplace stressors and ways to address them.
4. Determine if workplace violence and harassment are common at the site and/or if there were increases as a result of organizational change. If a problem exists, take steps to address the issues as a way of improving 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 reviews issues, with particular attention to supervisor support, management relations with the DOE, and mechanisms to respond to perceptions of an unsafe work environment.

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.

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.

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 provides 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 Schworer, 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 management is simply trying to figure out ways to lay off individuals in a more efficient or cost-effective manner, but rather is trying to improve quality of work 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.

- **Theoretical**

1. Understand the natural history of the effects of downsizing and other organizational change on health using a longitudinal study design.
2. Understand the phenomenological issues of naming and classifying the elements of organizational change.
3. Explore the statistical relationships between perceived fairness of the downsizing process and health and organizational functioning in a longitudinal study.
4. 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**

1. 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 (is this someone who has been downsized or is this a survivor).

2. Develop ways to measure organizational restructuring and other changes.

- **Multi-level Intervention**

1. Test hypotheses about the importance of voice, control and communication and role of union membership using an intervention model.

- **Outcome Issues**

1. 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.
2. Determine and understand barriers to using EAP counseling.
3. Develop a better way to identify and measure incidence of violence and harassment.
4. Develop and implement a monitoring program to identify discrimination.

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Appendix A

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)).

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- (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.

Appendix B

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.

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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

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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. 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." For this reason, it is also known as the Demand-Control Model.

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

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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? 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.

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

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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).

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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 Job Strain 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 Job Strain 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

Appendix B

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.

Appendix C

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.

Appendix C

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.

Appendix D

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).

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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.

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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.

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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

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.

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researchers used summaries of the groups to identify themes rather than relying on each voice as objective finding.

Appendix E

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 five groups. We assumed a 30% response rate and so requested a sample of 120 names.

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 Pantex

A total of 39 people participated in the five focus groups:

Group 1: Operators/Craftspeople/Technicians. 5 people

Group 2: Labor/Security/Clerical. 10 people

Group 3: Engineers/Scientists. 9 people

Group 4: Supervisors/Managers/Professionals. 7 people

Group 5: Operators/Craftspeople/Technicians. 8 people

Groups 1 and 5 were both conducted with operators/craftspeople/technicians, as these job categories represented 25% of the Pantex employee population.

Demographic information was collected anonymously (on data point sheets) by focus group attendees and is not distinguishable by group. Attendees represented the gender proportions at the Plant, as roughly one third of the participants were female. The data sheets provide information on tenure at Pantex and work at other DOE facilities for all focus group attendees as a whole: 13 participants worked at Pantex for more than 15 years (and 8 of them for more than 20 years) while 14 had worked for 4 years or less. The average tenure in the group was 11.4 years.

Appendix F

F. The *Boston University Workplace Survey*

Sections and scales, summarized

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

Appendix G

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 Subsample: BSI	1,180 (44.5%) 94	2,861
LANL	University of CA. Regents PTLA JCNNM	2,793 (42.7%) 206 (47.9%) 529 (44.0%)	6,535 430 1,203
INEEL	LMITCo	2,368 (42.3%)	5,596
NTS	Bechtel Nevada Wackenhut	921 (45.1%) 113 (55.1%)	2,092 205
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

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.

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(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 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:

- those who had taken a pilot test of the survey during one of our visits to the site;
- 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
- 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

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- 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

Sample code:

PMDIVAZZ0052

Pantex (P), Mason & Hanger (M)

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org code: DIVA

survey# : 0052

5. The Pantex Sample

There are 11 divisions (level 3s) and 2,861 employees

11 sampling units (None is smaller than 20 employees, so no merges)

Random Sample size = 1179 employees

Additional 94 employees invited to complete the survey (those who had previously completed the BSI or Brief Symptom Inventory.

Returns=779

Sample size = 2,442 Returns = 1,160

Survey administration

The Boston University Workplace Survey was administered to contractor employees at our five DOE study sites, and subcontractor 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.

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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 Pantex employees

- Mailing #1: July 2, 1998
- Mailing #2: July 13
- Mailing #3: July 30
- Re-mail #3: August 14
- Mailing #4: September 9

Issues/Comments

Mailing #3 was mailed twice because the study ID# was printed on the survey cover for the initial mailing#3. An announcement about the error was placed in the Pantex Pulse, asking employees to throw-out the survey and informing them that a replacement survey packet was in the mail. A cover letter was included in the re-mailing, to explain the error and our internal protocol for correcting all surveys that were returned with the ID# on the survey. All surveys received with the study ID# on the survey had the ID# removed and the correct organizational code added.

Mailings to Pantex BSI sample:

- Mailing #1: September 23
- Mailing #2: October 2
- Mailing #3: October 16
- Mailing #4: November 6

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:

- *Press Release in site newsletter, one month prior to first mailing*

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Purpose: To provide an update on the status of the project and to inform employees of the up-coming employee survey.

- *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.
- *Press Release in site newsletter, one to two weeks prior to mailing #1*
Purpose: To announce the survey mailing and staff site visit
- *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.
- *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.
- *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.
- *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 Pantex

- Pantex Pulse press release #1, June 12
- Management meeting announcement, July 6
- Pantex Pulse press release #2, July 7
- Amarillo Daily News, news release, July 8
- Pantex Pulse press release #3 re: survey error, August 7
- Site Visit: July 8,9 (Miriam Messinger)

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 reviewed⁷ 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); and
- 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 data⁸
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.

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.

Appendix H

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 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

$$\text{ST Rate} = (\# \text{ hours sick leave for 12 month period}) / (\# \text{ people in level 3})$$

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.

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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 method 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

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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 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*).

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

Appendix I

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 Pantex and our ability to process the data by our designated level 3s (survey sampling groups) are reviewed below.

Sick time data during the years January 1991 – October 1993 were recorded for the entire plant with monthly breakdowns only by employee pay status (specific bargaining unit/union--MTC, IGUA, NBNE-- exempt, weekly) and not by work unit. Monthly sick time rates by level 3 (Divisions) were available for the period November 1993 – September 1997 (no raw sick time hours taken and level 3 population numbers were available, only derived sick time rates). Raw monthly sick time data for the period July 1997 – June 1998 was available by level 2 (department) and level 3. Data fields submitted include the following:

- For November 1993 - June 1997: Level 3, month, year, sick time rate per Level 3
 - For July 1997-June 1998: Level 2 name, level 2 code, Level 3 name, month, year, sick time hours, level 2 population, number employees reporting sick time
- For November 1993-June 1998 we were able to match a survey label to 94% of the level 3s, capturing 97% of the sick time hours reported.

Overtime data prior to October 1995 were not collected because only plant totals were kept. Level 3 monthly overtime data were available and obtained for October 1995 – June 1997. Monthly overtime data were available and obtained for July 1997 – June 1998 by level 2 and Level 3. (In July 1997 a new electronic payroll system was implemented and from that point on overtime data was kept by department/level 2.)

Data fields submitted include the following:

- For Oct. 1995 – June 1997: level 3 name, month, year, number of overtime hours
- For July 1997 – June 1998: Level 2, month, year, number of overtime hours by level 2, number of employees in level 2, number of employees responsible for the overtime hours.

For October 1995- June 1998 we were able to match 93% of level 3s to a survey code which consisted of 99% of the reported overtime hours.

CAIRS data were obtained for all plant employees for January 1990 – June 1998 by level 3. Survey codes were assigned to 98% of the injury/accident records which occurred from 1991- June 1998.

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Downsizing data were obtained for the one voluntary reduction in 1997. Data fields submitted include: Level 3 name, level 2 name, number employees RIFed in each department.

Of the 342 individuals who were RIFed, 96% were linked to a level 3 survey code.

Appendix J

J. The Brief Symptom Inventory: Administration, Scales and Instrument

Administration at the Pantex Plant

The initial plan was to administer the BSI survey instrument to a group during the first site visit (November, 1996, Time 1) and follow them over time, re-testing at 3 months (Time 2) and six months (Time 3). We assumed that some would be RIF'd (approximately 10%) and others would stay. Initially, we planned to follow all original participants regardless of employment status.

Several aspects of the plan changed during the actual administration process including the timing of re-administration, the use of multiple administration methods and the addition of people to the cohort during time 2. These are described in greater detail below.

Time 1: Site Visit #1, November 11-15, 1996

During our first site visit to the Pantex Plant, in November of 1996, we administered the BSI as part of our focus groups. The 34 focus group participants took the BSI and also completed a brief demographic profile noting gender, ethnicity, job categories and length of service.

Time 2: June–August, 1997

Over the months of June, July and August 1997, we re-administered the BSI to the core group of 34 Time 1 participants by mail. Our efforts to encourage a high rate of participation included several mailings and phone calls. Time 2 administration was delayed because the site underwent a downsizing in February and March 1997.

Because we had a small BSI cohort (N=34 focus group participants from Time 1), we chose to increase the group during our second site visit in June of 1997. We mailed invitations to 188 additional employees (names selected using the same stratified random sampling procedures used for Time 1). Thirty-two of the 188 attended a session during the site visit to take the BSI in a large group format. Subsequent to the visit, we mailed surveys to those employees (among the 188) who had responded that they would take the BSI but who failed to attend the actual BSI administration.

Sixty additional people took the BSI during time 2 (of those, 32 took it in person and the remainder by mail) and 26 of the original 34 respondents completed a second survey during time 2 (all by mail).

Time 3: January – March, 1998

Over the months of January, February and March of 1998, we re-administered the BSI to the core group (employed and separated) and the larger group (recruited at Time 2). In January we mailed the BSI to everyone who had taken it at least once thus far (a sample of 94 people). During February and March, our outreach efforts to

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increase response rates included reminder letters and mailing a second copy of the BSI. Seventy-five people completed a survey during this administration period (21 from the original group and the remainder time 2 respondents).

Regarding administration of the BSI under differing circumstances:

During Time 1, the BSI was administered as part of the site visit focus groups. During Time 2 and time 3, the BSI was administered in two fashions: as a mailed survey and in a large group format. Although the BSI administration conditions varied, this is a self-administered assessment and the impact of different conditions should not be significant.

BSI Cohort participation in the Workplace Survey

Any employee who had taken the BSI at least once was not included in our employee sample for the Workplace Survey. We considered these employees separately, and chose to mail our Workplace Survey to all 80 Pantex employees who had taken the BSI at least twice.

Participation rates

A total of 94 Pantex Plant employees took the BSI at least once. Thirty four employees took the BSI during Time 1, 86 during Time 2 and 75 during Time 3. Overall, there was a response rate of sixty seven percent (94/144). If you remove from consideration the 17 employees who left the site pay roll at some point between time 1 and time 3, the response rate is nearly seventy one percent (90/127).

Of the eighty employees who took the BSI at least twice (59 employees took the BSI twice and 21 employees three times), 58 also completed the larger employee survey. We will only analyze the BSI data of those 58 individuals of whom 42 took the BSI twice and 16 completed it 3 times (these fifty-eight include 18 of the Time 1 respondents).

BSI Scales

Symptom Scales - 9 Primary Symptom Dimensions

SOM - Somatization

O-C - Obsessive-Compulsive

I-S - Interpersonal Sensitivity

DEP - Depression

ANX - Anxiety

HOS - Hostility

PHOB - Phobic Anxiety

PAR - Paranoid Ideation

PSY - Psychoticism

Global Indices

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GSI - Global Severity Index

PSDI - Positive Symptom Distress Index

PST - Positive Symptom Total

Brief Symptom Inventory (BSI) Instrument included as part of Appendix J.

Appendix K

K. Site Visits to the Y-12 Plant/Oak Ridge

Summary statistics of each visit

Visit: 1

Dates of visit: 11/12-15/96

of staff attending: 4

Research Staff Attending:

BU: Eileen McNeely, Project Manager; Jody Lally, Research Staff; Allsion Smith, Research Staff; Libby Samaras, Research Consultant;

Number of participants this visit:

Interviews 36 interviews

Meetings:

 Opening Meeting 18 attendees

 Closing Meeting 15 attendees

 Retirees meeting 20 attendees (4 females)

 5 focus groups 38 employees (14 females)

 3 BSI survey groups 39 employees (13 females)

Visit: 2

Dates of visit: 6/25-27/98

of staff attending: 1

Research Staff Attending:

BU: Jody Lally, Research Staff

Number of participants this visit

Interviews 13 interviews

 5 BSI survey groups 32 attendees (15 females)

Visit: 3 Survey Administration

Dates of visit: 7/98

Summary: One staff person, Miriam Messinger, was available to answer employee questions about the survey and to collect completed surveys.

Appendix L

L. 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 Pantex Plant

We interviewed personnel at Pantex and spoke with the contracted EAP provider for Pantex employees. Trends, observations and recommendations based on the analysis follow.

Pro Act is the contracted EAP provider for Pantex employees. Pro Act's contract began August 1998, 2 months after our study period ended. The previous provider, Panhandle Employee Assistance Program, had a contract with Mason & Hanger since 1995. They terminated services for Pantex employees without notice, leaving Pantex unknowingly without an EAP for its employees for several months in 1998. Our characterization of the current EAP is therefore very limited, as it reflects only 6 months of provider experience with the site.

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Pro Act provides a standard assessment and referral service for employees and their families. If during intake a counselor assesses that treatment will take more than 3 sessions, the employee is referred to an outside provider (to be covered by health insurance). Employees primarily come to use the program through self-referral and are aware of the program through brochures, articles in the Pantex Pulse or word of mouth. Pro-Act typically counsels 8-10 cases/month with 2 staff counselors. No utilization data was collected since data could not be obtained for our study period.

We spoke with the previous provider during our initial site visit to Pantex and from that interview were able to characterize concerns raised one month prior to the official downsizing announcement which took place December 1997. According to the EAP coordinator at the time, depression was severe among employees who sought out the EAP. Employees expressed worry regarding their finances and the need for re-training. Employees who knew they wouldn't be downsized expressed sentiments of survivor guilt.

Appendix M

M. Description of Survey Scales and Alpha Coefficients

Measure	Description
Psychological Job Demand	A 9-item Karasek scale (_____) measures the psychological demands of one's work (1, Strongly Disagree - 4, Strongly Agree).
Role Ambiguity	A 4-item Caplan scale (_____) examines how clearly job expectations and responsibilities are understood (1, Never - 4 Always).
Feedback Quality	A 3-item NIOSH scale ($\alpha= 0.87$) 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 ($\alpha=0.72$) 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 ($\alpha=0.76$), 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 ($\alpha= 0.77$) captures the spectrum of skills acquired in one's job. First of two scales in Karasek's "Decision Latitude" or control (1, Strongly Disagree - 4, Strongly Agree).
Decision Authority	A 3-item Karasek scale ($\alpha= 0.79$) measures decision-making authority in one's job. Second of two scales comprising Karasek's "Decision Latitude" (control) (1, Strongly Disagree - 4, Strongly Agree).
Macro Decision Authority	2 Karasek items ($\alpha= 0.43$) 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). Reverse scored.
Supervisor Social Support	A 5-item Karasek scale ($\alpha= 0.88$) 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 ($\alpha=0.84$) measures the degree to which

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co-workers are perceived as competent, cooperative, understanding and supportive (1, Strongly Disagree - 4, Strongly Agree).

Measure	Description
Morale	A 2-item Lim scale ($\alpha= 0.88$) rating personal and co-worker morale at work (1, Very Low - 5 Very High).
Innovation	A 5-item Industry/Corning scale ($\alpha= 0.83$) 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 ($\alpha= 0.68$) 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 ($\alpha= 0.82$) which measures how closely respondents identify with their employer (1, Strongly Disagree - 5, Strongly Agree).
Mission	A new BU 3-item scale ($\alpha= 0.63$) 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 ($\alpha= 0.91$) 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 ($\alpha= 0.81$) asks how problems are addressed within work groups and between contractors (1, Strongly Disagree - 5, Strongly Agree).
Organizational Communication	A 3-item BU scale ($\alpha= 0.86$) asks how strong communication is between management levels in the organization (1, Strongly Disagree - 5, Strongly Agree).
DOE Relations	A 4-item BU scale ($\alpha= 0.82$) 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 ($\alpha= 0.90$) measures safety and health practices (1, Strongly Disagree- 5, Strongly Agree).
Perceived Stress	A 4-item truncated scale ($\alpha= 0.76$) 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 ($\alpha= 0.90$) quantifies work stress in addition to the degree to which work stress is managed by the organization (1, Strongly Disagree - 5, Strongly Agree).

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Work Performance A 6-item scale ($\alpha= 0.53$) (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 ($\alpha= 0.84$) measures elements of job satisfaction including job training and decision involvement (1, Never - 4, Always).
Workload Dissatisfaction	A 3-item Caplan scale ($\alpha= 0.85$) measures the satisfaction with the amount, pace and type of one's workload (1, Never - 4, Always).
Matrixing	A new 8-item Mangione scale ($\alpha=0.80$) 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 ($\alpha=0.91$) 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 ($\alpha=0.83$) 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 ($\alpha=0.87$) 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).

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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).
SF-12	A 12-item version of the Short Form Health Survey (1996) comprised of two components: physical health ($\alpha=0.57$) and mental health ($\alpha=0.69$).

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 the number of days per week the person drinks 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.

Appendix N

N. 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: $[(\# \text{ impacts } 0-6)/6] \times 100$ 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	Survey #	Scoring Equation and Interpretation
("+" indicates also included in Level 3 model for Sick time outcome; "~" indicates also included in Level 3 model for TRC outcome)		
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 bargaining 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	$[B6g + B6i + B6a + B6e + B6f + (5 - B6h)] \times 2$ High score is better = more skill discretion
Decision Authority + ~ (part of control element of job strain)	B6	$[B6b + B6c + (5 - B6d)] \times 4$ 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	$C10a + C10b + C10c + C10d$

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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, range 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

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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 + D1.b + 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

Appendix N

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 and 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 (borderline 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 + C5f)
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

Appendix N

6= variable type unclear (functioned as either co-variate or outcome)

Appendix O

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

Outcome Variable	Total Sample		Females		Males	
	Pantex	All Sites	Pantex	All Sites	Pantex	All Sites
SF-12 PCS						
Sample size	748	5520	225	1651	516	3816
Mean Difference	2.25***	2.17***	1.66**	2.41***	1.83***	1.42***
Standard Deviation	6.80	7.19	7.68	8.01	6.3	6.76
SF-12 MCS						
Sample size	748	5520	225	1651	516	3816
Mean Difference	-0.01	-2.43***	0.08	-2.72***	-0.43	-2.7***
Standard Deviation	9.43	10.38	9.45	10.57	9.45	10.28
Perceived Stress						
Sample size	780	5741	234	1703	538	3969
Mean Difference	-0.47***	0.18***	0.08	0.62***	0.05	0.79***
Standard Deviation	2.77	2.86	2.88	2.86	2.71	2.85

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

Appendix Q

P. 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 status
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)

Appendix Q

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

Appendix Q

Q. Hierarchical Linear Modeling Results Results presented for each of nine outcomes

Model 7: Medical Conditions

Effect	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	7.60807628	9.82671095	9	0.77	0.4587
Ratio Downsizing	477.7991957	165.322142	534	2.89	0.0040
Downsizing Experiences Index*	0.04937422	0.02719572	534	1.82	0.0700
Fairness*	-0.17014459	0.05636645	534	-3.02	0.0027
Strain*	0.08940655	0.0879616	534	1.02	0.3099
Gender	-2.56330474	1.26178738	534	-2.03	0.0427
Race	-0.69017876	1.56980902	534	-0.44	0.6604
Education	-0.20594393	0.3078842	534	-0.67	0.5038
Age	0.01375729	0.05898713	534	0.23	0.8157
Married	1.43327806	1.3193825	534	1.09	0.2778
Kids	-1.82504288	1.06092665	534	-1.72	0.0860
Smoking	1.7634663	1.01797487	534	1.73	0.0838
Drinks/week	-0.23425352	0.13327908	534	-1.76	0.0794
Alcoholism*	0.02465045	0.05091943	534	0.48	0.6285
JOB Craft/Service	-2.03145042	2.27356209	534	-0.89	0.3720
JOB Laborer/Gen Ser/	2.02411537	2.26081081	534	0.90	0.3710
JOB Mgmt	-1.91639703	1.75301372	534	-1.09	0.2748
JOB Oper/Tech	-0.83638163	2.00662134	534	-0.42	0.6770
JOB Prof/Admin	-1.57831556	1.6379285	534	-0.96	0.3357
JOB Scient/Eng	0	.	.	.	.
Site years	2.15516944	1.07553715	534	2.00	0.0456
Pay Status	-0.19990661	1.46423623	534	-0.14	0.8915
Matrix*	0.00187319	0.0365929	534	0.05	0.9592
Conflict Resolution*	0.08328201	0.05287652	534	1.58	0.1158
DOE*	0.05159081	0.04206304	534	1.23	0.2205
Safety*	-0.00143348	0.05310891	534	-0.03	0.9785
Violence*	0.00201444	0.02235256	534	0.09	0.9282
Supervisor Support*	0.00886931	0.03835075	534	0.23	0.8172
Co-worker Support*	0.00649036	0.04630439	534	0.14	0.8886
Toxic*	0.11331564	0.04024081	534	2.82	0.0050
Noise*	-0.06417884	0.03993669	534	-1.61	0.1086
Communication*	-0.07551384	0.03509358	534	-2.15	0.0319

*scales standardized

Appendix Q

Model 7: NORM PCS

Effect	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	69.75663875	8.35067217	9	8.35	0.0001
Ratio Downsizing	-131.4100178	152.37497	526	-0.86	0.3889
Downsizing Experiences Index*	-0.03350452	0.02317722	526	-1.45	0.1489
Fairness*	0.03240122	0.04813366	526	0.67	0.5011
Strain*	0.04885898	0.07453368	526	0.66	0.5124
Gender	1.90759407	1.07616995	526	1.77	0.0769
Race	0.13421963	1.31957153	526	0.10	0.9190
Education	-0.05957572	0.2616478	526	-0.23	0.8200
Age	-0.03189755	0.04956944	526	-0.64	0.5202
Married	0.2280905	1.11948197	526	0.20	0.8386
Kids	1.78402927	0.89501778	526	1.99	0.0467
Smoking	1.17175446	0.86719333	526	1.35	0.1772
Drinks/week	0.22308814	0.11330965	526	1.97	0.0495
Alcoholism*	0.00724088	0.04299247	526	0.17	0.8663
JOB Craft/Service	-2.14821732	1.97223849	526	-1.09	0.2766
JOB Laborer/GenSer/	-5.30181981	1.98159564	526	-2.68	0.0077
JOB Mgmt	1.53190876	1.51525438	526	1.01	0.3125
JOB Oper/Tech	-1.49847175	1.73165298	526	-0.87	0.3872
JOB Prof/Admin	0.63650075	1.4264386	526	0.45	0.6556
JOB Scient/Eng	0	.	.	.	.
Site years	-1.28329127	0.9082404	526	-1.41	0.1583
Pay Status	0.8933624	1.2479668	526	0.72	0.4744
Matrix*	0.00629832	0.0310848	526	0.20	0.8395
Conflict Resolution*	0.00833241	0.04479556	526	0.19	0.8525
DOE*	-0.01296413	0.03583433	526	-0.36	0.7177
Safety*	0.02733332	0.04542342	526	0.60	0.5476
Violence*	-0.03024399	0.01887762	526	-1.60	0.1097
Supervisor Support*	-0.02765388	0.03255754	526	-0.85	0.3961
Co-worker Support*	0.06295484	0.03933662	526	1.60	0.1101
Toxic*	-0.03820711	0.03412172	526	-1.12	0.2633
Noise*	0.01016561	0.0339829	526	0.30	0.7650
Communication*	0.01143506	0.02963811	526	0.39	0.6998

*scales standardized

Appendix Q

Model 7: Norm MCS

Effect	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	63.62665112	10.2292657	9	6.22	0.0002
Ratio Downsizing	-379.8266102	179.414026	526	-2.12	0.0347
Downsizing Experiences Index*	-0.0657391	0.02844895	526	-2.31	0.0212
Fairness*	0.05249469	0.05913066	526	0.89	0.3751
Strain*	-0.31954995	0.09154874	526	-3.49	0.0005
Gender	0.38845262	1.32216947	526	0.29	0.7690
Race	0.4564777	1.62077196	526	0.28	0.7783
Education	-0.15971094	0.32127588	526	-0.50	0.6193
Age	0.13896657	0.06092786	526	2.28	0.0230
Married	-4.41934223	1.3757435	526	-3.21	0.0014
Kids	-1.47200268	1.09957388	526	-1.34	0.1812
Smoking	-0.9831569	1.06504449	526	-0.92	0.3564
Drinks/week	0.0636282	0.13925066	526	0.46	0.6479
Alcoholism*	-0.07286029	0.0528537	526	-1.38	0.1686
JOB Craft/Service	0.45312213	2.40076564	526	0.19	0.8504
JOB Laborer/Gen Ser/	0.94512743	2.42186611	526	0.39	0.6965
JOB Mgmt	0.97758976	1.84477073	526	0.53	0.5964
JOB Oper/Tech	0.81327109	2.1150243	526	0.38	0.7007
JOB Prof/Admin	2.21390937	1.73102425	526	1.28	0.2015
JOB Scient/Eng	0	.	.	.	.
Site years	-0.59100613	1.11553287	526	-0.53	0.5965
Pay Status	2.6653064	1.52711416	526	1.75	0.0815
Matrix*	-0.04680072	0.03817629	526	-1.23	0.2208
Conflict Resolution*	0.03834669	0.05505714	526	0.70	0.4864
DOE*	0.10098055	0.04403981	526	2.29	0.0222
Safety*	-0.04012859	0.05579097	526	-0.72	0.4723
Violence*	-0.0240273	0.02319425	526	-1.04	0.3007
Supervisor Support*	0.02198287	0.04000486	526	0.55	0.5829
Co-worker Support*	0.11159603	0.04835295	526	2.31	0.0214
Toxic*	0.05189614	0.04191016	526	1.24	0.2162
Noise*	0.00692544	0.04176583	526	0.17	0.8684
Communication*	0.00820489	0.03639097	526	0.23	0.8217

*scales standardized

Appendix Q

Model 7: Survivor Syndrome

Effect	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	74.33477792	9.45186906	9	7.86	0.0001
Ratio Downsizing	9.18201738	200.297012	514	0.05	0.9635
Downsizing Experiences Index*	0.01930416	0.02610775	514	0.74	0.4600
Fairness*	-0.09711032	0.05404582	514	-1.80	0.0730
Strain*	0.20098475	0.08383396	514	2.40	0.0169
Gender	0.05269509	1.20122573	514	0.04	0.9650
Race	-0.20468123	1.49826601	514	-0.14	0.8914
Education	0.13917321	0.29379744	514	0.47	0.6359
Age	0.02540397	0.05619353	514	0.45	0.6514
Married	-0.50026798	1.26712232	514	-0.39	0.6931
Kids	0.12688184	1.01119626	514	0.13	0.9002
Smoking	0.18410692	0.97347277	514	0.19	0.8501
Drinks/week	0.06267987	0.12632016	514	0.50	0.6200
Alcoholism*	-0.02263423	0.04782653	514	-0.47	0.6362
JOB Craft/Service	0.18263973	2.26041729	514	0.08	0.9356
JOB Laborer/Gen Ser/	-0.10908126	2.24996289	514	-0.05	0.9614
JOB Mgmt	-0.944666	1.73639821	514	-0.54	0.5867
JOB Oper/Tech	0.74481454	1.95366028	514	0.38	0.7032
JOB Prof/Admin	0.03476092	1.65669467	514	0.02	0.9833
JOB Scient/Eng	0	.	.	.	.
Site years	-0.393027	1.0279309	514	-0.38	0.7024
Pay Status	-1.69740117	1.43431333	514	-1.18	0.2372
Matrix*	0.0337731	0.0344544	514	0.98	0.3274
Conflict Resolution*	-0.08402557	0.05005955	514	-1.68	0.0939
DOE*	-0.09001495	0.03962988	514	-2.27	0.0235
Safety*	0.05940333	0.05101044	514	1.16	0.2447
Violence*	0.00473316	0.02123225	514	0.22	0.8237
Supervisor Support*	-0.05341074	0.03666837	514	-1.46	0.1458
Co-worker Support*	-0.05777392	0.04385753	514	-1.32	0.1883
Toxic*	-0.05909157	0.03875487	514	-1.52	0.1279
Noise*	-0.0428873	0.03800926	514	-1.13	0.2597
Communication*	0.01914128	0.03329244	514	0.57	0.5656

*scales standardized

Appendix Q

Model 7: Medical Symptoms

Effect	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	28.16915451	17.7168488	9	1.59	0.1463
Ratio Downsizing	416.7131076	288.601589	537	1.44	0.1493
Downsizing Experiences Index*	0.04060195	0.04937839	537	0.82	0.4113
Fairness*	-0.18096453	0.10220391	537	-1.77	0.0772
Strain*	0.34659188	0.15954806	537	2.17	0.0303
Gender	-5.64550748	2.28579516	537	-2.47	0.0138
Race	-0.80049028	2.8128153	537	-0.28	0.7761
Education	-0.55256557	0.55790983	537	-0.99	0.3224
Age	-0.10452969	0.10608796	537	-0.99	0.3249
Married	1.7057805	2.3957388	537	0.71	0.4768
Kids	-2.59894234	1.91205977	537	-1.36	0.1746
Smoking	1.71715586	1.84655356	537	0.93	0.3528
Drinks/week	-0.12619946	0.24226595	537	-0.52	0.6026
Alcoholism*	0.05832428	0.09264366	537	0.63	0.5293
JOB Craft/Service	-0.71532403	4.07337105	537	-0.18	0.8607
JOB Laborer/Gen Ser/	2.00625295	4.09317325	537	0.49	0.6242
JOB Mgmt	-2.36316815	3.15610531	537	-0.75	0.4543
JOB Oper/Tech	0.43876433	3.61371572	537	0.12	0.9034
JOB Prof/Admin	-0.4107999	2.93813678	537	-0.14	0.8889
JOB Scient/Eng	0	.	.	.	.
Site years	1.70573021	1.94259823	537	0.88	0.3803
Pay Status	-4.20990017	2.62880984	537	-1.60	0.1099
Matrix*	0.07946692	0.06650525	537	1.19	0.2327
Conflict Resolution*	-0.1054098	0.09609536	537	-1.10	0.2732
DOE*	-0.23692931	0.07640278	537	-3.10	0.0020
Safety*	0.30007695	0.09639771	537	3.11	0.0020
Violence*	0.12542265	0.04057031	537	3.09	0.0021
Supervisor Support*	0.0889212	0.06957077	537	1.28	0.2018
Co-worker Support*	-0.0338157	0.08415749	537	-0.40	0.6880
Toxic*	0.02022072	0.07277374	537	0.28	0.7812
Noise*	-0.04618444	0.07235654	537	-0.64	0.5236
Communication*	-0.01480245	0.06327622	537	-0.23	0.8151

*scales standardized

Appendix Q

Model 7: Work Performance

Effect	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	51.53375643	8.98011965	9	5.74	0.0003
Ratio Downsizing	277.9590368	179.149803	540	1.55	0.1214
Downsizing Experiences Index*	0.05929278	0.02473619	540	2.40	0.0169
Fairness*	0.05658684	0.05110947	540	1.11	0.2687
Strain*	-0.024395	0.07987004	540	-0.31	0.7602
Gender	-2.16987805	1.14291915	540	-1.90	0.0582
Race	-2.02615326	1.40695403	540	-1.44	0.1504
Education	0.23655037	0.27854133	540	0.85	0.3961
Age	-0.37050308	0.05289447	540	-7.00	0.0001
Married	1.79603208	1.19214987	540	1.51	0.1325
Kids	-1.25357656	0.95445056	540	-1.31	0.1896
Smoking	0.52672503	0.92273309	540	0.57	0.5684
Drinks/week	0.09477156	0.12092737	540	0.78	0.4336
Alcoholism*	0.02007118	0.04615798	540	0.43	0.6639
JOB Craft/Service	-4.36624316	2.13370685	540	-2.05	0.0412
JOB Laborer/Gen Ser/	-3.31664158	2.09251475	540	-1.59	0.1136
JOB Mgmt	-4.05346384	1.63889559	540	-2.47	0.0137
JOB Oper/Tech	-3.81392623	1.85757635	540	-2.05	0.0405
JOB Prof/Admin	-4.91612179	1.56031621	540	-3.15	0.0017
JOB Scient/Eng	0	.	.	.	.
Site years	-0.06280893	0.97240575	540	-0.06	0.9485
Pay Status	-0.53226357	1.33964146	540	-0.40	0.6913
Matrix*	0.05079721	0.03331346	540	1.52	0.1279
Conflict Resolution*	-0.10745781	0.04777197	540	-2.25	0.0249
DOE*	-0.06882274	0.03802095	540	-1.81	0.0708
Safety*	-0.03678262	0.04823167	540	-0.76	0.4460
Violence*	0.00230326	0.02025243	540	0.11	0.9095
Supervisor Support*	-0.03494551	0.03473756	540	-1.01	0.3149
Co-worker Support*	-0.1020601	0.04196954	540	-2.43	0.0153
Toxic*	0.00468658	0.03637907	540	0.13	0.8975
Noise*	-0.04553604	0.0360734	540	-1.26	0.2074
Communication*	-0.03221517	0.03165263	540	-1.02	0.3092

*scales standardized

Appendix Q

Model 7: Perceived Stress

Effect	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	47.33365117	11.42236	9	4.14	0.0025
Ratio Downsizing	326.5652428	227.864433	539	1.43	0.1524
Downsizing Experiences Index*	0.06882673	0.0315367	539	2.18	0.0295
Fairness*	-0.02267345	0.06500597	539	-0.35	0.7274
Strain*	0.3286204	0.10158291	539	3.23	0.0013
Gender	-2.57018447	1.45405179	539	-1.77	0.0777
Race	-0.10731246	1.79057711	539	-0.06	0.9522
Education	0.33981781	0.35514964	539	0.96	0.3391
Age	-0.19506315	0.06728124	539	-2.90	0.0039
Married	-0.39414448	1.51622631	539	-0.26	0.7950
Kids	1.63759448	1.21492188	539	1.35	0.1783
Smoking	-0.36862346	1.17387447	539	-0.31	0.7536
Drinks/week	-0.21429996	0.15383777	539	-1.39	0.1642
Alcoholism*	0.06956197	0.05870605	539	1.18	0.2366
JOB Craft/Service	2.56950442	2.71450994	539	0.95	0.3443
JOB Laborer/Gen Ser/	1.80545514	2.66282972	539	0.68	0.4980
JOB Mgmt	0.11486902	2.08749212	539	0.06	0.9561
JOB Oper/Tech	2.028312	2.3644924	539	0.86	0.3914
JOB Prof/Admin	-0.94791206	1.98493284	539	-0.48	0.6332
JOB Scient/Eng	0	.	.	.	.
Site years	3.45901059	1.23679268	539	2.80	0.0053
Pay Status	-3.90103966	1.70411855	539	-2.29	0.0225
Matrix*	0.01821086	0.0423698	539	0.43	0.6675
Conflict Resolution*	-0.09225432	0.06076012	539	-1.52	0.1295
DOE*	-0.07499259	0.04857917	539	-1.54	0.1232
Safety*	0.00309593	0.06134626	539	0.05	0.9598
Violence*	0.05017769	0.02576068	539	1.95	0.0520
Supervisor Support*	0.05619177	0.04418363	539	1.27	0.2040
Co-worker Support*	-0.10688672	0.05342528	539	-2.00	0.0459
Toxic*	0.00043155	0.04629575	539	0.01	0.9926
Noise*	-0.02691222	0.04588657	539	-0.59	0.5578
Communication*	-0.02261772	0.04039215	539	-0.56	0.5757

*scales standardized

Appendix Q

Model 7: Job Security

Effect	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	51.29078734	8.81862449	9	5.82	0.0003
Ratio Downsizing	562.2649726	145.2458	519	3.87	0.0001
Downsizing Experiences Index*	0.03509214	0.02453681	519	1.43	0.1533
Fairness*	-0.15607122	0.05151121	519	-3.03	0.0026
Strain*	0.27686146	0.08037479	519	3.44	0.0006
Gender	-1.04854727	1.15635681	519	-0.91	0.3650
Race	1.91522146	1.41407295	519	1.35	0.1762
Education	0.25240905	0.27845803	519	0.91	0.3651
Age	-0.00145406	0.05344512	519	-0.03	0.9783
Married	3.02856796	1.19828042	519	2.53	0.0118
Kids	1.14333409	0.9594771	519	1.19	0.2340
Smoking	1.57541812	0.92527099	519	1.70	0.0892
Drinks/week	0.04472543	0.12002931	519	0.37	0.7096
Alcoholism*	-0.10903304	0.04779234	519	-2.28	0.0229
JOB Craft/Service	1.91096601	2.06470292	519	0.93	0.3551
JOB Laborer/Gen Ser/	0.88023858	2.03407201	519	0.43	0.6654
JOB Mgmt	-1.18174306	1.56150217	519	-0.76	0.4495
JOB Oper/Tech	-0.83187907	1.80238338	519	-0.46	0.6446
JOB Prof/Admin	0.21354428	1.46310863	519	0.15	0.8840
JOB Scient/Eng	0	.	.	.	.
Site years	-1.16941782	0.96389034	519	-1.21	0.2256
Pay Status	-1.449704	1.32665479	519	-1.09	0.2750
Matrix*	0.04419758	0.03289673	519	1.34	0.1797
Conflict Resolution*	0.00819335	0.04771107	519	0.17	0.8637
DOE*	-0.07108612	0.03814013	519	-1.86	0.0629
Safety*	-0.05370745	0.0486504	519	-1.10	0.2701
Violence*	0.04483322	0.02031501	519	2.21	0.0278
Supervisor Support*	-0.04932967	0.0346685	519	-1.42	0.1554
Co-worker Support*	0.01754807	0.04293844	519	0.41	0.6829
Toxic*	0.06532184	0.03647344	519	1.79	0.0739
Noise*	-0.02636002	0.03626596	519	-0.73	0.4676
Communication*	-0.004309	0.0315724	519	-0.14	0.8915

*scales standardized

Appendix Q

Model 7: Morale

Effect	Estimate	Std Error	DF	t	Pr > |t|
INTERCEPT	-5.1701857	10.7574889	9	-0.48	0.6423
Ratio Downsizing Impacts*	-53.42356653	175.186908	538	-0.30	0.7605
Fairness*	-0.01300068	0.02991636	538	-0.43	0.6641
Strain*	0.06129977	0.06248669	538	0.98	0.3270
Gender	-0.50730779	0.09706053	538	-5.23	0.0001
Race	0.84669087	1.39446807	538	0.61	0.5440
Education	2.38709571	1.71805603	538	1.39	0.1653
Age	0.34825958	0.33781675	538	1.03	0.3030
Married	0.11770999	0.06457914	538	1.82	0.0689
Kids	0.91942817	1.45973426	538	0.63	0.5291
Smoking	-1.11666165	1.16308566	538	-0.96	0.3374
Drinks/week	-1.02635416	1.12158663	538	-0.92	0.3606
Alcoholism*	-0.05209355	0.14749837	538	-0.35	0.7241
JOB Craft/Service	0.14728055	0.05695521	538	2.59	0.0100
JOB Laborer/Gen Ser/	1.51508475	2.46649361	538	0.61	0.5393
JOB Mgmt	0.69634756	2.47129319	538	0.28	0.7782
JOB Oper/Tech	3.84700347	1.90339921	538	2.02	0.0438
JOB Prof/Admin	1.80709022	2.18746273	538	0.83	0.4091
JOB Scient/Eng	2.09800657	1.77973273	538	1.18	0.2390
	0	.	.	.	.
Site years	-4.61847094	1.18233856	538	-3.91	0.0001
Pay Status	1.53890536	1.59379556	538	0.97	0.3347
Matrix*	-0.01044312	0.0403985	538	-0.26	0.7961
Conflict Resolution*	0.23017878	0.05835474	538	3.94	0.0001
DOE*	0.06401927	0.04633145	538	1.38	0.1676
Safety*	0.04356628	0.05851683	538	0.74	0.4569
Violence*	-0.05823229	0.02462973	538	-2.36	0.0184
Supervisor Support*	0.12874506	0.0424132	538	3.04	0.0025
Co-worker Support*	0.33247929	0.05114114	538	6.50	0.0001
Toxic*	0.07982927	0.04421485	538	1.81	0.0716
Noise*	-0.03964873	0.04411975	538	-0.90	0.3692
Communication*	0.12330831	0.03835459	538	3.21	0.0014

*scales standardized

Appendix R

R. HLM 7 Step Summary for Selected Variables

Physical Health Outcomes

Bold = significant at: *** <=.001 ** <=.01 * <=.05

Variable	MODEL STEPS					
	2	3	4	5	6	7
Downsizing ratio	148.71				123.78	152.37
Downsizing experiences		0.02		0.02	0.02	0.02
Fairness		0.03		0.04	0.04	0.05
Strain			0.06	0.07	0.07	0.07
Gender					0.9**	1.07
Race					1.61	1.32
Age					0.04	0.05
Marital status					1.05	1.12
Alcoholism					0.04	0.04

Variable	MODEL STEPS					
	2	3	4	5	6	7
Downsizing ratio	129.2			139.38**	144.48*	165.32**
Downsizing experiences		0.02		0.02	0.02	0.02
Fairness		0.04***		0.04***	0.04***	0.06**
Strain			0.07***	0.07	0.07	0.09
Gender					1.07*	1.26*
Race					1.4	1.57
Age					0.05	0.06
Marital status					1.25	1.31
Alcoholism					0.05	0.05

Variable	MODEL STEPS					
	2	3	4	5	6	7
Downsizing ratio	330.45			286.7*	262.9	288.6
Downsizing experiences		0.04		0.04	0.04	0.04
Fairness		0.07***		0.07**	0.08***	0.10
Strain			0.13***	0.14***	0.14**	0.16*
Gender					2.0**	2.28**
Race					2.53	2.81
Age					0.1	0.11
Marital status					2.29	2.4
Alcoholism					0.08	0.09

Appendix R

Mental Health Outcomes

Bold = significant at: *** <=.001 ** <=.01 * <=.05

Norm MCS (SF-12)	MODEL STEPS					
	2	3	4	5	6	7
Variable	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>
Downsizing ratio	266.97			209.3	178.55	179.41
Downsizing experiences		0.02**		0.02**	0.02***	0.03*
Fairness		0.04***		0.05***	0.04***	0.06
Strain			0.07***	0.08***	0.08***	0.09***
Gender					1.11	1.32
Race					1.43	1.62
Age					0.25*	0.06*
Marital status					1.29**	1.38***
Alcoholism					0.04**	0.05

Survivor Syndrome	MODEL STEPS					
	2	3	4	5	6	7
Variable	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>
Downsizing ratio	211.22			206.68	195.84	200.3*
Downsizing experiences		0.02		0.02	0.02	0.03
Fairness		0.36***		0.04***	0.04***	0.05
Strain			0.07***	0.07***	0.07***	0.08
Gender					1.03	1.2*
Race					1.34	1.5
Age					0.05	0.06
Marital status					1.2	1.27
Alcoholism					0.04	0.05

Perceived Stress	MODEL STEPS					
	2	3	4	5	6	7
Variable	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>
Downsizing ratio	251.35			223.74	204.66	227.86
Downsizing experiences		0.03**		0.03**	0.03**	0.03*
Fairness		0.04***		0.05**	0.05**	0.07
Strain			0.08***	0.09***	0.09***	0.1***
Gender					1.23	1.45
Race					1.59	1.79
Age					0.06**	0.07**
Marital status					1.43	1.52
Alcoholism					0.05*	0.06

Appendix R

Organizational Outcomes

Bold = significant at: *** <=.001 ** <=.01 * <=.05

Job Security		MODEL STEPS					
Variable	2	3	4	5	6	7	
	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	
Downsizing ratio	149.55*			126.94**	134.35***	145.25***	
Downsizing experiences		0.02**		0.02	0.02	0.02	
Fairness		0.04***		0.04***	0.04***	0.05**	
Strain			0.07***	0.07***	0.07***	0.08***	
Gender					1.00	1.16	
Race					1.3	1.41	
Age					0.05	0.05*	
Marital status					1.16*	1.2**	
Alcoholism					0.04*	0.12*	

Work Performance		MODEL STEPS					
Variable	2	3	4	5	6	7	
	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	
Downsizing ratio	186.8			176.34	183.99	179.15	
Downsizing experiences		0.02**		0.02*	0.02**	0.02*	
Fairness		0.04**		0.04*	0.04**	0.05	
Strain			0.07***	0.07**	0.07	0.08	
Gender					0.98	1.14	
Race					1.26	1.41	
Age					0.05***	0.05***	
Marital status					1.13	1.19	
Alcoholism					0.04	0.05	

Morale		MODEL STEPS					
Variable	2	3	4	5	6	7	
	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	<i>B</i>	
Downsizing ratio	442.04			228.48	263.1	175.19	
Downsizing experiences		0.03		0.03	0.03	0.03	
Fairness		0.05***		0.06***	0.05***	0.06	
Strain			0.09***	0.1***	0.10***	0.1***	
Gender					1.4	1.39	
Race					1.8	1.72	
Age					0.07	0.06	
Marital status					1.62	1.46	
Alcoholism					0.05*	0.06**	