

Promoting Integrated Approaches to Reducing Health Inequities Among Low-Income Workers: Applying a Social Ecological Framework

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Background: *Nearly one of every three workers in the United States is low-income. Low-income populations have a lower life expectancy and greater rates of chronic diseases compared to those with higher incomes. Low-income workers face hazards in their workplaces as well as in their communities. Developing integrated public health programs that address these combined health hazards, especially the interaction of occupational and non-occupational risk factors, can promote greater health equity.*

Methods: *We apply a social-ecological perspective in considering ways to improve the health of the low-income working population through integrated health protection and health promotion programs initiated in four different settings: the worksite, state and local health departments, community health centers, and community-based organizations.*

Results: *Examples of successful approaches to developing integrated programs are presented in each of these settings. These examples illustrate several complementary venues for public health programs that consider the complex interplay between work-related and non work-related factors, that integrate health protection with health promotion and that are delivered at multiple levels to improve health for low-income workers.*

Conclusions: *Whether at the workplace or in the community, employers, workers, labor and community advocates, in partnership with public health practitioners, can deliver comprehensive and integrated health protection and health promotion programs. Recommendations for improved research, training, and coordination among health departments, health practitioners, worksites and community organizations are proposed.* Am. J. Ind. Med. © 2013 Wiley Periodicals, Inc.

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INTRODUCTION

Integrating occupational safety and health protection with health promotion to prevent worker injury and illness and to advance worker health and well-being has emerged as a major goal of the National Institute for Occupational Safety and Health through the Total Worker Health™ program. Long-standing debates in the occupational safety and health arena have often dichotomized public health programs into those that address protection from workplace hazards and those that focus on promoting positive lifestyle factors [DeJoy and Southern, 1993; Schulte et al., 2012]. With a few notable exceptions [Sorensen et al., 2002], health and safety programs to protect workers from hazards such as asbestos have minimized the role of personal health behaviors such as smoking; and worksite-based health promotion programs such as smoking cessation ignore contributing exposures from the workplace. Neither approach considers the interaction of these and other environmental, economic and social determinants of health [Punnett et al., 2009; Krieger, 2010], which often have a particular impact on the low-income, often non-unionized and immigrant workforce [Linnan et al., 2008]. This study describes challenges and opportunities to better integrate health protection and health promotion for low-income workers—at the worksite, through state and local health departments, in community health clinics and through community-based participatory health intervention programs.

The Low-Income Workforce and Health Inequities

According to the Current Population Survey (2009–2010), close to one of every three workers in the United States (approximately 39 million workers) was low-income (Table I), defined as weekly earnings below 150% of the federal minimum wage for a 40-hour workweek (currently \$435). Low-income workers were disproportionately women, African-American, Hispanic, foreign-born, lacking a high school diploma, and under 24 years of age. The most common occupations of low-income workers included cashiers, food service workers, personal and home care aides, housekeepers, hand packagers, farm workers, and child care workers (Table II). The low-income workforce is likely to remain large, since over half of the approximately 51 million job openings projected between 2008 and 2018 require no post-secondary education [U.S. Bureau of Labor Statistics, 2009].

Many studies have demonstrated associations between income level and overall life expectancy [e.g., Lin et al., 2003; Singh and Siahpush, 2006; Clarke et al., 2010] and rates of chronic disease including diabetes, hypertension and obstructive lung diseases [e.g., Diez Roux et al., 2002; Kanjilal et al., 2006; Braveman et al., 2011; Kanervisto et al., 2011]. These disparities in health are also

considered to be *health inequities*, because they often arise from social disadvantage which has created modifiable and ethically unfair exposures at work, at home, and in the community [Krieger et al., 2008; Braveman, 2010; Centers for Disease Control and Prevention, 2011].

Several of the most common low-income occupations are also among those with the highest numbers of work-related injuries and illnesses [Bureau of Labor Statistics, 2010]. Thus unsafe and unhealthy working conditions represent one possible mechanism by which health disparities may arise [Chandola et al., 2005; d’Errico et al., 2007; Boyer et al., 2009].

Other health-promoting factors, such as neighborhood walkability, availability of healthy food, and physical safety in the community, are often inadequate in low-income communities [Mujahid et al., 2008; Hutch et al., 2011; Woolf et al., 2011]. Low-income workers, especially those from racial and ethnic minority communities, are also more likely to live in communities with higher levels of air, water, and soil contamination [Morello-Frosch and Jesdale, 2006]. People of color make up the majority (56%) of those living within two miles of the nation’s commercial hazardous waste facilities; an even larger majority (69%) lives in neighborhoods with multiple hazardous waste facilities [Bullard et al., 2007]. Low-income and minority populations also have more difficulty accessing safe and healthy housing [USDHHS, 2009]. Experiences of racism and other forms of discrimination may have additional health effects [Krieger and Sidney, 1996]. Thus, many lower income individuals face multiple levels of unhealthy exposures at work, in the community and at home.

Some characteristics of low-income occupations limit the information available about the health impact of working conditions in these groups. Many low-wage workers are employed by small establishments, and small companies are less likely to report occupational injuries to the Bureau of Labor Statistics’ Survey of Occupational Injuries and Illnesses (SOII) [Souza et al., 2010; Dong et al., 2011]. Low-wage workers may be more susceptible to pressure from employers not to report occupational injuries or file workers’ compensation claims [Azaroff et al., 2002; Lowry et al., 2010]. Those low-wage workers hired as independent contractors are frequently not covered by their employers’ workers compensation programs, and so illness and injuries in these workers would not be detected in reviews of compensation claims [NAIC, 2008].

The many problems faced by low-income workers and the complex interplay of overlapping occupational and non-occupational issues pose significant challenges. These are exacerbated by the lack of effective public health programs to address the multiple and interacting sources of risk. The separation of different health hazards into disciplinary “silos” occurs in academia as well as by practitioners in workplaces, community, and clinical settings. Until recently, with a few

TABLE I. Number and Demographic Characteristics of Low-Income^a Compared to Higher Income Wage and Salary Workers^b in the United States, 2009–2010^c

| | Low-income wage and salary workers ^a | | Higher income wage and salary workers ^a | |
|--------------------------------|---|-------|--|-------|
| | Number | % | Number | % |
| Total | 38,972,477 | 100.0 | 85,308,980 | 100.0 |
| Age group | | | | |
| 16–19 | 4,185,513 | 10.7 | 322,144 | 0.4 |
| 20–24 | 7,975,143 | 20.5 | 4,422,903 | 2.2 |
| 25–34 | 8,247,776 | 21.2 | 19,967,455 | 23.4 |
| 35–44 | 6,112,927 | 15.7 | 21,598,114 | 25.3 |
| 45–54 | 6,036,856 | 15.5 | 22,920,207 | 26.9 |
| 55–64 | 4,152,387 | 10.7 | 13,746,584 | 16.1 |
| 65+ | 2,261,875 | 5.8 | 2,331,573 | 2.7 |
| Sex | | | | |
| Male | 15,790,025 | 40.5 | 47,744,668 | 56.0 |
| Female | 23,182,452 | 59.5 | 37,564,311 | 44.0 |
| Race | | | | |
| White | 31,056,899 | 79.7 | 70,254,401 | 82.4 |
| Black | 5,317,533 | 13.6 | 8,843,574 | 10.4 |
| Native American/Alaskan Native | 348,808 | 0.9 | 543,836 | 0.6 |
| Asian | 1,494,760 | 3.8 | 4,378,602 | 5.1 |
| Hawaiian/Pacific Islander | 128,330 | 0.3 | 247,237 | 0.3 |
| Multiple races | 626,147 | 1.6 | 1,041,329 | 1.2 |
| Hispanic origin | | | | |
| Hispanic | 8,111,482 | 20.8 | 10,036,833 | 11.8 |
| Non-hispanic | 30,860,995 | 79.2 | 75,272,146 | 88.2 |
| Education | | | | |
| < 9th grade | 2,350,425 | 6.1 | 135,9675 | 1.6 |
| 9th–12th grade (no diploma) | 5,568,007 | 14.3 | 2,849,034 | 3.3 |
| High school/GED diploma | 13,270,994 | 34.1 | 21,830,624 | 25.6 |
| College (no degree) | 9,527,977 | 24.5 | 14,587,694 | 17.1 |
| Associates degree or higher | 8,255,074 | 21.2 | 44,681,949 | 52.4 |
| Citizenship | | | | |
| Native | 31,397,081 | 80.6 | 73,580,344 | 86.3 |
| Naturalized | 2,256,457 | 5.8 | 6,175,498 | 7.2 |
| Non-citizen | 5,318,938 | 13.7 | 5,553,137 | 6.5 |

^aLow-income defined as a reported weekly income ≤ 1.5 times the gross weekly income for a minimum wage worker working 40 hours a week (\$435). Higher income includes all other wage and salary workers.

^bWage and salary workers only. Excludes self-employed and unpaid family workers.

^cData based on authors analysis of the Current Population Survey 2009–2010.

exceptions [DeJoy and Southern, 1993], few public health professionals even envisioned more holistic programs to address low-income workers' health [Campe et al., 2011].

APPLYING A SOCIAL ECOLOGIC FRAMEWORK

Recognizing the moral imperative to achieve health equity, public health practitioners, researchers, and community and worker advocates have begun to promote new, more integrated programs [Cherniack et al., 2011; Morello-Frosch

et al., 2011]. In this article we apply a social ecological framework (SEF) to address the needs, challenges, and existing opportunities to create more integrated programs that consider the interface between health protection and health promotion with a focus on improving the health of the low-income working population.

The social ecologic framework (SEF) [McLeroy et al., 1988; Stokols, 1992; Green et al., 1996] examines the ways in which multiple levels of influence can impact health outcomes including at the *intrapersonal*, *interpersonal*, *institutional*, *community/society*, and *policy* levels

TABLE II. Occupations^a Employing >100,000 Workers and Paying <150% of the Federal Minimum Wage (\$11.00 Per Hour), 2010^b

| Occupation ^a | Hourly wage (\$) | No. of workers |
|--|------------------|----------------|
| Cashiers | 9.52 | 3,354,170 |
| Combined food preparation and serving workers, including fast food | 8.95 | 2,692,170 |
| Waiters and waitresses | 9.99 | 2,244,480 |
| Home health aides | 10.46 | 982,840 |
| Maids and housekeeping cleaners | 10.17 | 865,960 |
| Food preparation workers | 9.93 | 802,650 |
| Personal care aides | 9.82 | 686,030 |
| Packers and packagers, hand | 10.63 | 676,870 |
| Childcare workers | 10.15 | 611,280 |
| Cooks, fast food | 8.91 | 525,350 |
| Dishwashers | 8.98 | 505,950 |
| Bartenders | 10.25 | 495,350 |
| Counter attendants, cafeteria, food concession, and coffee shop | 9.27 | 446,660 |
| Dining room and cafeteria attendants and bartender helpers | 9.29 | 390,920 |
| Hosts and hostesses, restaurant, lounge, and coffee shop | 9.43 | 329,020 |
| Cleaners of vehicles and equipment | 10.74 | 288,110 |
| Amusement and recreation attendants | 9.50 | 254,630 |
| Farmworkers and laborers, crop, nursery, and greenhouse | 9.64 | 228,600 |
| Hotel, motel, and resort desk clerks | 10.30 | 222,540 |
| Food servers, nonrestaurant | 10.40 | 205,330 |
| Laundry and dry-cleaning workers | 10.21 | 204,820 |
| Cooks, short order | 10.11 | 171,780 |
| Sewing machine operators | 10.88 | 147,030 |
| Nonfarm animal caretakers | 10.61 | 135,070 |
| Parking lot attendants | 10.21 | 124,590 |
| Lifeguards, ski patrol, and other recreational protective services | 9.98 | 117,540 |
| Ushers, lobby attendants, and ticket takers | 9.76 | 107,200 |

^aBased on the 2010 Standard Occupational Classification coding system.

^bData based on authors analysis of the Bureau of Labor Statistics, Occupational Employment Statistics, 2010.

of influence [Breslow, 1996; Linnan et al., 2001; Campe et al., 2011]. Our goal is to examine how better integration might be achieved at these multiple levels of influence through programs initiated in each of four settings: the worksite, state and local health departments, community health centers, and other community-based organizations.

Factors at the *intrapersonal* (individual) level include individual behaviors and their immediate precursors, such as lack of knowledge about how to use workplace protective equipment or how to prepare healthy meals. Low-income workers may have limited formal education or limited English proficiency, lacking skills to interpret information available from employers, practitioners, and other sources (i.e., low health literacy) [Shelton et al., 2011]. They may also be less confident about their ability to influence their own health or their working conditions (i.e., low self-efficacy) [Lipscomb et al., 2008].

At the *interpersonal* level, a lack of co-worker or family support for health choices or practices, excessive demands by managers/supervisors which intensify the

work pace or increase work hours, the multiple demands of paid employment and unpaid child and elder care—especially affecting working women—may all negatively influence health [Sorensen et al., 2011]. Conversely, membership in worker-based, community-based, or faith-based organizations may provide support, information, and social programs that help individuals confront pressures at work and at home [Delp et al., 2010].

At the *institutional* level, specific workplace or community conditions may disproportionately expose low-income workers to environmental toxins, safety hazards, and psychological stress [Quinn et al., 2007; d'Errico et al., 2007; Boyer et al., 2009]. Institutional factors may also create unequal access to health-promoting services or conditions such as union membership, health screenings, training in safe work practices, or accessible recreational facilities. Thus solutions require not only physically healthier environments, such as hazard free workplaces, safe streets and access to fresh fruits and vegetable outlets, but also psychosocially healthier conditions that promote

the empowerment of workers and community members and in which all individuals are treated fairly. For example, an intervention with nursing home workers used the SEF to design specific organizational practices and policies to support exercise and dietary improvements [Flanery et al., 2012].

Community or society level influences include political, social, and economic forces that determine the kind of local industry and availability of good jobs, access to transportation, access to supermarkets and fresh food outlets, and housing options [Morland et al., 2006; Larson et al., 2009; Walker et al., 2010]. For example, when these influences result in an insufficient number of jobs for a given community, or limit access to certain populations, or when a major portion of the available jobs are temporary or low-wage jobs, this can create financial and psychosocial stresses from under-employment that add burdens to already vulnerable worker populations [Landsbergis et al., 2012]. And although environmental factors contribute to more than 25% of all global disease, and toxic agents ranked fifth in underlying causes of U.S. deaths in 2000, environmental and occupational medicine is largely omitted in the curriculum of U.S. medical and nursing schools, thus limiting detection of occupational health disparities [Gehle et al., 2011].

Finally, *policy* level influences may produce disparities through zoning laws, budget cuts, and labor policies that limit access to fair, living wages, and workers' ability to organize. Policies determine wage levels and benefits, establish occupational and environmental standards, and support enforcement of safety and health standards. Disparities between lower and higher income workers are likely when these policies are weak.

The SEF suggests that these levels of influence interact with each other. The effects on psychosocial strain from working conditions, inequitable distribution of resources, and societal racism all combine to create health inequities [Krieger, 2010]. Individual attitudes and behaviors are influenced by experiences in the community, in the workplace, and by the collective attitudes of the broader civil society [Breslow, 1996]. With SEF as a guiding framework and mindful that health inequities are created and controlled by influences at all these levels, we can more thoughtfully identify the elements of integrated programs that are likely to be effective in improving health (Table III).

PROGRAM SETTINGS TO REDUCE LOW-INCOME WORKERS' HEALTH INEQUITIES

The Worksite

Traditionally, worksite health programs have either addressed lifestyle habits such as cigarette smoking and

weight control *or* workplace environmental conditions such as chemical exposures or heavy lifting; these are rarely combined as part of an integrated program [Cherniack et al., 2011; Sorensen et al., 2011]. A more fundamental issue, however, is the scope of most worksite health programs rarely attend to or even acknowledge the larger social, economic, and political context that influences health behaviors, work and community environmental conditions, and access to jobs.

Worksite health promotion (WHP) programs typically focus predominately on addressing personal "lifestyle" through education and screening activities aimed at increasing individual workers' awareness of personal risk factors and suggesting strategies to modify health behaviors. Some have also involved institutional changes in the workplace to promote healthy behaviors, such as providing exercise facilities, labeling vending machines with nutritional information, and preferentially pricing healthy choices in worksite cafeterias [Pratt et al., 2007]. Few WHP programs reach the one-half or more of U.S. workers in small companies or scattered in small numbers across multiple sites [Linnan et al., 2008].

The scope of many traditional WHP programs ignores the contribution of work-related exposures to illness. One example would be a program that focuses only on smoking cessation for workers exposed to asthmagens or other substances that cause lung disease. When employers ignore workplace environmental conditions which are of concern to employees, then health messages and other WHP programming may be less effective [Sorensen et al., 2002; Cherniack et al., 2011]. The new National Healthy Worksite Program of the CDC explicitly calls for identification of occupational health and safety concerns as part of the needs assessment process to implement a workplace health promotion program [CDC, 2012].

Failure to consider work organization factors can also limit the success of WHPs. Shift scheduling, involuntary overtime, lack of affordable childcare, lack of adequate transportation, employee medical insurance coverage and sick leave, and low wages may all directly affect workers' access, free time, or ability to exercise or prepare healthy meals. Factors in the work environment including night work, work pace, occurrence of assaults, low decision latitude, and other psychosocial stressors can all increase the prevalence of risk factors such as cigarette smoking, alcohol use, unhealthy eating patterns, lack of leisure-time exercise, and obesity [Brisson et al., 2000; Kivimäki et al., 2001; Parkes, 2002; Chandola et al., 2005; Wempe and Rosvall, 2005; Kouvonen et al., 2005a,b; Albertsen et al., 2006; Ostry et al., 2006; Vaananen et al., 2009]. Low-income workers have reported their eating and exercise behaviors to be adversely affected by time pressure, physical fatigue, and low control over workload and scheduling, as well

TABLE III. Examples of Program Activities at Multiple Levels of the Social Ecological Framework

| Levels of influence | | Program setting | | |
|---|--|--|--|--|
| Intervention targets | Worksite | Health departments | Community clinics | Community-based |
| Intrapersonal <i>Individual</i> | Disseminate information on smoking risks and cessation programs; and on how smoking may interact with workplace exposures to increase disease risk Provide healthy food options in cafeteria & vending machines Illuminate and decorate staircases to encourage their use | Disseminate information on asthma prevention and control (including work-related asthma) to patients through health care providers. | Ask patients what they do for work and about hazardous physical activities and exposures in their work and home environment Discuss the importance of smoking cessation and physical activity during clinic visits | Disseminate information through community forums about hazard remediation Disseminate information about workplace exposures and proper use of protective equipment through door to door visits by community outreach workers |
| Interpersonal <i>Individual/Dyad/Small group family/friends, co-workers, supervisors</i> | Support peer health coaches to encourage exercise, healthy diet, and smoking cessation Support peer health coaches to assist nursing home workers in successful use of resident handling devices | Provide tools to parents about how to communicate with their teens about workplace safety Support teen health peer leaders in high schools and community organizations | Organize farm worker support groups and use promoters de salud to reach out to employers and workers to provide education about exposures in the work and home environment Collaborate with worker centers or other community based organizations to provide education about exposures in the work and home environment | Create worker train-the-trainer programs so that workers can educate other workers about identifying hazards in the workplace Offer group exercise programs or cooking classes as one of the social activities within community centers that provide information about jobs or working conditions |
| Institution <i>Worksite, community</i> | Support worker committees/teams to identify obstacles to healthy behaviors and strategize about solutions, with sufficient budget & decision authority to implement at least some solutions, and protection against reprisals for team members who identify problems Change policies and practices that interfere with healthy behaviors (e.g., mandatory overtime, supervisor pressure to work faster rather than safer) Conduct routine surveillance of working conditions, including physical & chemical exposures as well as psychosocial job features Eliminate workplace hazards to health and safety | Promote integrated health promotion/health protection programs in workplaces Incorporate workplace health and safety training in high school curricula and workforce development programs | Integrate prompts for clinicians to ask about occupational hazards into the Electronic Medical Record, and use the EMR to assess specific goals set by the community clinic Provide occupational health referral services that include consultation with employers about how to control hazards | Create community gardens and farmers markets and arrange hours that accommodate varying work shifts Collaborate with community service centers such as legal aide centers and social service agencies to distribute information about workplace hazards |

(Continued)

TABLE III. (Continued)

| Levels of influence | Program setting | | | |
|------------------------------|--|--|--|---|
| | Worksite | Health departments | Community clinics | Community-based |
| Intervention targets | | | | |
| Community/society | Conduct state health department surveillance of work-related injuries and illnesses as well as relevant chronic health conditions (e.g., diabetes, metabolic syndrome, ischemic heart disease) by sector and occupational category | Incorporate worker health and safety interventions into the purview and agenda of health departments | Develop standard protocols for assessment and management of occupational and environmental hazards across CMHC network | Apply for community based job training grants and include incentives for employers who comply with safety standards Use community development funds for infrastructure projects that promote physical activity (pools, parks, etc) |
| Policy | | | | |
| Government laws or standards | Regulate physical/ergonomic stressors in the workplace (e.g., heat, noise, heavy lifting) Provide financial incentives (e.g., tax credits) to employers who support worksite health promotion programming with genuine participatory design | Support state law banning use of highly flammable floor finishing chemicals—protecting workers and home occupants Incorporate requirements to use safe needle devices in hospital licensure regulations—protecting workers and patients | Evaluate and document best practices at the community clinic level, and use that evidence to support widespread application of those practices Promote regulations that require clinicians to report/document work related injuries and exposures | Advocate for community ordinances to control hazardous exposures Advocate for local living wage ordinances Advocate for zoning changes that create mixed land use and restrict the density of fast food restaurants |

as by limited food options in the workplace [Champagne et al., 2012].

An underlying goal of health promotion is to motivate healthy decision-making by individuals. Therefore, the work environment itself should reinforce employee competence in decision-making [Koelen and Lindstrom, 2005; Punnett et al., 2009]. If the work environment is experienced as negating the individual's autonomy and decision-making capacities, then the entire strategy underlying WHP is contradicted. Many low-income workers have no job decision-making authority or opportunities to use and develop their skills at work. Workers in these types of jobs, with low "decision latitude," may develop a lower sense of self-efficacy, becoming more passive in relation to their life circumstances [Karasek and Theorell, 1990]. Conversely, greater decision latitude, realized through participating in a work team towards a common goal or having a voice through one's union, can increase satisfaction and self-efficacy [Watts et al., 2001; Park et al., 2004; Delp et al., 2010].

Worker input is also important in designing a program that is relevant and acceptable to workers [Henning et al., 2009; Punnett et al., 2009]. A genuinely participatory structure increases the likelihood that the WHP program will be relevant to workers, enhancing the environmental features that are supports and addressing those that are obstacles to healthy behaviors. One example of a participatory program engaging low-income workers to integrate health protection and health promotion (Table IV) was developed through one of the NIOSH-funded Centers of Excellence to Promote a Healthier Workforce (<http://www.cdc.gov/niosh/TWH/centers.html>).

State and Local Health Departments

Achieving health equity for all groups is an overarching goal in *Healthy People*, a set of recommendations designed to guide public health efforts nationwide [USDHHS, 2010]. State and local public health programs directly target special populations such as low-income women, adolescents, immigrants, minorities, and people with disabilities. Public health agencies are in a position to intervene at multiple levels of the SEF—by shaping policy and promoting systems change at the workplace and in the community, as well as by offering individually focused education and preventive services and assuring access to care [Davis and Souza, 2009].

The state and local public health infrastructure can provide many points of access to reach underserved worker groups with information about health and safety risks, and with strategies to control hazards, provide occupational health services and provide information about legal rights. Public health agencies in a number of states have, for example, disseminated information about health

TABLE IV. Nursing Home Participatory Intervention

The Center for the Promotion of Health in the New England Workplace (<http://www.uml.edu/Research/centers/CPH-NEW/>), one of the NIOSH Centers for Excellence to Promote a Healthier Workforce, has developed a project to promote the physical and mental health of caregivers in nursing homes. Workers in a group of nursing homes have been invited to prioritize their health needs across a broad spectrum of issues, ranging from weight loss, to heavy lifting (resident handling), to perceived lack of respect from center managers and nurses toward aides. Participatory teams have identified obstacles to employee health and strategized a variety of solutions such as improving the quality of food in the vending machines and organizing ergonomics training sessions to complement the company's Safe Resident Handling Program. To increase decision latitude and self-efficacy, the investigators taught skills to support effective team meetings, problem-solving, and improving interdepartmental communication. Team members feel more confident speaking with managers to express concerns and suggest new programs. In one facility, staff wanted to purchase salads and other healthy food options from the center kitchen at a reasonable price. Kitchen staff was initially too busy to discuss the idea, but with planning, the team worked with kitchen staff to reach a solution

Worker self-efficacy can be undercut by unsupportive administrators or by conditions that inhibit participation in the program. Turnout for team meetings is regularly hindered by employees' workloads, busy schedules, and understaffing. Many supervisors have shown support by releasing their staff to participate in team meetings and in team sponsored activities such as walking and weight loss programs, ergonomic training, etc. However, resident care must be given priority, and the reimbursement structure for nursing home services does not incorporate any support for either administrators or workers to seek to improve working conditions

risks in cosmetology through local public health sanitarians responsible for inspecting beauty salons. Health departments in Connecticut (personal communication: Thomas St. Louis, Connecticut Department of Public Health) and in the San Francisco Bay Area [Gaydos et al., 2011] have conducted outreach about worker safety hazards in restaurants through food safety inspectors. In Massachusetts, the public health department disseminates information about young worker health and safety through the school health network (e.g., www.mass.gov/dph/teen-satwork) and is increasingly using social media to publicize health and safety risks, such as public health podcasts in Portuguese and Spanish on safety risks in residential construction. Important targets for these outreach efforts are specific cultural outlets including media [Calles-Escandon et al., 2009] which in turn disseminate the information to their constituents. US public health agencies could replicate a Canadian program that has disseminated basic information about health and safety rights and resources to newcomers through refugee resettlement programs [Institute for Work and Health, 2011]. These mainstream public health avenues of communication can also serve as important two-way streets through which health departments not only provide occupational health and safety information and services, but also collect information from community members about their work and other life experiences that influence health. The occupational public health program in New Hampshire, for example, has collaborated with their Office of Minority Health and Refugee Affairs to identify community leaders to facilitate focus groups to collect information about health and safety needs of immigrants and refugees (personal communication: Karla Armenti, New Hampshire Division of Public Health Services).

State health departments can also coordinate public health collaborations that arise when health concerns of workers and the public-at-large clearly intersect. Many

health hazards such as indoor air quality in schools, latex exposure in health care settings, and lead exposure in home renovation, threaten the health both of workers and of the general public. These shared hazards demand policy and practice solutions that protect all those at risk. Interventions driven largely by concern for the public can result in secondary gains for workers and vice versa. In California, the health department's *Cleaning for Asthma-Safe Schools* project promotes safer cleaning in schools to protect custodians, school staff, and students (Website: <http://www.cdph.ca.gov/programs/ohsep/Pages/class.aspx>, accessed 12/19/2012). In Oregon, concern about resident and worker exposure to commercial pesticides in homes led to changes in training for emergency responders; collaboration among multiple state health agencies conducting pesticide surveillance has led to changes in national pesticide labeling to protect consumers and workers alike [Davis et al., 2012]. These collaborations between occupational health and other public health disciplines bring together their distinct but complementary community networks—leading not just to shared knowledge but also to an expanded advocacy base to prevent workplace and community exposures.

Truly integrative programs address the complex interplay among factors at work, at home and in the broader environment. Important opportunities occur when the public health focus is on outcomes such as violence, cardiovascular disease, and asthma for which occupational risks are among the contributing factors. Integrating occupational health concerns into strategic public health planning can set the stage for future actions and resource allocation. For example, in New Jersey, addressing occupational asthma is included on the state's asthma agenda and these efforts have promoted increased recognition of the need for asthma prevention as well as environmental control. In Michigan, a multidisciplinary team, including occupational health professionals, conducts case reviews of sudden

asthma death and often uncovers workplace causes that can be addressed [<http://www.oem.msu.edu/Asthma.aspx>, accessed February 2, 12; Chester et al., 2005]. In Massachusetts, workplace violence is now included on the state's agenda to reduce youth violence; consequently health and safety training has been integrated into a number of youth violence prevention programs. Likewise, workplace stress is on the statewide strategic plan to address cardiovascular disease, which has resulted in initiatives to develop integrative approaches to worksite wellness that address both personal and occupational risk factors [Davis and Souza, 2009]. In Connecticut, the occupational public health program has partnered with the state health department's cardiovascular health initiative to develop the HEARTSafe Workplace certification program, aimed at reducing workplace hazards and other risk factors and training in cardiac event response [CSTE, 2012]. In California, health department occupational and environmental health programs have joined forces to train promotores (Latino/a community health workers) throughout the state on environmental and occupational health issues and are working to develop a 40-hour environmental health curriculum, which will include training on occupational health [CDPH, 2012].

Public health agencies also influence population health through policy initiatives, developing public health regulations (such as mandatory reporting of lead poisonings) and bringing stakeholders (including other state agencies, such as state OSHA or environmental quality programs) together to address critical public health problems. State health agencies, which have the legal authority to require disease reporting and to collect health data, can also play an essential role in documenting health disparities [Souza et al., 2010]. They have access to many health data sources and can document occupational health needs of vulnerable groups that are not well captured in the SOII and workers' compensation data sets. For example, clinical laboratory data on elevated blood lead levels has been used to document the high risk of lead poisoning among Hispanics adults [Tak et al., 2008]. A joint NIOSH-state initiative is underway to incorporate occupational information in the Behavioral Risk Factor Surveillance System, which will allow opportunities to examine a range of health outcomes in relation to work and other socio-economic variables.

Many public health programs currently focus on individual-level health education programs, but there is renewed recognition of the need for systematic institutional or organizational changes to improve health [Frieden, 2010] and new opportunities for integrative approaches—both programs and policies—to improve the health of low-income workers. With an increasing number of state health and labor agencies developing occupational public health programs in recent years—23 states were funded by

NIOSH in 2011 to implement fundamental programs—there is a growing platform on which to build collaborative efforts.

Community Health Centers

The working poor are disproportionately un- or under-insured for medical services. In 2010, 43% of lower income working age adults (18–64-year olds with an income between 100% and 200% of the poverty level) were uninsured [Cohen et al., 2011]. Lack of health care access causes delays in early diagnosis and treatment and contributes to health inequities [Smedley et al., 2003]. Many workers face added barriers to access health services for work-related injuries and illnesses [Leigh and Robbins, 2004]. Obstacles to using workers' compensation have been widely documented [Dembe, 2001; Boden, 2012]. A 2007 survey in 10 states found the median proportion of those injured at work whose medical treatment was paid for by workers compensation was only 61% [Centers for Disease Control and Prevention, 2010]. Failure to use workers' compensation may not only interfere with access to medical care but also precludes workers' ability to access wage benefits necessary to support themselves and their families during recovery or if disabled.

Community and Migrant Health Centers (C/MHCs) are direct-care providers serving the poor (including the working poor), the uninsured, the homeless, immigrants and refugees, and migrant and seasonal farmworkers, among others. They are supported in part by the Health Resources and Services Administration (HRSA), Department of Health and Human Services, and operate in more than 8,000 locations, serving 23 million patients throughout the US (<http://bphc.hrsa.gov/about/index.html>). They are an important healthcare safety net for the medically indigent, including workers who are likely to seek care for health problems that are caused or compounded by their work exposures [Earle-Richardson et al., 2008].

C/MHCs are often the first point of access for low-income workers seeking care for work-related or non work-related health concerns. Even for workers who have access to occupational health services within their workplaces, job insecurity, and fears of retaliation (firing or being labeled a “careless” employee) means that many low-income workers are seen in C/MHCs for work-related problems [Azaroff et al., 2004]. Often uninsured workers are not aware that they are entitled to medical care for work-related health problems through workers compensation insurance. In five C/MHCs in Massachusetts, over 1,400 working or recently unemployed patients completed a short, anonymous survey. Twenty-one percent reported experiencing a work-related injury, illness, or other health problem during the previous year, yet 39% of those experiencing a work-related health problems had never

heard of workers' compensation and 63% had never heard of the Occupational Safety and Health Administration [Massachusetts Department of Public Health, 2007].

The health care providers at community health centers, like many other primary care providers (PCPs), frequently lack the knowledge or skills to address these occupational health needs. Among C/MHC clinicians surveyed by the Massachusetts Department of Public Health, only one-third reported having adequate training to help patients with injuries or illnesses caused by their jobs, and only 10% thought they had adequate educational or resource materials to offer patients who might be exposed to hazards on the job (personal communication: Letitia Davis). A review of chart notes for patients with chronic obstructive pulmonary disease in primary care practices found that, while 90% of the time the provider documented the individual's occupation, and most patients reported a history of occupational exposures to respirable hazards, a recommendation to avoid exposure was made in only 10% of the cases [Kuschner et al., 2009]. A similar chart review among patients with newly diagnosed asthma found that job title was documented in 75% of cases, but exposure data were collected less frequently and clinical action to address occupational asthma was taken in only one case [Shofer et al., 2006]. These findings are not surprising, given the limited attention paid to occupational and environmental health in medical and nursing school curricula [Schenk et al., 1996; Goldman et al., 1999; McCurdy et al., 2004; Gehle et al., 2011].

Greater collaboration between occupational health practitioners and PCPs improves patient care and facilitates opportunities for intervention at multiple levels of the SEF framework. Practitioners in C/MHCs bring valuable experience with linguistic and cultural competency, an understanding of the role of social factors in determining an individual's health and access to community support services [Adashi et al., 2010; Kugel and Zuroweste, 2010]. Occupational health practitioners can share their knowledge and skills in diagnosis and treatment of work-related health problems and provide an increased understanding of the reality of people's work lives. Several model programs have been developed to assist primary care providers in providing more comprehensive care by better integrating risk factors related to the work environment through specialty consultation programs and by providing easy access to information through toll free hotlines. For example, the New York State Occupational Clinic Network, funded through the state worker's compensation fund, provides consultation to health care providers treating patients with potentially work-related illnesses and injuries and also assists professionals and patients to deal with the workers' compensation system [Herbert et al., 2000]. Table V illustrates how these kinds of consultation services have helped clinicians and patients in community health centers serving agricultural workers. Massachusetts has also piloted the collection of information about occupation in electronic health records at several CHCs, which may improve recognition and

TABLE V. Examples of Programs That Promote Integration in Community and Migrant Health Centers (C/MHCs) Serving Farm Workers

Migrant Clinicians Network, Inc. (MCN) offers an environmental and occupational health (EOH) program supported through a cooperative agreement with the US Environmental Protection Agency's National Strategies for Healthcare Providers: Pesticide Initiative. The primary aim of this program is to integrate EOH into primary care in order to assist clinicians in better recognizing and managing pesticide exposures. MCN's program acknowledges the competing demands and severe time constraints in a primary care setting and recognizes that healthcare providers struggle with ways to incorporate occupational medicine practices into their day-to-day efforts. MCN focuses on feasible changes in clinical practices to improve the recognition and management of occupational exposures and injuries. This is done through partnerships with C/MHCs and involves on-site clinical training, the provision of resources and technical assistance and peer-to-peer networking between frontline providers and occupational and environmental medicine specialists

Between 2006 and 2011, MCN established 10 model environmental and occupational programs in community health centers and clinics across the US. These programs systematically demonstrate: (1) changes in clinical systems including intake, screening, outreach, and education; (2) primary care providers' willingness to acknowledge and address occupational injury and exposure which leads to improved patient care; (3) new linkages between health centers and clinicians and the agricultural workplace; and (4) connections between primary care providers and pesticide experts and OEM specialists [Garcia et al., 2012]

Agricultural Workers' Access to Health Project (AWAHP) is a California-based medical legal partnership to address the frequent exclusion of farmworkers from the workers' compensation system. Since 2004, AWAHP has worked to develop and implement a three-part effort in which low-wage immigrant workers are informed of their right to medical treatment and related benefits in the workers' compensation system and are provided medical and legal services so they can obtain the medical treatment they need. During the last 3 years AWAHP led *Salud Para La Gente*, a C/MHC, through planning and implementation allowing it to provide effective treatment and conduct proper coding and billing for work injuries under workers' compensation, with a focus on sustainable services and proper payment for services rendered

Community Health Partnership of Illinois (chpofil.org) has five health clinics that serve migrant and seasonal farmworkers and their families. They operate a nurse-managed health program for farmworkers that stresses outreach, health promotion and case management. This program provides stipends, training and ongoing support to 16-farmworker men and women each year who serve as *promotores de salud*. There are many other similar successful programs around the country (mcn.org). One Florida based program trained 427 farm workers over two growing seasons, distributed 705 pairs of safety glasses and provided first aid to 227 farm workers. Observations of workers harvesting fruit showed that eyewear use increased from virtually 0% before the intervention to 34% after the intervention [Forst et al., 2004]

diagnosis of work-related health problems and management of care for patients more generally [Wegman et al., 2011].

Community health workers

Community Health Workers (CHWs) are increasingly used throughout the US to reduce health inequities. CHWs assist people in receiving the care they need, give counseling and guidance on health behaviors, advocate for individual and community health needs, and provide some direct services such as first aid and blood pressure screening [Viswanathan et al., 2009]. The CHW model is another application of the SEF: as peer mentors, community health workers reach workers, and their families to provide information that influences both intrapersonal and interpersonal factors. Most community health workers are affiliated with community clinics, and some include issues related to the work environment (such as the example from Illinois in Table V).

CHWs have worked with community organizations to address larger economic and policy issues such as living wage legislation and environmental hazard remediation. The CHW model has been used to communicate safety and health information to low-wage immigrant workers, most commonly to farmworkers [Monaghan et al., 2011] but also among North Carolina poultry processing workers [Grzywacz et al., 2009] and construction workers [Williams et al., 2010]. Many of these programs were created in collaboration with Worker Centers [Fine, 2006] which provide assistance with a wide range of employment issues to low-wage and marginalized workers, especially

those who are immigrants. While workers may initially come to a workers center for assistance with other labor issues (like wage theft) they are then introduced to health and safety programs. For example, worker centers in New Jersey and Chicago teamed up with local occupational health experts to establish peer-led training on construction health and safety [Williams et al., 2010]. The peer-trainers have subsequently demanded a larger and sustained role in carrying health and safety training and advocacy to their peers on street corners and at work sites. Another example (Table VI) describes the use of community health workers as part of a training program targeting casual, temporary workers with limited literacy and English skills in high-hazard industries and provides information using culturally appropriate material.

Community-Based Programs

While historically most community-based health programs were offered through community health centers or local health departments, more recently other community organization have initiated or are playing central roles in programs to promote health equity, including programs to reduce environmental and occupational exposures. These intervention programs, often referred to as community-based participatory programs, prioritize the active participation by community members in the development, implementation and evaluation of programs [Wallerstein and Duran, 2010]. These programs embrace the SEF framework by looking beyond individual risk factors and health behaviors to examine broader social and community influences on health [Minkler, 2010].

TABLE VI. Community-Based Participatory Training

IDEPSCA, the Instituto de Educación Popular del Sur de California, is one of more than 100 worker centers throughout the country [Fine, 2006]. Organized as a coalition in 1983, volunteers taught Spanish literacy and English classes and were committed to responding to the needs of low-wage, immigrant workers, and defending their human rights. Based on popular education principles (critical analysis and education for action), the classes led to organizing among day laborers, household workers, tenants, and street vendors. Health emerged early on as a critical issue and IDEPSCA launched a Worker Health Project officially in 2003, targeting casual, temporary workers with limited literacy and English skills in high-hazard industries. IDEPSCA established periodic health fairs reaching thousands of people, with local physicians providing health exams and with *promoters* providing health information. They collaborated with a network of clinics to refer patients to low-cost medical resources and provided education about health and workers' rights in clinic waiting rooms

Work-related health and safety is now a key component of many IDEPSCA programs. Staff collaborates with the UCLA Labor Occupational Safety and Health program (LOSH) to obtain technical information and training and with a community coalition, SoCalCOSH, to develop outreach programs through the consulates, churches and other community groups. To build organizational capacity, IDEPSCA staff and worker leaders attend UCLA-LOSH leadership courses to become Health and Safety Specialists and a core group has become peer trainers. Staff and worker leaders document common job hazards of day laborers, street vendors, household and other workers, develop case studies, a newsletter and other educational materials, train workers at day laborer job centers, on street corners, and in other venues, and support the establishment of worker health and safety committees. They have been key partners and peer trainers in LOSH's Southern California campaign to prevent heat illness, part of a large statewide initiative

IDEPSCA's holistic and preventive approach to health—addressing the context of workers lives through outreach, education, access to health care, and job creation—also encompasses policy advocacy. Current policy initiatives include advocating for worker protection standards in green chemistry regulations with an emphasis on safer cleaning chemicals, and working in coalition to advocate for a Domestic Workers Bill of Rights

A community-based participatory approach is useful in reaching many low-income workers, especially those workers whose employers are unwilling or unable to address occupational safety and health issues (such as small business owners) or for workers who may feel intimidated at the workplace [Minkler et al., 2010]. They are also effective in developing education and outreach programs that overcome the cultural, language, and literacy barriers that limit the effectiveness of some workplace training programs [Baron et al., 2009]. Finally, by building local knowledge and leadership these approaches help to create sustainable programs [Minkler et al., 2008; Israel et al., 2010]. Many of these characteristics are demonstrated in the community-based training initiative for contingent Latino workers described in Table VI.

Environmental Justice: Partnerships for Communication is an example of a federally funded community-based participatory research (CBPR) initiative addressing environmental and occupational health [Baron et al., 2009]. This program was first funded in 1994 by the National Institute of Environmental Health Sciences (NIEHS) to allow community members to actively participate in the environmental and occupational health research affecting their communities. By 2007, NIEHS, together with the Environmental Protection Agency and NIOSH, had funded a total of 53 projects in urban and rural communities throughout the US. The projects brought together three groups—community organizations, environmental/occupational health researchers, and health care professionals—to address the needs of communities facing disproportionate health and environmental burdens. They emphasized community engagement to encourage individual behavior change and to motivate collective actions to create sustainable programs and improve policies, thus implicitly adopting the SEF. The projects raised health awareness at the intrapersonal and interpersonal levels through community classes and workshops, educational presentations in community centers and religious institutions, and technical information meetings in response to specific community complaints. “Neighbor to neighbor” community outreach strategies, often by community health workers, developed portable illustrated flip charts, photos for digital storytelling, and interactive exercises. They also used mass media outlets including radio, television, and newspapers; and created educational fact sheets and pamphlets, posters, video/DVDs, audio cassettes, photo exhibits, and community theater performances [Green et al., 2002; Vallianatos et al., 2004; May et al., 2008; Baron et al., 2009; Brody et al., 2009; Downs et al., 2009; Gute et al., 2009; Morello-Frosch et al., 2009; Krieger et al., 2009a,b; Azuma et al., 2010; Adams et al., 2011].

Targeted health behaviors included in the Partnerships for Communication projects included increasing physical activity and promoting healthy eating habits, reducing use

of toxic cosmetic products, and increasing the use of non-toxic “green” cleaning agents by domestic, or household, workers. The projects also influenced community/institutional change, leading to a direct reduction in exposure to hazardous environmental toxins such as decreased use of toxic cleaning compounds in a large commercial cleaning worksite, controls on airborne contaminants in auto body shops, and reductions in the use of toxins by computer manufacturers. In Chicago and Los Angeles, the projects contributed to actions of school boards to reduce student access to unhealthy foods. A manufacturer of blueberry harvesting rakes began marketing rakes that were physically less stressful on workers and an insurance company encouraged farm company clients to use employee training materials developed by the community. The projects also led to policy changes, such as a New York City Council law to reduce diesel exhaust from school bus idling, a Massachusetts State law prohibiting the use of highly flammable solvents by floor finishing companies and a collaboration with a mayor’s task force in Houston, Texas to reduce toxic emissions in the petrochemical industry [Baron et al., 2009; Azaroff et al., 2011]. The success of such collaborations by occupational/environmental health practitioners and community-based organizations has since been replicated in other communities, often expanding into broader and more integrated health initiatives.

Finally, the Minority Worker Training Program (MWTP) established by NIEHS in September 1995, funds programs to recruit and train under- and unemployed individuals living near hazardous waste sites or other contaminated properties. The program trains participants in the skills needed to engage in hazardous waste remediation so that they can obtain work in the environmental field [NIEHS, 2009]. The MWTP targets unemployed workers, especially those living in communities disproportionately affected by environmental exposures. It supports the creation of “green jobs,” such as Los Angeles City’s green building retrofit program. Community, workforce development and environmental justice groups, labor and university programs provide job skills, access to health and social support services, health and safety training, and programs to improve workers’ self-efficacy to contribute to their community. These training programs have served more than 7,800 workers across the country and placed 5,400 workers in jobs in over 30 communities from Boston to Los Angeles [NIEHS, 2009].

DISCUSSION AND RECOMMENDATIONS

The examples described above illustrate several complementary venues for integrated public health programs that consider the complex interplay between work-related and non-work-related factors, that integrate health

protection with health promotion and that are delivered at multiple levels to improve health for low-income workers. Hazards in the workplace can impact health directly; and working conditions, both physical and organizational, can influence what are commonly thought of as personal health choices. Whether at the workplace or in the community, employers, workers, labor, and community advocates, in partnership with public health practitioners, can deliver comprehensive and integrated health protection and health promotion programs. Achieving real integration—programs that address the combined and interacting factors at work, at home, and in the community and that combine health protection with health promotion—is difficult to accomplish. While a few good examples are beginning to emerge, there is much more work to be done in this area to evaluate effectiveness and to translate research findings into practice [Cherniack et al., 2011].

SEF is a helpful planning framework, as it posits the need for multi-level interventions that address the complex and dynamic interplay of factors more often treated separately. Traditional health promotion efforts that address only employee motivations, beliefs, or attitudes (intrapersonal level), but do not address fundamental changes in the way work is organized (organizational level), or the interactions that take place between supervisor–employee (interpersonal level), are unlikely to produce lasting change. Moreover, by only addressing a single level of influence, the disparities in health facing low-income workers will likely persist or perhaps even expand.

There are many challenges to developing integrated public health programs for low-income workers. Public health professionals, community partners, labor, and other employee advocates are often overwhelmed. In times of limited resources, they may be unwilling to add new program elements even if they recognize their importance. For example, while there are several examples of programs in community clinics serving agricultural workers that better integrate the consideration of occupational exposures (Table V), in many other busy primary care practices occupational exposures may not receive attention.

Professional “silos” create distinct jargon and orientations that also impede collaboration within or across levels of the SEF. For example, many in public health articulate a primary program goal of promoting *positive health behaviors*. Occupational safety and health practitioners are uncomfortable with the suggestion that workers “choose” unsafe work practices or unhealthy behaviors and therefore they, rather than unsafe working conditions, are to blame for their injuries and illnesses.

On the policy level, our institutional frameworks and siloed funding streams have created divisions that are often hard to overcome. While federal and state labor departments that enforce labor laws are the lead agencies

in protecting workers’ health, environmental, and public health agencies have important complementary roles in conducting health surveillance, and funding research and intervention programs. Environmental, labor, and health agencies often work in isolation, despite the clear relationship between the workplace and community environment and the clear impact on health, particularly the health of low-income workers who confront multiple exposures. For example, a worker in a small automotive repair shop in California suffered peripheral neuropathy when a chemical known by public health professionals to be hazardous to workers was substituted for one banned by air quality agencies [Wilson et al., 2007]. The recently revived initiative to integrate environmental justice principles into all government agencies prompted dialogue and collaboration to expand the concept of environment to include the workplace and develop a more integrated approach to controlling exposures (see Federal Interagency Working Group on Environmental Justice at www.EPA.gov).

Community involvement also enhances policy change. Effective programs that reduce worker injury and illness have come about because of community concerns about dust from construction sites or pedestrian injuries from falling scaffolds; local regulations to require dust controls or scaffold inspections improve worker safety as well. Community-based programs that engage stakeholders with differing viewpoints and knowledge and which cross disciplines are more likely to find creative ways to address the personal, social, and economic factors that affect the health of the low-income workforce whether in or outside of the workplace.

Lastly, many seeking to improve health equity view employment as part of the solution, and are reluctant to acknowledge that it may also be part of the problem. Concerns about workplace hazards or environmental impact can be hard to address when work is a fundamental way to improve socioeconomic status (and thus health) and an ideology persists that any job is better than no job. The NIEHS Minority Worker Training Program is an example of an intervention approach that confronts the issue by creating and training unemployed workers for safe jobs focused on improving environmental conditions, especially in communities with disproportionate exposure to contaminants.

Some broad recommendations for promoting a more integrated approach to improving the health of low-income workers include:

- (1) Improve access and enhance quality and usefulness of data: Whether in a clinic, as part of a health surveillance system, or within community-based initiatives, collecting data related to individuals’ work environment helps incorporate work-related factors into public health programs. Ongoing efforts to include work-related variables in the electronic health

record [Wegman et al., 2011] and national health surveys are important examples that will improve data and may help improve health equity.

- (2) Integrate work environmental factors into care at community health centers: Development of quality of care measures for community and migrant health centers around occupational health would require providers to take concrete steps to address occupational health issues in their patient populations. Federally funded community and migrant health centers are required to use common clinical performance measures that are based on a metric and definitions used by other tools including Health Plan Employer Data and Information Set [Harman et al., 2010]. Occupational health performance measures that could be added include questions such as: Did the provider ask working-age patients with asthma about potential triggers at their workplace? For what percentage of house painters were blood lead tests ordered? Was employer name or industry collected for at least 50% of working age adults?
- (3) Enhance exchange of information and ideas: Mutual exchange of information and experience among public health disciplines and programs is key to improving integration. This includes exchanging information between occupational health and primary care practitioners; between different programs within public health agencies; between those conducting workplace wellness programs and those responsible for workplace safety and health; between labor, community members and experts; and between workers themselves and all of these components of the public health infrastructure.
- (4) Provide more integrated public health/occupational health education and training: Improving all health profession school curricula to reach clinicians at the beginning of their health careers might be beneficial in creating better communication and more exchange of information. New models to provide practicing health care providers with occupational health information and links to occupational health resources need to be explored. Training social workers, health navigators, community health workers, and others about work and health and occupational health resources will also be critical as these workers play increasingly important roles in the health care delivery system.
- (5) Engage worker and community participation: Capacity-building is a key step in providing workers, labor unions and community-based organizations with the tools to act as equal partners in implementing intervention programs. As we have described, whether through worksite programs, as *promotores* within community clinics, or as active members of

community-based participatory research and training programs, worker participation is essential to build effective and sustainable programs. To the extent that it helps to correct dis-empowerment, participation may itself be a health-promoting activity. Capacity-building also helps create jobs and promote economic development for low-income communities and community residents. Public health and other government agencies likewise need to build working relationships with worker and community organization partners to increase government accountability to local community needs.

- (6) Conduct research: The development of truly integrated public health intervention programs for low-income workers will require additional research efforts to test new approaches and to evaluate their effectiveness. Support for innovative demonstration projects that are multidisciplinary and community-based will build the scientific basis that will contribute to program sustainability and influence policy development.

In summary, protecting the health of the low-income workforce should be a public health priority due to the existence of well-documented disparities in a wide-range of health outcomes, including work-related injuries and illnesses. The many problems faced by low-income workers and the complex interplay of overlapping occupational and non-occupational risk factors, exacerbated by the inequitable distribution of resources and societal racism, pose significant challenges and require creative new approaches to improve health equity. To address these issues will require integrated public health programs that control unhealthy exposures, encourage healthy lifestyles, and promote healthy decision making. This will best be accomplished through the active engagement of a broad range of partners—including occupational safety and health professionals, state and local public health programs, healthcare providers, and low-income workers, their employers and their communities. We have provided a number of promising examples where integrated public health programs have been established in workplaces, through health departments, in community clinics and by community-based organizations. These examples demonstrate the importance of developing integrated programs that combine individual solutions with institutional-, community-, and policy-level changes.

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