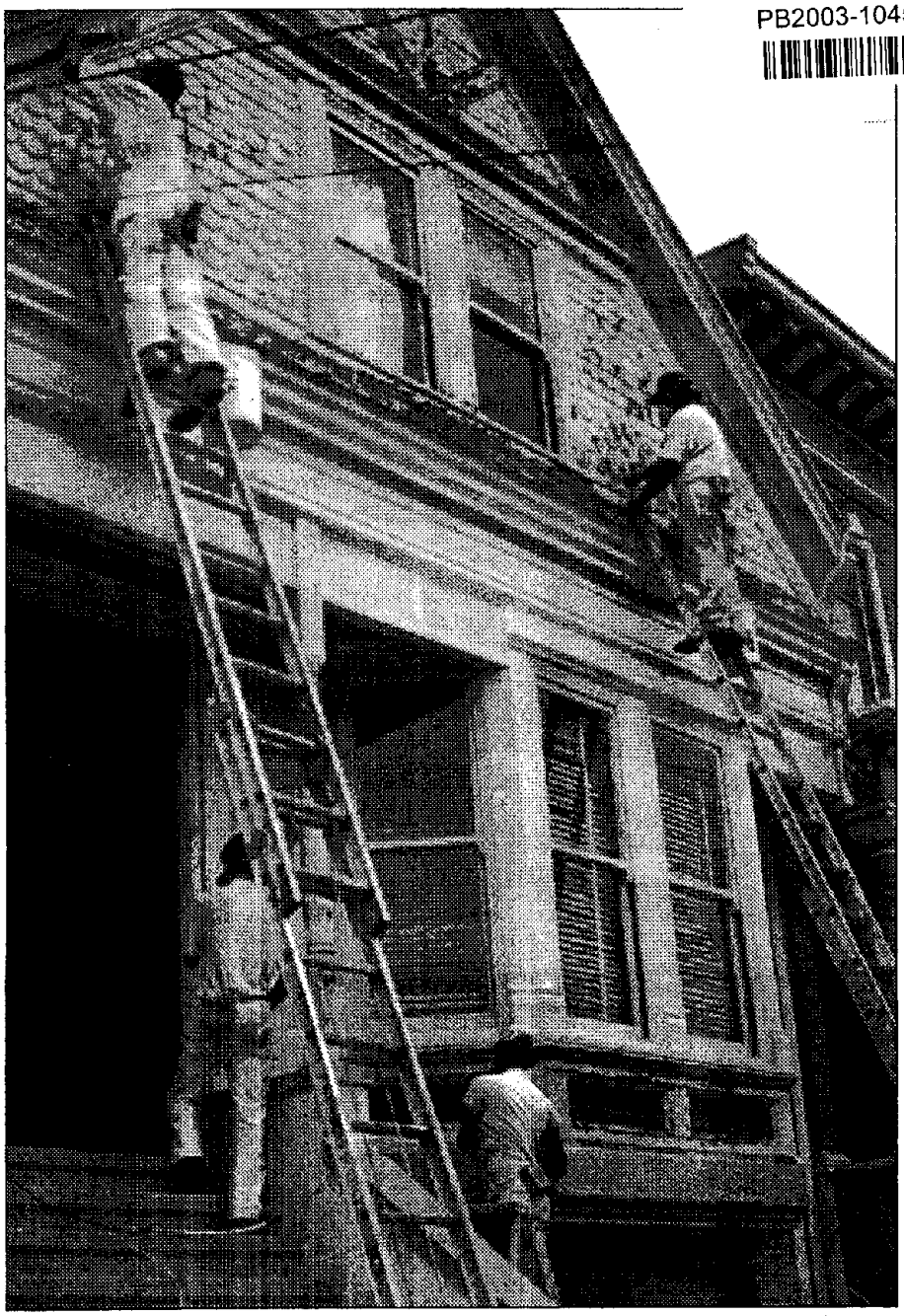
CALIFORNIA PAINTERS PROJECT

Helping Small Business Work Safely with Lead



Occupational Lead Poisoning Prevention Program
California Department of Health Services

FEBRUARY 1998

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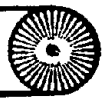

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For more information on the California Painters Project, or a copy of the full 664-page report with appendices, please contact:

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EXECUTIVE SUMMARY

The Occupational Lead Poisoning Prevention Program (OLPPP) of the California Department of Health Services (CDHS) provides statewide preventive services aimed at reducing the occurrence of work-related lead poisoning. Its activities include: managing the Occupational Blood Lead Registry; investigating serious cases of lead poisoning in workers; developing educational materials; educating workers, employers, and health professionals; and conducting interventions targeted to specific high risk industries. In October of 1993, OLPPP initiated the California Painters Project (CPP), a two-year effort to design, implement, and evaluate a multi-dimensional intervention research strategy to prevent lead poisoning among a group of lead-exposed painters in the City and County of San Francisco. The CPP was funded by OLPPP and the National Institute for Occupational Safety and Health (NIOSH)/Centers for Disease Control and Prevention.

The purpose of the Project was four-fold: first, to develop and implement a model lead poisoning prevention strategy and evaluate it for its effectiveness with small to medium-sized painting contractors involved in residential and commercial painting activities; second, to develop a step-by-step employer compliance assistance manual; third to generate information on the resources required, problems encountered, and the feasibility and efficacy of the model, and to make recommendations for revisions; fourth, to assess the risk for lead poisoning among a painting workforce engaged in activities that disturb lead-based paint.

BACKGROUND

Residential and commercial painters are at risk of work-related lead poisoning because lead paint is present in the work environment, and their work tasks frequently generate lead dust and fume. Although the U.S. Consumer Product Safety Commission prohibited the addition of lead to paint for use in homes and public buildings in 1978, older buildings are usually coated with at least one, and often more than one, layer of lead-containing paint. These include single family dwellings and apartment buildings, as well as public buildings such as schools, day care centers, offices, and retail and commercial establishments. It is estimated that 3 million homes in California (27% of the housing stock) may have lead-based paint on their exteriors and approximately 1.3 million homes (12% of the housing stock) may have interior lead-based paint (Sutton et al., 1995).

Painters typically spend an extensive amount of time and effort preparing the surface prior to repainting. Surface preparation methods can produce large amounts of fine lead dust or fume. Studies have shown that airborne lead levels in excess of OSHA's Permissible Exposure Limit are generated by power sanding and grinding, dry manual sanding and scraping, heat gun use, and propane torch burning (Booher, 1988; CDHS, 1993; NIOSH, 1992; NIOSH, 1997; OSHA, 1993 [pg. 26612]; Washington State Department of Labor and Industries, 1995; U.S. EPA, 1997; Zedd et al., 1993). Once lead paint dust is released from the surface, workers can inhale it. They can also ingest the lead dust that settles on their hands, clothing, or equipment particularly when they smoke cigarettes, eat, or drink in the work area.

Data on lead poisoning among painters are limited because lead-poisoned workers may not exhibit overt symptoms and blood lead testing is not widespread within the construction industry.

Nevertheless, serious lead poisoning cases (BLLs ranging from 70 to 600 ug/dl) have been documented among house painters who conduct surface preparation without using adequate protective measures (Feldman, 1978; Amitai et al., 1987; Spaedy and Schubert, 1988; Schneitzer et al., 1990).

Surface preparation work by painters not only puts workers at risk, it can also contaminate the building and surrounding property if not done properly. There are numerous case reports and population studies documenting lead poisoning in children attributable to renovation and remodeling work (Marino et al., 1990; Amitai et al., 1987; Rabinowitz et al., 1985; Amitai et al., 1991; Franko et al., 1997). Lead dust brought home by painters on their clothes, shoes, and bodies can contaminate their vehicles and homes and endanger household members. Two recent studies documented lead contamination in the automobiles of abrasive blasters who removed paint at a bridge renovation site and in the automobiles and homes of New Jersey construction workers (Piacitelli et al., 1995; Piacitelli et al., 1997).

Nationwide there are 35,180 painting contractors that employ 160,812 painters (U.S. Department of Labor, 1993). In California, 4,429 painting contractors employ 21,730 painters (U.S. Department of Labor, 1993). These numbers, however, do not represent the entire population of workers at risk. There are many self-employed painters, persons who paint on a temporary, seasonal basis, and others who do painting work for employers who are not painting contractors.

National statistics indicate that the painting trade is dominated by small businesses, with the average painting contractor employing approximately five workers (U.S. Bureau of the Census, 1990). There is often little safety awareness among small business owners, including awareness of applicable OSHA regulations; OSHA does not conduct targeted inspections of businesses with fewer than 10 employees. Lack of resources for health and safety is also an issue for small business owners.

The promulgation of the Cal/OSHA Construction Lead Standard (Title 8 CCR Section 1532.1) only months prior to the start of the Project, heightened awareness of the potential for lead poisoning in the painting trades, and created an environment in which painting contractors, their trade associations, and unions were receptive to participating in the Project. Several other developments influenced the environment in which the Project took place: the enactment in 1992 of the federal Residential Lead-Based Paint Hazard Reduction Act (Title X); the lowering by the CDC of the BLL of concern in children from 25 ug/dl to 10 ug/dl; the passage of the California "Lead-Safe Schools Protection Act" (Chapter 1317, Statutes of 1992); and the passage of California legislation requiring the California Department of Health Services to establish a state program to carry out federal Title X mandates (Chapter 1122, Statutes of 1993). Together, these developments have created a demand for contractors who are knowledgeable about lead-safe painting.

PROJECT DESIGN

The CPP was designed to test the hypothesis that a comprehensive intervention strategy of education, training, and technical assistance, implemented in a step-by-step manner, would be

effective in encouraging residential/commercial painting contractors to establish lead safety programs. We also hoped to generate information on the feasibility and efficacy of this strategy in order to make recommendations for replication by others, including state and local health departments.

Several key principles guided the design of the CPP. First, multiple factors which affect health and safety must be addressed simultaneously. Second, both employers and workers must be participants in the intervention in order to bring about significant change at the work site. Third, the Project must either directly provide or facilitate access to the tools and resources necessary for making improvements. Finally, the small business person is most likely to adopt improved health and safety practices when introduced to the material in a stepwise manner and when clear guidance is given concerning the relative importance of specific changes.

RECRUITMENT AND ENROLLMENT OF PARTICIPANTS

Contractors were recruited from the population of licensed residential and commercial painting contractors located in San Francisco. San Francisco was selected as the project site because a large proportion (74%) of the housing stock in San Francisco was built prior to 1978, increasing the likelihood that employee participants would have significant exposure. Eligible companies had to have at least 2 employees who do surface preparation work; work on older buildings likely to contain lead paint; have workers' compensation insurance; and be substantially out of compliance with the Cal/OSHA Construction Lead Standard. OLPPP staff worked with the Painting and Decorating Contractors of America (PDCA) and the International Brotherhood of Painters Union to publicize the Project and recruit participants at local trade association and union meetings, and at the annual PDCA statewide convention.

The final project enrollment was 21 painting contractors, employing 132 surface preparation workers. Participation in the Project was completely voluntary, and contractors and/or workers could drop out of the Project at any time. The State of California Health and Welfare Agency's Committee for the Protection of Human Subjects reviewed and approved the project protocol and procedures for obtaining informed consent, and data collection instruments. Informed consent was obtained from participating contractors and employees.

PROJECT INTERVENTION ACTIVITIES

Project intervention activities took place from June 1994 through November 1994. This time frame was chosen to coincide with the highest seasonal activity period for painters. The Project provided to contractors 32 hours of instruction on how to set up a lead safety program; a nine chapter, step-by-step, lead safety manual developed specifically for participants; and assistance in selecting a medical provider. Participants were also offered industrial hygiene services for conducting airborne exposure monitoring for lead at no cost. Workers received an 8-hour lead training course; a set of easy-to-read fact sheets covering basic lead safety topics; written notification of BLL and ZPP results taken at baseline and post-intervention accompanied by a fact sheet on understanding these tests; and a letter on take-home contamination and specific instructions on how to prevent it. All worker activities, including orientation meetings, structured

interviews, training, and written correspondences, were conducted in English, Spanish and Chinese (Cantonese).

An essential part of the CPP was a comprehensive evaluation plan designed to determine whether the Project was implemented as planned (process evaluation), provide feedback from participants during the intervention phase on the quality of activities and materials (formative evaluation), and measure the effect of the intervention on company lead safety programs and worker BLLs (impact evaluation). We set measurable objectives designating the degree of improvement in lead safety practices that we hoped to achieve through our intervention efforts; 27 objectives pertain to employer changes in behavior/work practices and 12 to worker behavior/work practices. Quantitative observations were made over a number of time intervals preceding and following the intervention. These quantitative methods included standardized employer and worker questionnaire interviews on lead safety programs and work practices, and BLL and ZPP testing of lead-exposed workers. We also collected qualitative information in order to arrive at a better understanding of the underlying factors related to the success or failure of intervention activities, and to identify unintended impacts of the Project. Our qualitative methods included focus group discussions with contractors and written and verbal evaluation of employer seminars and worker training sessions.

EXPOSURE RESEARCH

The industrial hygiene monitoring services offered to contractors as a part of the employer intervention activities also provided an opportunity to investigate full-shift and task-specific airborne lead exposures to painters. In the absence, until recently, of a comprehensive Cal/OSHA Construction Lead Standard, few data have been collected on lead exposures to residential and commercial painters. Although limited, these data may be useful to regulatory agencies and others in the future.

RESULTS

Lead Safety

By the end of the Project, participating contractors had made a number of important improvements such as:

- more frequently testing for lead in paint before beginning a job;
- more often selecting the appropriate respirator;
- better containing the spread of lead contamination by sealing windows and doors during exterior work; and
- using safer, more effective clean-up methods.

Workers also made significant improvements in work and personal hygiene practices including:

- more frequently washing before eating, drinking, or smoking;
- less frequently eating, drinking, or smoking in the work area;
- more frequently washing up at the end of the work shift; and
- dry sweeping less frequently.

Data collected one year after the intervention showed that contractors continued to use safer work practices, and in some cases made additional improvements. As could be expected, employers took a longer time to implement practices that required sizable financial investments such as the purchase of HEPA vacuums and HEPA-exhausted power tools.

Contractors were less successful switching from established surface preparation methods to safer methods, maintaining a medical surveillance program and providing new hires with adequate lead safety training.

In addition to changes in work practices, contractors reported changes in their business practices and their relationships with their employees as a result of participating in the CPP. Several contractors have sought work identified as "lead abatement" or have started to advertise their knowledge about lead paint hazards and are receiving referrals for lead-safe work. Contractors reported that employees were more likely to identify where lead paint might be present, consistently take safety precautions, and request the necessary equipment and supplies to complete a job safely.

Airborne Lead Exposure During Surface Preparation

Our air monitoring data show that full-shift airborne lead exposures can exceed the Cal/OSHA Permissible Exposure Limit (PEL) of 50 ug/m^3 during surface preparation work on lead-containing paint. The results of the 25 full-shift samples ranged from 0.8 to 550 micrograms per cubic meter of air (ug/m^3). The average full-shift exposure was 57 ug/m^3. Exposures exceeding the PEL appear to be most likely when dry manual sanding or uncontrolled power sanding are employed. Both of these work methods, but particularly uncontrolled power sanding, were shown to be associated with very high airborne lead exposures. The average short-term (30-minute) sampling result during dry manual sanding was 420 ug/m^3 and 580 ug/m^3 during uncontrolled power sanding. The data also show that HEPA-exhausted power sanding can result in significantly reduced exposures to the worker (90% reduction) when substituted for uncontrolled power sanding.

Blood Lead Levels

BLLs ranged from less than 5 to 38 ug/dl, with a geometric mean of 9 ug/dl at all four times testing was conducted. Two to four percent of painters on all four test dates had a BLL in the 30 to 39 ug/dl range. No participant had a BLL above 40 ug/dl, the level at which Cal/OSHA requires medical evaluation. These BLLs reflect the moderate exposure participants reported in the month prior to testing; on average participants did only a few days (3 to 5) of surface preparation work on buildings likely to contain lead paint in the month prior to blood testing. Although we do not know how the recent lead exposure of our group compares to that of residential/commercial painters as a whole, these results suggest that painters' BLLs are not as high as more continuously exposed worker groups, such as those involved with automotive radiator repair. Still, the average BLL of CPP participants was three times greater than that of the general public.

DISCUSSION

The improvement we saw in many areas indicates that contractors substantially out of compliance with the Cal/OSHA Construction Lead Standard can be successfully encouraged to implement a lead safety program. In general, we were most successful in inducing contractors to make changes that were simple and straightforward, a familiar part of their day-to-day operations, inexpensive or considered reasonably priced. Contractors may have been particularly successful in improving housekeeping and containment practices since these changes can reduce clean-up time and therefore lower long-term labor costs, decrease contractor liability for contamination of the customer's property, and improve customer satisfaction.

Switching from established surface preparation methods to alternative, safer methods proved more difficult for contractors. Contractors may have been reluctant to use alternate surface preparation methods that they believed risked the fundamental quality of their work, thereby threatening customer satisfaction. For example, contractors reported that wet sanding (a safer alternative to dry sanding) was often problematic because it can later lead to problems with underlying moisture.

Contractors were also less successful at maintaining routine blood testing. All of the participating contractors selected an experienced medical provider and 90% sent employees in for scheduled BLL and ZPP testing in August 1994. However, only 57% sent their workers for the next scheduled testing. Still, this achievement is noteworthy, particularly when compared to studies showing that a very low percentage (in one study less than 10%) of employers in lead-using industries conduct routine BLL testing (Rudolph et al., 1990).

Contractors may have made greater improvement in some areas given more feasible work practice alternatives and less costly, more accessible medical services and products. In other areas, contractors may have made greater improvement had we provided more hands-on training to develop comfort with new work practices, or provided training specifically for on-site foremen or supervisors.

REPLICATION OF THE CPP INTERVENTION MODEL

A major goal of the CPP was to develop a lead safety intervention strategy for small to medium-sized residential and commercial painting contractors which could be used by state and local health departments and others. While full implementation of the CPP intervention strategy may not be feasible or appropriate in every situation, the model can be adapted to the needs and resources of local programs. We recommend that state and local health departments and others consider the points below when adapting the model for their use.

The employer seminars appeared to be the most significant project component in achieving desired changes among employers. The use of peer educators, hands-on demonstrations, and participatory training techniques were key to the success of these training efforts. Providing assistance identifying qualified medical surveillance services was instrumental to employers

establishing medical surveillance programs. Industrial hygiene consultation and monitoring services, although helpful, could be scaled back if program resources are limited. We recommend that the educational materials developed by the CPP be used rather than developing new materials.

In addition to specific project components, several characteristics of the Project appeared to have a significant impact on the success of the CPP. First, intervening simultaneously with employers and workers led to significant changes at the work site. Approaching employers with an open mind and clearly communicating a willingness to listen and learn, as well as providing opportunities for peer interaction and education, appeared to greatly facilitate the CPP's success. Contractors repeatedly told us that the respectful, non-condescending, open-minded attitude of CPP staff was critical to their efforts, and their employees' efforts, to improve lead safety.

The success of the approach used in the CPP depended on an ability to attract volunteer participants. Local health departments for the most part do not have regulatory authority in the area of occupational health and therefore are in a position to replicate our strategy. The role of the state health department in regulation of the workplace varies from state to state. State health departments which have occupational regulatory responsibilities in addition to their public health responsibilities should consider the effect this may have on their ability to implement a voluntary program. One approach which has been tried by health departments in this situation is to provide limited protection from enforcement action for employers who participate in an intervention program.

Differences in resources and staffing patterns between OLPPP and state and local health departments may also affect the replicability of the CPP in these settings. The CPP was a resource-intensive program and many local health departments may not be able to marshal sufficient resources to implement such a comprehensive model. Throughout the report we have tried to point out areas where activities could be modestly scaled back if necessary.

Another important factor which state and local health departments should consider is their ability to assemble a multi-disciplinary team. Assembling a team of industrial hygienists, health educators, nurses, etc., may be realistic for many state health departments, but most local health departments will find it difficult to compile such a team. Still, local health departments may be able to bring in private consultants or work with other local agencies to bring together the necessary expertise.

CONCLUSION

We conclude based on our initial interviews of painting contractors and their employees that there is likely to be widespread lack of compliance within the industry with the key components of the Cal/OSHA Construction Lead Standard. Our air monitoring data document that airborne lead exposures during surface preparation on lead-containing paint can exceed the Cal/OSHA PEL of 50 ug/m^3; dry manual sanding and uncontrolled power sanding can result in very high exposure levels. While CPP participants' BLLs were lower than those of workers with daily high lead exposure, the average BLL was three times greater than that of the general population.

It is important to note that these BLL results represent a small group of painters who had only moderate exposure to lead paint at the time of our study. Certainly, lead exposure may be higher among painters who concentrate on work in older buildings or painters whose main task is surface preparation. OLPPP and others have found individual residential painters who were seriously lead poisoned following surface preparation without proper controls.

The indication of widespread lack of compliance with the Construction Lead Standard, the evidence of the potential for serious exposure, and the finding that painters' BLLs exceed those of the general population point to the need for education and technical assistance programs/projects for painting contractors and their employees.

Our appraisal of the degree of success of the CPP depends on what *we believe* should have been achieved given our intervention efforts since there are no established performance standards for comprehensive workplace intervention projects or intervention projects which target painters. Unfortunately, there was very little information available to us at the outset on which to base reasonable expectations for improvement. Over the course of the Project it became clear that our expectations were overly optimistic. If we judge the CPP solely on whether we met the objectives we set initially, the CPP was not overwhelmingly successful; employers did not meet 12 of 27 objectives and workers did not meet 9 of 12 objectives. However, such an assessment of the Project masks the extensive improvement that employers and workers made. Looking more closely at the data we find that there was 50% or greater (57% - 84%) improvement in 6 of the 12 areas where employer objectives were not met; of the 9 areas where worker objectives were not met, there was 50% or greater (53% - 82%) improvement in 6 and very close to 50% improvement in the remaining three cases (44%, 48%, 49%). Given that we were attempting to influence a very complex phenomenon, human behavior, our expectations for improvement should have been more modest.

Although we fell short of achieving many of the objectives that we set, we believe that the significant improvement we observed indicates that the CPP intervention strategy of education, training, and technical assistance, implemented in a step-by-step manner, was effective in inducing residential/commercial painting contractors to establish lead safety programs and encouraging workers to use safe work practices. Further, these improvements were sustained.

Our inability to meet employer objectives in the areas of safer surface preparation methods, medical surveillance, and employee training indicates the need for some changes in the intervention approach (e.g., more hands-on training for new work practices) and less costly, more accessible services and products. Approaching employers with an open mind and clearly communicating a willingness to listen and learn from them were critical to the project's success. While effective, full implementation of the CPP intervention strategy may not be feasible for all local and state health departments. For programs choosing to implement a modified version of the CPP strategy, our evaluation provides guidance on where limited resources should be placed and which project components should be emphasized in future intervention projects.

RECOMMENDATIONS

Local and State Health Departments

We recommend that health departments and others interested in replicating or adapting the CPP intervention strategy with painters:

- Adapt this model to fit their target population and the resources available to them keeping in mind that: employer and worker education and training appeared to be the most significant component in achieving improved lead safety; and assistance identifying qualified occupational medical services was essential to employer efforts to establish a medical program.

- Investigate new approaches to addressing the major obstacles to lead safety that we identified through the CPP including: reticence to adopting new work practices and technologies; lack of accessible and affordable medical services; lack of awareness among the public about lead issues; competition from the unlicensed sector and other painters not using lead-safe practices; and variability of enforcement by regulatory agencies.

- Highlight the message that becoming a lead-safe painting company decreases contractors' liability and increases market opportunities.

- Use or adapt educational materials and approaches developed in this Project to raise awareness about lead issues and motivate employers to seek training by accredited training providers.

Occupational Health and Safety Intervention Researchers

We recommend that occupational health and safety intervention researchers and practitioners consider the following points when conducting intervention research.

Our experience in the Project validated much of what has been written regarding effective intervention research efforts:

- Learn as much as possible about the industry prior to beginning the intervention.

- Involve trade associations, unions, and other stakeholders in all phases of the project.

- Base the intervention design on theories in the engineering, sociological, organizational, and behavioral sciences which describe how the project will lead to the desired outcome.

- Use a research design as similar as possible to a true scientific experiment. In most workplace intervention research settings a quasi-experimental design will be necessary.

- Plan to devote significant resources to project evaluation, including follow-up evaluation to determine if changes were sustained or further changes made.

- Develop reasonable performance objectives by which to evaluate the impact of the project.

- Include qualitative evaluation methods to inform and interpret quantitative data.

- Maximize limited occupational health resources by developing intervention projects which can to applied to a larger audience.

Based on our experience, we also propose the following as important to the success of workplace intervention efforts:

- Design comprehensive intervention projects which address the multiple factors which affect workplace health and safety, work simultaneously with employers and workers, provide or facilitate access to tools and resources necessary for making improvements, introduce material in a stepwise manner over an extended period of time, and give clear guidance concerning the relative importance of specific changes.

- Approach employers and workers with respect and an open mind and a willingness to learn from them and adapt the intervention based on their input/feedback.

- Recognize the significance of peer influence and peer support and design projects which include peer education. Use participatory training techniques, including hands-on demonstrations.

- Offer concrete incentives to encourage participation and minimize record keeping tasks and paperwork required for participants.

- For those conducting research in industries where lead exposure is intermittent and highly variable, validate a means for estimating recent lead exposure which minimizes reliance on individual recall and surrogate exposure measures.

Policy Makers

We recommend that policy makers concerned with the prevention of lead poisoning in residential/commercial painting and other industries where small businesses predominate:

- Provide ongoing funding to implement and evaluate new intervention approaches and develop industry-specific educational materials.

- Ensure that free or low-cost education and technical assistance are available to small businesses owners, including painting contractors, to implement lead safety programs in compliance with the OSHA Construction Lead Standard.

- Support stronger enforcement of the OSHA Construction Lead Standard, including targeted inspections.

- Support requirements for state- or EPA-certification of painters (supervisors and/or workers) and/or for painters to use specific lead-safe work practices.

- Promote the development of externally-provided training services for small business owners and their employees that are accessible, affordable, and institutionalized (i.e., available on an on-going basis through educational institutions such as community colleges, union apprenticeship programs, etc.).

- Foster the development of new approaches to the delivery of accessible and affordable, high quality occupational medical services, including lead medical surveillance, to small business owners and their employees.

- Support the development of ongoing financial resources for small business owners for implementation of health and safety improvements.

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