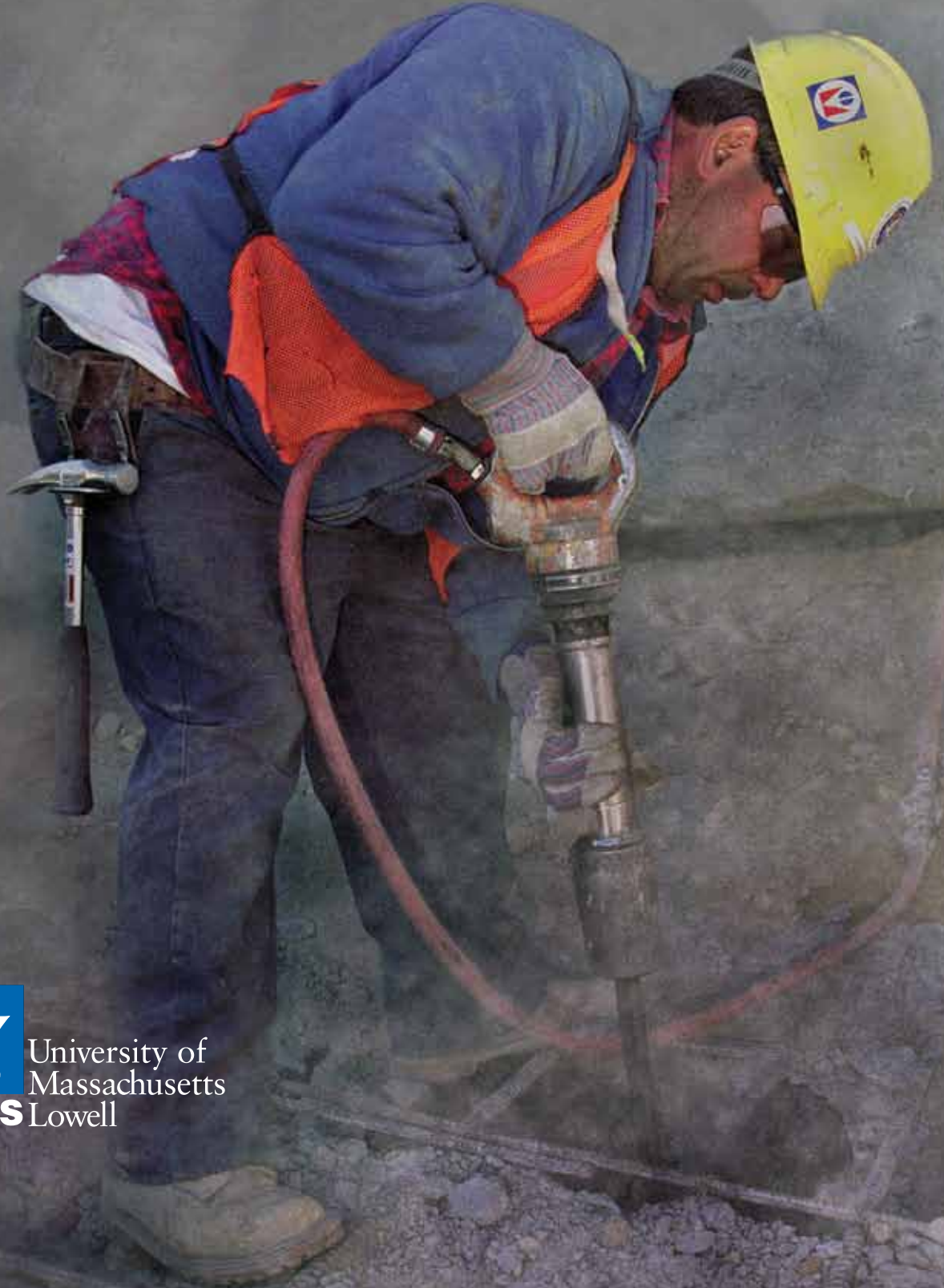


Lessons Learned

Solutions for Workplace Safety and Health



Lessons Learned

Solutions for Workplace Safety and Health

APRIL 5, 2010

Explosion at Upper Branch Mine
in West Virginia kills 29 coal miners

APRIL 20, 2010

Eleven men dead on Deep Horizon
BP oil rig in Gulf of Mexico

JULY 14, 2010

Oven at U.S. Steel plant near Pittsburgh
explodes, injuring 15 workers, at least
two critically

THE SUFFERING OF WORKERS SEEMS to be front-page news nearly every day. Yet for all the disasters that appear in the headlines, far more workers die or are injured without making the headlines. And these incidents not only affect the injured workers, but greatly impact their families and communities. Every day, fourteen workers die, and each year, more than 4 million are seriously injured or are sickened by exposure to toxic agents.¹ Given that federal regulatory agencies are currently sympathetic to the idea that government should do more to protect workers, this should be a moment for real changes to the nation's approach to workplace safety and health.

But what kinds of changes? There is a risk that the eagerness to fix ineffective worker safety and health protections will lead to quick, reactive efforts to undo the failings of earlier administrations, without sufficient thought about the deeper limitations of the regulatory approach that was developed in the late 1960s and is still largely intact. The quick response approach has three potential pitfalls: (1) it precludes broader system-level changes

to occupational and environmental health; (2) it inhibits broad coalition-building that could reduce the compartmentalization of worker health, consumer health, and environmental health; and (3) it could inadvertently shift risks from one sector of society to another in the search for a solution to a problem too narrowly defined.

To fully understand the limits of our current federal worker safety and health policies and identify long-term solutions that are both viable and effective, we must step back and view broadly the systems of production within which work environments function. More inspections and more standards alone will not cure structural flaws in occupational safety and health regulations in the United States. In addition, agencies other than the Occupational Safety and Health Administration (OSHA) are also responsible for worker protections—for example, the Mine Safety and Health Administration, in the case of mine workers, and the Environmental Protection Agency (EPA) in the case of farm workers exposed to pesticides.

Our research has led to the conclusion that the most effective reforms will come through preventive redesign of workplaces, work processes, and products and not simply tighter regulation of the current way of doing business. Further, reforms to OSHA regulations need to be coupled with a new research agenda—through the National Institute for Occupational Safety and Health (NIOSH) and other science agencies—focused on more prevention-oriented research. To begin to move this process forward, we undertook the task of researching and writing a set of stories demonstrating why and how our occupational safety and health systems are broken and identifying lessons learned that we hope can provide insights on how to fix those systems.



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Six case studies: revealing where we went wrong in our systems to protect workers

The Lowell Center for Sustainable Production at the University of Massachusetts Lowell sought to use the rich history of actions and inactions regarding selected workplace safety and health policies and practices in the United States to reveal compelling evidence for national policy reforms that will lead to stronger, more effective, prevention-focused worker safety and health protections. The resulting six case studies illustrate a range of current failures in our approach to workplace safety and health.

Floor finishers, lacquer sealers and fires: safer product alternatives are the solution.

Three Vietnamese floor finishers were killed in two separate fires in Massachusetts in 2004-2005. In each case, highly flammable lacquer sealer vapors ignited and flashed almost instantly across a newly varnished floor, causing a deadly inferno. Fatal fires like these, as well as less dramatic but also serious neurological damage and other adverse health effects from floor finishing chemicals, illustrate

the dangers faced by small entrepreneurial businesses staffed by immigrant laborers. Despite the challenges to creating protections for these workers, this case study has a hopeful ending. It demonstrates the power of connecting the health struggles of immigrant workers with community organizing efforts that resulted in landmark legislation in Massachusetts prohibiting highly flammable floor finishing chemicals. The story shows how grassroots organizing can lead to practices that protect workers—in this case, replacing dangerous products with safer alternatives.

When my job breaks my back: shouldering the burden of workplace musculoskeletal disorders.

Work-related musculoskeletal disorders are a serious public health concern. Our case study on back injuries and other musculoskeletal disorders among health care workers, hotel housekeepers, and poultry processing workers illustrates how badly ergonomic injuries can disable us and affect our everyday well-being both at work and outside our work. Despite overwhelming scientific evidence on the risks and the economic costs of failure to

control ergonomic hazards, OSHA was prevented from mandating comprehensive solutions. In the first months of 2001, OSHA's Ergonomics Standard was repealed with the first use and thus far the only use of the Congressional Review Act—a move made possible by a Republican Congress and the newly elected President George W. Bush. Yet a decade later, musculoskeletal disorders remain one of the leading causes of lost work time and an extremely burdensome “cost of doing business” with impacts felt throughout the economy and the health care system.

Successful initiatives in several states are highlighting at least one way forward: programs that focus first on reducing injuries in high-risk tasks such as manual patient handling and transfer in the health care and social assistance sectors, and then on tackling particularly hazardous occupations, and finally entire industries. Further, occupational safety and health management systems based on real worker participation and leadership commitment will help address ergonomic risks in those industries where the burden is heaviest.

**The poison that smells like butter:
diacetyl and popcorn workers' lung disease.**

In 2000, a cluster of disabling and potentially fatal lung disease among workers was identified in a microwave popcorn plant in Jasper, Missouri. A few years later, additional cases were identified among workers exposed to butter flavoring chemi-

icals while working at their food flavoring manufacturing jobs. This shocking case study raises a troubling question: how could a chemical that can destroy a worker's lungs in just a few months evade our system of chemical regulation? Workers were once again the “canary in the coal mine” for the general public whose lungs are also being damaged by the artificial butter flavoring chemical, diacetyl. This case points out the challenges of chemical-by-chemical regulation spanning multiple agency jurisdictions, and highlights the essential role played by occupational and environmental health specialists on the front lines, detecting and minimizing harm to workers. It also illustrates the need for national comprehensive chemicals policy reform leading to safer chemicals and ensuring that risks are not transferred among workers, communities, and the environment.

**Injuries are not accidents: construction
will be safe when it's designed to be safe.**

Every day in the United States, approximately three workers die in construction accidents.* And for every worker who is killed, more than 100 more suffer injuries that result in lost work time, lost wages, and a drag on productivity.** Investigations of construction accidents invariably find a complicated web of causal factors involved in these tragic, yet avoidable events. To manage these complex occupational hazards and protect workers adequately, the construction sector needs a more comprehensive approach than mere compliance with government standards or the sporadic application of control measures following a serious accident.

This case study shows the importance of implementing an occupational safety and health management system on the worksite. A commitment to a comprehensive occupational safety and health management system can break through bad habits, careless thinking, and the inertia that prevents managers and workers from making real changes in safety procedures. Further, this case study shows how vital training and community-based safety and health strategies are for the immigrant workers



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* Based on the US Bureau of Labor Statistics' total fatality cases (975) in construction, in 2008.

** Based on the US Bureau of Labor Statistics' total non-fatal cases (120,240) in construction, in 2008.



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who are increasingly employed in this sector. Journalists have a role to play, too. When a workplace disaster happens, the reporting too often frames the problem as a tragic and inevitable accident rather than as the result of an avoidable failure in managing a dangerous human activity.² By redesigning workplaces to avoid hazards in the first place, we can use innovation and ingenuity to ensure workers are protected.

Regulating methylene chloride: a cautionary tale about setting health standards one chemical at a time.

OSHA's chemical-by-chemical risk-based standard setting process is so slow that years can go by between the time that it is clear that workers are being dangerously over-exposed and the time that effective controls are put into place. The tortured path to OSHA's methylene chloride standard is a potent illustration of the limits of the current standard-

setting process. The methylene chloride standard took more than a decade to establish. And, under the standard that was finally set, the legal exposure limit continues to allow workers to be exposed to this cancer-causing chemical at a level hundreds to thousands of times higher than is permitted for the general public. By focusing the debate on the narrow question of exactly how risky a specific exposure level might be, OSHA and its risk-based standard setting process distracts attention from the more important question: do we need this chemical at all? Are there alternatives that are safer? In the case of methylene chloride, the risk debate allowed some employers to shift from methylene chloride to an untested, unregulated substitute chemical—1-bromopropane—which turned out to be a neurotoxicant, a reproductive toxicant, and possibly a more potent carcinogen than methylene chloride.

Safe food from safe workplaces: protecting meat and poultry processing workers.

Over a century ago, Upton Sinclair's novel *The Jungle* exposed the dehumanizing labor conditions and unsanitary environment of the meatpacking industry. Slaughtering and processing of meat and poultry for our food supply are inherently dangerous jobs. These hazards are well known and predictable, and solutions to preventing harms are feasible. Yet since Sinclair's time, rates of injuries and illnesses in the meatpacking industry have been notoriously high.

The long history of the meat and poultry slaughter and processing industry shows how solutions to protect the safety and health of workers cannot be addressed in isolation; eliminating hazards on the production line, providing dignity and job satisfaction to line workers, and ensuring a safe and ecologically sound food supply are all components of the same food systems approach to this industry. The roadblocks to effective food safety practices and to healthy jobs are the same: workers with little control over their jobs on the plant floor, regulatory agencies with inadequate resources and powers, and the perverse economics of our industrial meat and food production system in which narrow profit margins drive business decisions with insufficient commitment to either working conditions or food quality.



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From individual tragedy to broad understanding: some lessons learned

As we dissected these stories, each with its own long history of problem identification, scientific evidence, policy prescriptions, and often frustrating delays and setbacks, we saw some common themes. These lessons learned should lead to solutions, to fresh approaches, and to new commitments.

Important lessons for preventing workplace injury and illness:

- Both employers and employees have essential roles in making workplaces healthy.
- Clear and comprehensive laws and regulations are critical elements of worker health protections, but can be more effective when combined with other strategies such as incentives to innovate with inherently safe technologies, and campaigns that link improvement in worker health to goals like environmental protection and energy efficiency.

- Adequate resources are needed to ensure the deterrent effect of enforcement, but there is also a clear need for sufficient technical resources to help firms more effectively protect workers and communities, as well as resources to promote research and application of safer production systems and products.
- It is impractical to rely solely on federal inspectors, working to ensure compliance with hundreds of specific rules, as the primary solution to our occupational health crisis: this approach is either too expensive (if enough inspectors could be hired) or ineffective (with the current numbers of inspectors).
- Workplace health and safety and environmental protection should be viewed as two aspects of the design of sustainable systems of production. Economically, this can create efficiencies, and politically, it can help forge alliances among traditionally contentious interests.
- Globalization has not only sent many hazardous jobs overseas, it has also led to the concentration of marginalized immigrant workers in those dangerous and exhausting jobs that remain in the United States. Immigrant rights and occupational health are increasingly linked.
- Occupational and environmental health policies that focus upstream—on prevention at the source of the hazards—are not only feasible, but also protect workers' health and save money for companies and government agencies.

Solutions: promising directions to improve worker safety and health

We have identified seven high-priority strategies that could have important impacts on making workplaces safer. The first three are policy changes within the traditional boundaries of OSHA's activities, while the remaining four involve changes in other agencies and organizations.

1. Establish a Workplace Safety and Health Program Rule that emphasizes injury and illness primary prevention and worker participation.

Several of the case studies concluded that a key solution for preventing injury and illnesses is to improve the capacity of both employees and employers to identify and prevent workplace hazards. In response to nearly a dozen fatalities on a job site

“The whole system is clogged up like I-15. There are traffic jams, so that makes you less productive and makes you nervous. Then you hurry up because you’re trying to be a productive employee. Just like how when you speed on a freeway you have less time to react, when you hurry on the job you have less time to correct that mistake.”

— An iron worker employed on one of the two major construction projects in Las Vegas where nearly a dozen construction workers died in a period of less than 17 months³

in Las Vegas, one iron worker for example identifies factors contributing to the accidents, “The whole system is clogged up like I-15. There are traffic jams, so that makes you less productive and makes you nervous. Then you hurry up because you’re trying to be a productive employee. Just like how when you speed on a freeway you have less time to react, when you hurry on the job you have less time to correct that mistake.”³

OSHA could issue a rule similar to those already in place in states such as California, requiring each employer to develop, implement and continuously evaluate a workplace safety and health prevention program. This standard has the potential to comprehensively address a range of hazards present in workplaces without establishing specific rules for each. Each employer’s plan would include a set of core practices fundamental to worker safety and health to fill significant gaps in hazard prevention. These core practices—with measurable performance targets—include:

- procedures for management commitment and employee involvement (and also community involvement, where applicable) in all facets of planning, implementing, evaluating, and decision-making about the program;
- clear requirements for worksite analysis to identify and assess all hazards and their root causes;
- hazard prevention and control, including requirements to evaluate hazards and assess safer alternatives;
- requirements for employee, manager, and supervisor safety and health education and training and
- requirements for medical surveillance.

Workplace safety and health prevention plans should include subcontractors’ employees, who often make

up a significant fraction of the workers in an establishment.

In May 2010, OSHA took preliminary steps towards rulemaking efforts requiring workplace safety and health prevention programs, the Injury and Illness Prevention Program (I2P2). This appears to be a promising prevention-oriented policy solution to better protect workers.

2. Revamp OSHA’s enforcement system by leveraging existing agency inspectional systems, as well as cross-training of inspectors, to support greater regulatory compliance by employers.

Establishing a workplace safety and health program could fill an important gap in motivating and maintaining healthy and safe workplaces, as it is clear that the threat of inspections and fines alone is simply inadequate. Yet enforcement remains an important element of workplace protections. While OSHA has prioritized enhancing its enforcement efforts by hiring new compliance officers to inspect more facilities, and also by changing how penalties are calculated to increase employer fines where appropriate, there are still too many workplaces for any realistic inspection force to cover.

However, enforcement can be enhanced by leveraging the capacity and the presence of other public and private public health auditing and/or inspectional services. Whether it’s the US Department of Agriculture’s (USDA) Food Safety and Inspection Service inspectors in the case of meat and poultry facilities, the Joint Commission on Accreditation of Healthcare Organizations’ (Joint Commission) surveyors in the case of health care facilities, or the EPA Risk Management Program auditors in the case of establishments that have

“I played by the rules. I worked to support my family. This unregulated industry virtually destroyed my life. Don’t let it destroy the lives of others. These chemicals that are used on food in large scale production must be tested and proper instructions and labeling supplied with their sale.”

— Eric Peoples, microwave popcorn plant worker who was diagnosed with a form of fixed, obstructive lung disease resulting from workplace exposure to artificial butter flavoring chemicals⁹

large volumes of toxic chemicals on site, the presence of services like these in a broad range of other agencies provides an opportunity to integrate occupational health into existing activities with a public health focus.

Many workplaces targeted by current environmental/public health inspectional and auditing programs are reached only infrequently by OSHA. Thus, leveraging the capacity of existing inspectional and auditing programs provides the opportunity for OSHA to ensure that more facilities are complying with its regulations. As the USDA’s, the Joint Commission’s and EPA’s inspectors, surveyors, and auditors are already skilled in public health protections, probably only minor cross-training on issues specific to occupational health is needed to allow these programs to serve as additional sets of eyes for OSHA. Further, a more coordinated approach that engages teams of inspectors, or calls for whole-facility multi-media inspections, would help ensure that hazards are not shifted from inside the plant to outside and could focus on facility-level prevention opportunities. Finally, many states have pollution prevention and manufacturing extension offices that could provide engineering support for workplace and facility design in the course of inspections.

While only OSHA has the jurisdiction to issue citations for violations, these additional inspectional/auditing services can serve as important referral sources for OSHA inspections. The USDA already has a memorandum of understanding (MOU) with OSHA to carry out these services.⁴ Yet more effort is needed to realize the potential of this MOU and to establish similar MOUs with other public and private agencies.

3. Expand occupational safety and health surveillance and enable rapid interventions when hazards are detected.

Accurate, comprehensive, and informative surveillance data are essential for ensuring that resources to protect the safety and health of workers are targeting the most at-risk workers and for evaluating whether hazard prevention policies and programs are effective. As discussed in the majority of case studies, statistics on injuries and illness collected by the Bureau of Labor Statistics (BLS) woefully undercount injuries and illnesses that are occurring in workplaces.^{5,6}

OSHA is currently pursuing two important efforts to improve surveillance data: (1) its Recordkeeping National Emphasis Program will presumably help rectify deliberate under-reporting by certain employers; and (2) current efforts to include musculoskeletal disorders as a reportable illness category will help reveal the true extent of these injuries. Yet beyond these activities, major surveillance gaps will still remain—gaps that severely impede not only OSHA’s regulatory enforcement and compliance assistance activities, but also non-regulatory hazard and disease prevention efforts by NIOSH and state occupational health programs. BLS data should be supplemented by new annual national surveillance surveys or similar tools to capture data that current BLS surveillance tools were not designed to collect. Additional surveillance data collection efforts should include illnesses with long latencies such as cancer, additional injury and illness types not specified on data collection forms used by BLS (OSHA 300 logs), and the experience of workers employed by some small businesses.

Also of crucial importance is the need to expand the capacity of state and federal occupational health programs to intervene rapidly to prevent additional cases of injury or illness when hazards are identified. According to a survey by the Council of State and Territorial Epidemiologists, 34 of 50 US states have minimal to no surveillance or epidemiology capacity in occupational health.⁷ And those that have the staff capacity have neither the real-time injury or illness data nor hazard surveillance tools to support occupational health officials in meeting their responsibility to identify and warn workers who are at risk, or to identify early-stage cases of disease. Hazard surveillance tools should include a central repository of chemical use information. This need was clearly revealed in the diacetyl case study: the California Department of Health Services' Hazard Evaluation System and Information Services (HESIS) unit could not appropriately warn workers of hazards associated with diacetyl, as it had no way of finding out which workplaces used butter flavorings.⁸

4. Implement comprehensive chemicals policy reform, including both occupational and environmental hazards.

At present, the United States has roughly 15 federal agencies and many more state agencies responsible for chemicals management. As seen in the popcorn workers' lung and methylene chloride case studies, this disjointed collection of overlapping jurisdictions for managing chemicals—a system that tends to treat chemical hazards as “safe until proven hazardous”—is harming workers. This harm was poignantly described by Eric Peoples, a popcorn plant worker, “I played by the rules. I worked to support my family. This unregulated industry virtually destroyed my life. Don't let it destroy the lives of others. These chemicals that are used on food in large scale production must be tested and proper instructions and labeling supplied with their sale.”⁹ Nor is our chemicals management system protecting the general public or the environment.

A comprehensive approach to regulating workers' exposure to chemicals needs to move beyond OSHA's risk-based health standards—a substance-by-substance process that every OSHA administrator has recognized cannot keep pace with the



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rapid pace of technological change in the American workplace. Moreover, the risk of unintended consequences of regulating one chemical at a time was clearly revealed in the methylene chloride case study—some employers responded to the methylene chloride standard by switching to 1-bromopropane, an unregulated chemical that testing has now revealed may be four times more potent in causing cancer than methylene chloride.¹⁰

An important model for the chemicals management system needed in the United States is the European Union's policy called REACH—Registration, Evaluation, and Authorization of Chemicals. This policy requires that manufacturers and importers of chemicals assess chemical hazards, communicate these hazards through supply chains, and ensure safe use of chemicals rather than placing the burden on government to show that each substance is harmful before action can be taken to regulate it. Some key components are:

- Manufacturers must provide hazard, exposure, and use data on all chemicals, not only new ones, before they can be used in commerce.
- Companies have the responsibility to provide information on health and environmental effects of the chemicals they use.
- Hazard information must be communicated both up and down the supply chain.
- Substances of “very high concern” need explicit authorization for use, and a plan to substitute safer alternatives.

While efforts are underway to reform the 30-year-old US Toxic Substances Control Act, many US

“It’s sad to not know who to complain to, because even the doctors and nurses are on the company’s side.”

— an anonymous Nebraska meat packing worker¹¹

companies already recognize the need to understand what chemicals are in their products and to undertake necessary testing and evaluation. Several US states are also undertaking broad chemicals reforms to rapidly prioritize chemicals into higher and lower hazard categories and require safer alternatives to chemicals of concern. Proposed regulations in California, for example, will require the state to prioritize chemicals and products of concern and require that retailers and distributors evaluate safer alternatives to those substances. But none of these developments, including REACH, includes the full range of components of a Comprehensive Chemicals Policy that considers all chemicals, across all uses and jurisdictions, with the goal of promoting safer chemicals and not simply controlling the hazardous ones.

5. Promote “Prevention through Design” (PtD) to make jobs, products, and materials inherently safe.

For decades, chemists, engineers, and architects designed the materials and production processes that fuel our economy with little or no regard for the safety and health of workers. From avoidable falls among construction workers, preventable back injuries to health care workers, and neuropathy among workers exposed to 1-bromopropane, the case studies again and again reveal entirely avoidable harms if only our chemicals, production processes, and technologies were *designed* differently. Across the life cycle—from manufacture and construction to operation, maintenance, and disposal—fatalities, illnesses, and injuries result from hazards inherent in the way things were designed. Given that these problematic materials and processes were designed and created by humans, solutions can be also—and one of the best ways to protect workers is to design out those hazards.

NIOSH has a dedicated Prevention through Design (PtD) initiative whose mission is to “re-

duce the risk of occupational injury and illness by integrating decisions affecting safety and health in all stages of the design process.” With current interest in greening the economy and in getting people back to work, successful implementation of PtD concepts holds great promise for breaking free of the false dichotomy of safety versus profit—it doesn’t have to be a trade-off. Tools to implement PtD, including alternatives assessment and toxics use reduction planning, can be integrated into decision-making by both businesses and regulatory agencies to reduce hazards at their sources rather than simply managing downstream risks. PtD application at the firm level can be combined with coordinated federal agency research to identify design-oriented solutions for workplace hazards that optimize worker and environmental health. The training of chemists, engineers, designers, and business and finance professionals could include PtD as well. Federal research programs could be used to stimulate innovative research on the most cost-effective ways to design out hazards throughout the economy.

6. Expand labor/migrant labor safety and health protections. Support immigrant worker centers to develop expertise in assisting workers.

The globalization of systems of production has two distinct aspects. The export of hazardous industries is perhaps the better understood aspect. But we can see that when a hazardous and exhausting job *can’t* be exported—construction, janitorial services, personal care, health care—these trades are increasingly carried out by immigrants, which creates special challenges for those who try to help them protect themselves.

New immigrant workers experience communication, legal, and cultural barriers to understanding and exercising their workplace rights. In some sectors, trade unions have been successful at organizing these marginalized workers, and this can be an important step in providing them with basic protections. Yet in many situations, unionization has been very difficult. As described in the construction case study, only 11 percent of Hispanic construction workers belong to a union. They also suffer far more fatal and non-fatal injuries and are 48 percent less likely to receive payment for medical costs from workers’ compensation than

their non-Hispanic white co-workers.¹² Similar needs were also revealed in the case study of meat and poultry workers. For example, less than half (44 percent) of the predominantly immigrant workforce on Nebraska's meatpacking disassembly lines remembered receiving information about workers' compensation, according to a survey by Nebraska Appleseed.¹¹ As described by one meatpacking employee, these populations often feel that their employer's human resources and medical staff only have the company's interest in mind, "It's sad to not know who to complain to, because even the doctors and nurses are on the company's side."¹¹

Safety and health training, information, and other support can be offered through immigrant worker centers and other community initiatives to reach out to these populations. And OSHA could strengthen its ability to communicate with immigrant workers and their communities through outreach activities and additional resources devoted to working with non-English speakers. However, information alone will not be sufficient to protect workers. It must be coupled with policies and enforcement and compliance programs that ensure that the most vulnerable workers are protected from workplace hazards (considering the cumulative impacts of workplace and community hazards and stressors). By protecting those most vulnerable, all workers will be better protected.

7. Strengthen occupational and environmental health expertise and related clinical initiatives that are created by health care reform legislation.

Health care reform debates have opened many opportunities to improve health care focused on the hazards of work. If it were not for astute physicians, such as Dr. Alan Parmet in Kansas City and Dr. Phil Harber in Los Angeles, who diagnosed the first cases of lung disease in workers exposed to butter flavoring chemicals, the epidemic would have lasted longer and more workers and consumers would have been sickened.

When physicians are trained in occupational health and when effective occupational health surveillance systems are in place, workers' lives are better protected. Yet the Institute of Medicine has declared that there is a "critical shortage" of specialty-trained occupational and environmental physicians in communities, in academic medical

centers, and in public health and related agencies.¹³ Public health and medical curricula should require a minimum level of competence in recognizing occupational injury and illness to enhance



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the capacity of future professionals. Some states, such as Massachusetts, are implementing programs to integrate occupational health into existing public health, clinical care, and worksite wellness programs.¹⁴ Focusing these initiatives in community health centers makes sense because the low-income patients who use these centers often find themselves in the most hazardous jobs.

Taking the next steps

The challenges of protecting workers' safety and health are great, but the opportunities for broad solutions that can improve the health of workers, communities, and the environment while stimulating innovation are even greater. The case studies in this report explore multiple overlapping factors that lead to workplace injury and illness. Using these case studies, we have identified concrete steps for systems-level changes that can prevent injury and illness. None of the proposed recommendations is sufficient in and of itself. It will take multiple efforts with the engagement of a wide range of parties to effect fundamental change. Resources for participating in this ongoing dialog are available at our website: www.sustainableproduction.org, along with the six case studies and resources for going deeper into each of these topics.

This report was researched and written by faculty and research staff of the Lowell Center for Sustainable Production, University of Massachusetts Lowell:

David Kriebel
Molly Jacobs
Pia Markkanen
Joel Tickner

Editorial assistance provided by Nancy Irwin Maxwell.

About the Lowell Center

The Lowell Center for Sustainable Production is a research center of the University of Massachusetts Lowell working to build healthy work environments, thriving communities, and viable businesses that support a more sustainable world. We do this by working collaboratively with citizens' groups, workers, businesses, and government agencies.

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Contact

For inquiries about the report, please contact Molly Jacobs: mjacobs@envhealth.net.

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Going to work should not be a choice between feeding your family and protecting your health.

Every day, 14 workers die on the job, and each year more than 4 million are seriously injured or sickened by exposure to toxic agents. Given that federal regulatory agencies are currently sympathetic to the idea that government should do more to protect workers, this should be a moment for real changes to the nation's approach to workplace safety and health.

But what kinds of changes? This report documents six case studies of systemic failures in protecting workers from injury and illness. By analyzing these failures, we have identified strategies for real change—approaches that can protect workers while stimulating innovation in safer forms of production that can also protect the communities in which we all live.

The full report can be found at: www.sustainableproduction.org.



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Lowell Center for Sustainable Production
University of Massachusetts Lowell
1 University Avenue
Lowell MA 01854 USA
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